Volume 9, Number 3, (Cumulative No.30) Part 15 September 25, 2012 ISSN:1097-8135

Life Science Journal

Marsland Press

PO Box 180432, Richmond Hill, New York 11418, USA

Website:
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

Phone: (347) 321-7172

Life Science Journal 2012 Volume 9, Number 3, Part 15 ISSN:1097-8135

Volume 9, Number 3, Part 15 September 25, 2012 ISSN:1097-8135

Life Science Journal

ISSN 1097-8135

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Websites:
http://www.lifesciencesite.com
http://www.sciencepub.net

Emails:
lifesciencej@gmail.com
editor@sciencepub.net

Volume 9, Number 3, Part 15 September 25, 2012 ISSN:1097-8135

Life Science Journal

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Websites:
http://www.lifesciencesite.com
http://www.sciencepub.net

Emails:
lifesciencej@gmail.com
editor@sciencepub.net

ISSN: 1097-8135

Life Science Journal

Acta Zhengzhou University Oversea Version

(*Life Sci J*)

Life Science Journal, the Acta Zhengzhou University Oversea Version, is an international journal with the purpose to enhance our natural and scientific knowledge dissemination in the world under the free publication principle. The journal is calling for papers from all who are associated with Zhengzhou University-home and abroad. Any valuable papers or reports that are related to life science - in their broadest sense - are welcome. Other academic articles that are less relevant but are of high quality will also be considered and published. Papers submitted could be reviews, objective descriptions, research reports, opinions/debates, news, letters, and other types of writings. Let's work together to disseminate our research results and our opinions.

Introductions to Authors

1. General Information

(1) Goals: As an international journal published both in print and on internet, **Life Science Journal** is dedicated to the dissemination of fundamental knowledge in all areas of nature and science. The main purpose of **Life Science Journal** is to enhance our knowledge spreading in the world under the free publication principle. It publishes full-length papers (original contributions), reviews, rapid communications, and any debates and opinions in all the fields of nature and science.

(2) What to Do: The **Life Science Journal** provides a place for discussion of scientific news, research, theory, philosophy, profession and technology - that will drive scientific progress. Research reports and regular manuscripts that contain new and significant information of general interest are welcome.

(3) Who: All people are welcome to submit manuscripts in life science fields. Papers of other fields are also considered.

(4) Copyright and Responsibility of Authors to their Articles: When the manuscript(s) is submitted to the journal, the authors agree the following: All the authors have participated sufficiently in this work; The article is not published elsewhere; Authors are responsibility on the contents of the article; The journal and author(s) have same right for the copyright of the article and either of the journal or author(s) can use it by anyway without noting the other party.

(5) Publication Costs: US$500 per article to defray costs of the publication will be paid by the authors when it is received. Extra expense for color reproduction of figures will be paid by authors (estimate of cost will be provided by the publisher for the author's approval).

(6) Advertisements: The price will be calculated as US$400/page, i.e. US$200/a half page, US$100/a quarter page, etc. Any size of the advertisement is welcome.

2. Manuscript Preparation

Each manuscript is suggested to include the following components but authors can do their own ways:

(1) Title: including the complete article title; each author's full name; institution(s) with which each author is affiliated, with city, state/province, zip code, and country; and the name, complete mailing address, telephone number, facsimile number (if available), and at least one email address for author(s). **(2) Abstract**: including Background, Materials and Methods, Results, and Discussions. **(3) Key Words**. **(4) Introduction**. **(5) Materials and Methods**. **(6) Results**. **(7) Discussions**. (8) **Acknowledgments**. **(9) References**.

3. Manuscripts Submission

(1) Submission Methods: Submission through email (editor@sciencepub.net) is encouraged.

(2) Software: The Microsoft Word file will be preferred.

(3) Font: Normal, Times New Roman, 10 pt, single space.

(4) Indent: Type 2 space in the beginning of each new paragraph.

(5) Manuscript: Don't use "Footnote" or "Header and Footer".

(6) Email: At least one author's email must be put under title.

(7) Title: Use Title Case in the title and subtitles, e.g. "**Debt and Agency Costs".**

(8) Figures and Tables: Use full word of figure and table, e.g. **"Figure 1.** Annul Income of Different Groups**", Table 1. Annual Increase of Investment".**

(9) References: Cite references by "last name, year", e.g. "(Smith, 2003)". References should include all the authors' last names and initials, title, journal, year, volume, issue, and pages etc.

Reference Examples:

Journal Article: Hacker J, Hentschel U, Dobrindt U. Prokaryotic chromosomes and disease. Science 2003;301(34):790-3. **Book**: Berkowitz BA, Katzung BG. Basic and clinical evaluation of new drugs. In: Katzung BG, ed. Basic and clinical pharmacology. Appleton & Lance Publisher. Norwalk, Connecticut, USA. 1995:60-9.

(10) Submission Address: editor@sciencepub.net, Marsland Press, PO Box 180432, Richmond Hill, New York 11418, USA, 347-321-7172.

Marsland Press / Zhengzhou University
PO Box 180432, Richmond Hill, New York 11418, USA
http://www.lifesciencesite.com; http://www.sciencepub.net
lifesciencej@gmail.com; editor@sciencepub.net

CONTENTS

Interactional behavior and relational impact of physicians in healthcare with emotional intelligence competencies

Dr. Venkatesh. J[1], Balaji. D[2], Thenmozhi. S[3] and Dr. Balasubramanie. P[4]

[1,2]School of Management Studies, Anna University: Chennai - 600025, Regional Office - Coimbatore, Coimbatore - 641047, Tamil Nadu, INDIA
[3,4]Department of Computer Science and Engineering, Kongu Engineering College, Perundurai, Erode - 638052, Tamilnadu, INDIA
[2]Corresponding Author: balablooms@gmail.com

Abstract: The focus of this research article is to examine how the Physician's interactional behavior namely, listening and explaining behavior is influenced by the patients' loyalty, and confidence, which are the components of emotional intelligence. This would appear to enhance its significance as of its kind conducted in the context of an advanced developing economy. The research enhanced suggests that development of effective communication skills in Physicians warrants due attention in medical education. Furthermore, the results of this study validate relevant measurement scales in India's context. Results confirm that the Physician-patient relationship is positively influenced by the interaction behavior of service providers, i.e. emotional labors, and further demonstrates that Physicians' interaction behavior is instrumental in developing an effective relationship with their patients and boosts patients' confidence in their Physicians. Additionally, effective interaction enhances patients' loyalty to their service providers.

[Venkatesh. J, Balaji. D, Thenmozhi. S and Balasubramanie. P. **Interactional behavior and relational impact of physicians in healthcare with emotional intelligence competencies.** *Life Sci J* 2012;9(3):2169-2178] (ISSN:1097-8135). http://www.lifesciencesite.com. 313

Key Words: Health services, Customer relations, Physicians, Patients, Customer satisfaction, Customer loyalty

Introduction:

The quality of healthcare services is an issue that is generating increasing interest internationally from academics and practitioners. Healthcare services affect quality of life more than any other service sector. Healthcare services are high-credence services, characterized by a high degree of uncertainty and risk. Patients or their families usually lack the professional knowledge to judge the quality of the service being provided during the service delivery and even after receiving the service. Patients evaluate the quality of healthcare services based on their interactions or so-called "service encounters" with healthcare service providers, their Physicians. These interactions help build patients' confidence in their Physicians and the quality of the medical services being provided. Most patients are keen to form a relationship with their Physicians. The relationship between patients and their healthcare providers (especially Physicians) is very important because patients gain a certain sense of security regarding the outcome of the service provided to them. The quality of care improves through long-term relationships with Physicians who know their patients' medical history. On the other hand, due to intense competition, patients can exercise their right to a choice by switching if they are not satisfied with their healthcare providers. This can result in increased marketing costs and less profitability for the healthcare service provider. Therefore, the relationship is as critical to healthcare providers as it is to patients. As well as the core benefits of a service, the extant literature refers to a customer's motives for entering and maintaining a relationship with a service provider because there are perceived economic, functional, social, and psychological benefits.

Service Providers in Health Care:

Berry (1995) emphasizes the importance of customers' relational benefits for a successful business relationship and considered relational motives such as customers' desires for risk reduction and social benefits. Gwinner et al. (1998) propose three relational benefits from the customer's perspective: social benefits, confidence benefits and special treatment benefits. Owing to the nature of healthcare services, the relationship with Physicians is primarily driven by their patients' desire for risk reduction and confidence. Customer loyalty including repurchase behaviors and positive word-of-mouth communication has been seen as the ultimate relationship marketing outcome, and it has been viewed as the real strength of the relationship. Satisfaction is regarded as an equally important outcome of the buyer-seller relationship in the service context and it is a key variable of relationship continuity. Therefore, this study involving Physician-patient relationships proposes confidence, satisfaction and loyalty as relational outcomes and investigates the effect of Physicians' interaction behavior during the service encounters on these

relational outcomes. Understanding such relationships is necessary in order for better service practices to develop. Despite its obvious importance, there is little research exploring the impact of Physician behavior during the service encounters on relational outcomes. In particular, little is known about the influence of Physicians' communication behavior in building relationship satisfaction and confidence. This study attempts to broaden our understanding of the association between these relational outcomes and Physicians' interaction behaviors: listening, explaining and perceived competence. Listening refers to patients' perception that their Physicians are willing to take time to listen to them and pay attention to the issues that concern them. Explaining refers to patients' perception about their Physicians' ability to provide the information regarding their state of health, medication, home care and medical procedure required. Perceived competence is the extent to which patients trust their Physicians' skills and knowledge required to provide for their healthcare needs. Behavioral loyalty includes repurchase intentions and world-of-mouth recommendations as suggested by various scholars. This study is conducted in India, which is currently making great strides as an advanced emerging economy. Indians are considered to be relationship oriented and socially they engage in collectivist principles and practices, which historically have dominated India for much of its history. Little empirical research of service behaviors has been undertaken in emerging economies where healthcare systems work very differently in comparison to mature economies. This study attempts to bridge this important gap in the literature by integrating the findings in medical sociology literature and the work emanating from research in services marketing.

Literature Review:

Relational Benefits:

A strong relationship between people, communities or organizations is based on mutual benefits (Crosby et al., 1990; Gro¨nroos, 1994, 1996). In the relationship concerning service providers and customers, the latter expect to receive benefits beyond just the core service benefits from their service provider. Researchers have termed these relational benefits because they are essentially additional expected benefits (Bendapudi and Berry, 1997; Dwyer et al., 1997; Hennig-Thurau et al., 2000, 2002; Reynolds and Beatty, 1999). These relational benefits are said to provide the real reasons why "true relationships" exist (Barnes, 1994; Bendapudi and Berry, 1997). The relational benefits will be particularly valued by customers in situations where: first, little differentiation is possible between competitive products/services; and second, where the product/service is difficult to evaluate even after consumption (Fisk et al., 2007; Zeithaml, 1981; Zeithaml et al., 2009) – such as healthcare services. Relational benefits can be important in relationships between a single customer and a single employee such as in the case of exchanges between a patient and his/her Physician. These benefits are referred to as personal level benefits due to the particularly high levels of intimate contact between customer and employee (Hennig-Thurau et al., 2000). A typology of three relational benefits is developed by Gwinner et al. (1998) and empirically supported by some studies (Bendapudi and Berry, 1997; Berry, 1995; Gwinner et al., 1998):

- Confidence benefits, which refer to perceptions of reduced anxiety and enhanced comfort
- Social benefits, which refer to the emotional part of the relationship and are characterized by personal recognition of customers by employees, the customer's own familiarity with employees and the creation of friendships between customers and employees
- Special treatment benefits, which take the form of price breaks, faster service or individualized additional services

Of these three benefits, confidence benefits are highly valued and the most relevant for a high-credence service like healthcare service. This is because patients want to have as little anxiety as possible prior to undergoing medical treatment, and involve themselves positively in recovery following the treatment. Therefore, in the studies involving Physician-patient relationships, patient confidence in their Physician needs to be further explored.

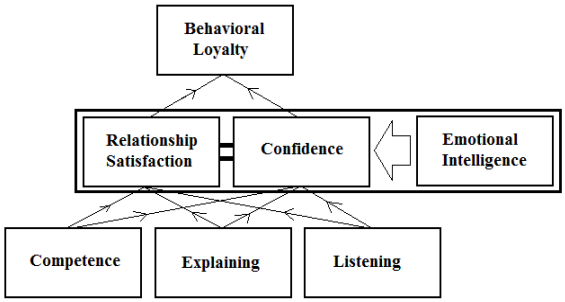


Figure 1: The Conceptual Model of the Study

Relationship Satisfaction:

The satisfaction in a relationship has been considered to be a measure of relationship quality. Relationship satisfaction has been defined as "customers' cognitive and affective evaluation based on their personal experience across all service episodes within the relationship". In other words, relationship satisfaction is accumulated across all the interactions in an ongoing relationship. In the Physician-patient relationship context, satisfaction is

generated by Physician behaviors during interactions with their patients.

Service Behaviors Responsible for the Customer Relationship:

Customer perception of service quality mostly focuses on technical concerns – what is provided and how the service functions or is provided. In service marketing literature, service quality perception includes interpersonal quality, technical quality, environment quality and administrative quality. Researchers in medical sociology have explored patients' perceptions of various aspects of medical services, and such studies have involved conducting patient satisfaction surveys comprising assessments of professional competence, interpersonal manner, access to and availability of resources. Reseachers identified four dimensions of service encounter: perceived competence, listening, dedication and effectiveness. They found that these four dimensions contribute more to the evaluation of the service encounter than the effectiveness of the service. In a study of patient satisfaction in a family practice centre, DiMatteo and Hays (1980) found conclusive evidence that if patients felt their Physicians were effective communicators, they also considered them to be technically competent and to be providing appropriate effective care. In the medical sociology literature, a physician's ability to establish rapport with patients is at least partially dependent on his/her communication skills. In another study, DiMatteo et al. (1979) found that Physicians' socio-emotional behavior such as caring and openness to communication tended to weigh heavily in patients' decision to continue the physician-patient relationship. According to these studies, the most important aspects of satisfaction with Physicians is patients' feelings of being genuinely cared for by their them, the degree to which their Physicians took time with them, explained and listened to them, and were accessible when needed. Johnson (1987) reviewed the literature in behavioral disciplines on communication styles and concluded that the marketing exchange between patient and practitioner is more satisfying for both parties when communication improves. A survey of surgical patients also highlights the need for Physicians to spend more time explaining what is wrong with the patient and possible treatments available to them. An extant review of previous studies both in service marketing and medical sociology literature indicates that two dimensions of service behaviors – perceived effectiveness of communication including listening and explaining, and perceived competence of Physicians – are the most important aspects of patients' satisfaction and contribute to relational benefits. Studies have also suggested that effective communication can foster trust in the development of the relationship. Effective communication between Physicians and their patients is helpful in reducing the uncertainties and suspicions that patients may have before and after the clinical service. Thus, effective communication between Physicians and their patients' enhances the latter's overall satisfaction with healthcare providers and reinforces confidence in the relationship. This two-way communication specifically includes listening from the patients and explaining by the Physicians.

Listening:

Listening is one of the six major components of the interactivity dimension, along with responsiveness, didactics, understanding, personalization and psychological proximity. Willingness to listen demonstrates that a person has a certain degree of attentiveness. It is essential for the customer oriented approach of a salesperson and is positively related to customer satisfaction. The consumer's perception of a salesperson's listening behavior has an impact on the promotion of long-term relationships, building of trust and satisfaction, and anticipation of future interactions. In the healthcare service context, patients themselves are the primary sources of information used by Physicians to understand their medical needs. Taking the time to listen to their patients is the first step for Physicians to provide proper care, treatment and quality service.

Explaining:

The explaining behavior involves explanation of the condition, which includes:

- Providing patients with information regarding their condition
- Changes in condition and prognosis; explanation of the process of care which includes the process of explaining tests
- How and why they are being conducted; treatments, therapies, etc.
- Explanations of self care including patients being provided with information about
- How to take care of themselves at home to promote recovery or optimal health; and
- Explanation of medicines incorporating information on how to take medication, their possible side effects, etc.

Perceived Competence:

Competence is defined as the possession of the required skills and knowledge to perform services. Similarly, expertise is also defined as the customer's perception of a salesperson's competencies associated with the product, information and service delivery. Professional competence is defined as a dimension of service quality measuring the salesperson's knowledge and expertise.

Loyalty:

In this study, loyalty is conceptualized to include the behavioral aspect of repurchase intention, the attitudinal aspect of willingness to recommend or positive word-of-mouth and the cognitive side of being the first choice to come to mind. Service marketers aim to ensure that out of their marketing efforts, they can generate favorable behavioral outcomes. Customer loyalty in the business world has long been considered a key behavioral outcome. Loyalty is generally expressed in terms of two behavioral outcomes:

- Repurchase intention
- Willingness to recommend.

Repurchase intention indicates whether or not a customer will maintain the relationship with his or her service provider. Word-of-mouth recommendation is the extent to which customers will inform their friends, relatives, and colleagues about the consumer experience. Customers who recommend a service firm to others are also likely to continue using the service provider for their own needs. Word-of-mouth has been found to play a particularly important role in the advertising of services. It is a powerful force in influencing future buying decisions, particularly when the service is perceived as high risk for the customer; and it also helps in attracting new customers as relational partners for a company's offerings. The link between satisfaction and loyalty has been well established in the literature. Satisfaction leads to the creation of a strong relationship between the service provider and customer, leading to relationship longevity, or customer retention. Service loyalty depends more on interpersonal (face-to-face) interactions. Therefore, the customer's perception of the face-to-face interaction with the service provider is one of the strongest determinants of loyalty. It has been discovered that confidence in the relationship has a positive impact on satisfaction ratings in channeling relationships between manufacturers and buyers and in service interactions. Greater levels of confidence in the interaction will result in less anxiety leading to greater satisfaction. Confidence/trust in a relationship reduces uncertainty and vulnerability, especially for services that are difficult to evaluate due to their intangible, complex and technical nature. Patients should be expected to be loyal to their healthcare provider when they gain confidence in their Physicians.

Concept of Emotional Intelligence:

Emotional Intelligence (EI) was formally conceptualized by Salovey & Meyer (1990). Salvovey & Meyer (1990) and Pfeiffer (2001) stated that EI is a subset of social intelligence which involves the ability to monitor one's own and other's feelings; emotions to discriminate among them and to use this information to guide one's thinking and ability. Salovey and Meyer (1990) later examined a variety of skills including management skills that relate to EI. This model consisted of four components of abilities mainly, a) to perceive accurately, appraise and express emotion; b) to access and or generate feeling when they facilitate thought; c) to understand emotion and apply emotional knowledge; and d) to regulate emotions, to promote emotions and intellectual growth. Contrary to Salovey & Meyer's (1990) model, Goleman (1995) proposes EI's model which consists of two components mainly personal competence and social competence. Personal competence includes self-awareness (the keystone of EI), self- regulation and motivation while social competence consists of empathy and social skills. Self-awareness is the ability to recognize and understand one's own moods, emotions, drives and their effects on others. Self-confidence, realistic self-assessment and often a self-deprecating sense of humor are among characteristics of self-awareness. In self-awareness leaders are supposed to be able to recognize a feeling as it happens, to accurately perform self-assessment and have self-confidence. Goleman's study (1995) found that effective leaders are those who demonstrate self-awareness, have high self-confidence as well as able to assess their strengths and weaknesses. It can be concluded that a high level of self-awareness that is associated with EI tend to encourage leaders to demonstrate self-confidence, earn respect and trust from followers. Meisel (2004) found that self-awareness is the greatest predictor of success in everything people do.

Self-regulation or self-mastery is the ability to control emotions, to remain calm, encounter problem and resistance, manage stress skillfully, finding ways to handle fears, anxieties, anger and sadness and to stay focused on the tasks performed. Individuals with self-regulation are able to handle change and being comfortable with ambiguity. Through self-regulation, leaders can objectively consider the needs of others despite their own immediate feelings. Goleman (1998) highlighted that qualities of self-regulations are like trustworthiness, integrity, conscientiousness, self-control, adaptability, innovativeness and taking responsibility for one's own actions. A leader with EI is expected to be able to keep disruptive emotions and impulses (self-control); maintain standards of honesty and integrity (trustworthiness); take responsibility for one's performance (conscientiousness); handle change (adaptability) and be comfortable with novel ideas and approaches (innovation). A leader with EI would be optimistic and show happiness despite obstacles, setbacks and failure. Motivation relates to expanding energy in a specific direction for a specific purpose. It refers to the emotional tendency guiding or facilitating

the attainment of goals. It encompasses achievement drive (meeting a standard excellence); commitment (alignment of goals with the group and organization); initiative (acting on opportunities) and optimism (persistence reaching goals despite setbacks). Good emotion will encourage leaders to be more motivated in the tasks performed. Motivation also involves passion, confidence, enthusiasm and normally zeal to work not because of money or status but to pursue goals with energy and persistence. Maxwell (1999) contended that passion is the first step towards achievement that increases willpower; passion changes individual and allow individual to become a more dedicated and productive person. Further, Maxwell (1999) suggested that a leader with great passion and few skills always outperforms a leader with great skills and no passion. Meanwhile, motivated leaders will have a high desire to achieve and are constantly optimistic in any situations while unmotivated leaders tend to be pessimistic and may give up earlier. Highly self-motivated individuals and leaders are result oriented who have a high drive to meet their objectives and standards (Goleman et al., 2002). Leaders who have the ability to maintain balance will always keep themselves motivated, optimistic and hopeful to be a role model and inspire others. Social skills or interpersonal skills refer to a person's proficiency in managing relationship with others and building networks. It involves the ability of meeting each other's needs; relating to each other over time and exchanging information about one's feelings, thoughts and ideas. Other qualities of social skills are effectiveness in leading change, persuading others, building and leading teams (Goleman 1995). As a fundamental to EI, social skills relate to leaders who have the ability to influence (induce desirable responses in others through effective diplomacy to persuade); to communicate (listen openly and send convincing messages); to lead (inspire and guide groups and individuals); to build bonds (nurture instrumental relationships, to collaborate work with others towards a shared goal) and to cooperate (create group synergy in achieving goals). The ability of leaders to manage interpersonal skills tends to motivate and inspire the followers or subordinates. Effective leaders can deal with a diversity of people including personalities that are not emotionally stable, able to develop networks and play organizational politics (Zaslow, 2004).Empathy is a person's ability in sensing the emotional makeup of other's feeling and perspective and taking active interest in their concerns and problem (Goleman, 1998). Accordingly, empathic people will treat others according to their emotional needs. Empathic leaders are those who are expert in building and retaining talent; sensitive with diversities; appreciative of various perspectives and avoid unnecessary conflicts. Leaders who are highly empathic are also skilled in managing other's problem. They are able to understand others by being aware of their needs, perspectives, feelings, concern and sensing the developmental needs of others. EI helps leaders to recognize and respect subordinates with feelings, opinion, ideas, unique needs and abilities. Accordingly, empathic leaders help followers to grow and develop; to enhance their self-images and sense of self worth; and to achieve their needs and goals through social skills.

Hypothesizes Generated:

- *In the Component of Listening*
  - ***(H1) - Physicians' listening behavior is positively related to patients' relationship satisfaction.***
  - ***(H2) - Physicians' listening behavior is positively related to patients' confidence in the Physician.***
- *In the context of Relationship under the phenomenon of Explaining*
  - ***(H3) - Physicians' explaining behavior is positively related to patients' relationship satisfaction.***
  - ***(H4) - Physicians' explaining behavior is positively related to patients' confidence in the Physician.***
- *In the context of Relationship under the phenomenon of Perceived Competence*
  - ***(H5) - Perceived competence of the Physician is positively related to patients' relationship satisfaction.***
  - ***(H6) - Perceived competence of the Physician is positively related to patients' confidence in the Physician.***
- *In the context of Relationship under the phenomenon of Loyalty*
  - ***(H7) - Relationship satisfaction is positively related to patients' loyalty towards their health care provider.***
  - ***(H8) - A patient's confidence in his/her Physician is positively related to relationship satisfaction.***
  - ***(H9) - A patient's confidence in his/her Physician is positively related to patients' loyalty towards their healthcare provider.***

Methodology:

Research setting:

This study is set in India, which has several features that make this study particularly relevant. Over the last two decades India's economic character has much changed and the pressures of globalization have resulted in increased competition. Medical patients are now much aware of their rights and expectations as customers, and the common wisdom

suggests that Physicians will have to adapt behaviors if they want their healthcare businesses to succeed. This has implications for the resulting relationships with patients. In India one can observe two extremes in its social system, specifically what is now known as consumer segments. On one hand, India has the world's largest English-speaking population and a huge middle class, yet on the other hand about one third of its population lives in abject poverty. The latter group is mostly ignorant about their rights and choices as consumers and are thus not discerning. These two customer segments are qualitatively distinct. The segments do not indicate clearly whether patients' interpretation of Physicians' competence and behavior is important for Physician-patient relationships. No systematic empirical investigation has been undertaken on the impact of Physicians' listening and explaining behaviors and perceived competence on their relationship with patients in an emerging economy such as India. It is this gap in the knowledge that makes the study very important.

Sample and Data Collection:

Since the study is set in the context of a Physician-patient relationship, the population consisted of all patients who have visited the same Physician more than three times a year in selected clinics in the city of Mumbai in India. Specialist Physicians who require more than one visit from a patient over a period of time were considered ideal for the study. As such, dentists, gynecologists, physiotherapists, obstetricians and family Physicians met the contextual requirement. The clinics were approached for permission to conduct the survey at their premises. The Physicians and clinics were further assured that the survey would not in any way disrupt the business of the establishment and only those patients willing and able to respond to the survey would be requested to fill out the questionnaire. Finally, 11 clinics were selected as sites for conducting the survey. After the clinics were identified, patients who waited to see the Physician in these clinics were approached in the reception area in order to familiarize them with the procedure. The patients were informed that the survey was a part of research and that their responses would be kept completely confidential. They were also told that the Physician's permission to conduct the survey had been obtained and as such, they were under no pressure to fill out the questionnaire. The survey was carried out under the personal supervision of the one of the co-authors. A total of 340 completed questionnaires were obtained. These 340 responses were from 188 female and 152 male participants, most of who were aged between 20 and 45 years. More than 55 percent of respondents worked in the service sector. Almost all the respondents possessed a graduate or postgraduate level qualification. In total, 20 responses were omitted due to incomplete information being supplied for many questions, and consequently a total of 320 completed questionnaires could be used for analysis.

Survey Instrument and Scale Validation:

All the constructs were measured using multiple items, where respondents were asked to indicate their agreement on a Likert scale from 1 (strongly agree) to 7 (strongly disagree). First, Stewart's scale (Stewart et al., 1999) was used to measure each Physician's listening behavior and explaining behavior. Second, Brown's scale (Brown and Swartz, 1989) was used for Physician's perceived competence. Third, for measuring a patient's confidence in the Physician-patient relationship, the scale developed by Hennig-Thurau et al. (2000) was used and for the relationship satisfaction the items were drawn from the scale developed by De Wulf et al. (2000).

Table I: Model fit indices for CFA models

Model	x^2	(d.f.)	RMR	RMSEA	GFI	AGFI	NFI	TLI	CFI
Measurement model for listening, explaining and perceived competence	104.6	51	0.059	0.057	0.950	0.923	0.917	0.942	0.955
Measurement model for outcome variables	96.4	32	0.055	0.079	0.943	0.902	0.923	0.925	0.947

Table II: Construct validity and Reliability

Constructs	Composite reliability	Cronbach *a*	Average variance extracted
Listening	0.762	0.794	0.446
Explaining	0.693	0.724	0.362
Perceived competence	0.719	0.737	0.408
Perceived confidence	0.613	0.683	0.354
Relationship satisfaction	0.713	0.743	0.454
Behavioral loyalty	0.822	0.859	0.542

Table III: Means, Standard Deviations and Correlations

Variables	Mean	SD	Lis	Exp	Com	Conf	Sat
Listening (Lis)	4.712	0.867	–				
Explaining (Exp)	4.677	0.812	0.51*	–			
Perceived competence (Com)	4.562	0.825	0.46*	0.50*	–		
Confidence (Conf)	4.589	0.872	0.39*	0.49*	0.65*	–	
Relationship satisfaction (Sat)	4.660	0.883	0.65*	0.60*	0.58*	0.53*	–
Loyalty (Loy)	4.620	0.819	0.43*	0.56*	0.72*	0.63*	0.55*

Note: n = 320; *Correlations are significant at $p < 0.01$

Table IV: Regression Results

Variables DV	Regression 1		Regression 2		Regression 3	
	Perceived confidence Unstandardised regression coefficients	SE	Relationship satisfaction Unstandardised regression coefficients	SE	Loyalty Unstandardised regression coefficients	SE
Listening (Lis)	0.227 **	0.041	0.421 **	0.034		
Explaining (Exp)	0.316 **	0.041	0.313 **	0.035		
Perceived Competence (Com)	0.553 **	0.041	0.29 **	0.040		
Perceived confidence (Conf)			0.115 *	0.044	0.389 **	0.040
Relationship satisfaction (Sat)					0.273 **	0.045

Note: Values are unstandardised regression coefficients, with standard errors in parentheses;
* $p < 0:01$; ** $p < 0.001$

Fourth, and finally, behavioral loyalty was measured using the scale developed by Zeithaml et al. (1996). The Appendix provides a list of all the items used in the survey instrument. The reliability and validity of constructs was assessed by confirmatory factor analysis (CFA) using AMOS 7. As CFA is very sensitive to sample size, two separate models were constructed to perform so as to have several cases per free parameter (Bollen, 1989). One model comprised the three constructs of an individual Physician's behavior: listening, explaining and perceived competence. The second model comprised the three constructs of outcome variable: perceived confidence, relationship satisfaction and behavioral loyalty. Table I presents the fit indices for both models.We can see that the fit indices are in the acceptable range as suggested by Bentler (1992) for both models, and this provides support for the scales' reliability and validity. We also found that all the individual factor loadings are highly significant, which supports the contention of convergent validity (Anderson and Gerbing, 1988). We calculated the Cronbach alpha coefficient, composite factor reliability, and average variance extracted for each of the scales. These values are indicated in Table II. The reliability values (Cronbach alpha coefficient) were higher than 0.70 for all the constructs except for one. The construct of confidence was 0.68, which is very close to the norm. Composite reliability values were also higher than 0.6. However, the value of average variance extracted was lower than 0.40 for some of the scales. The discriminant validity was further investigated using constrained analysis (Sharma, 2000), which entailed constraining the covariance between all pairs of constructs to unity. All of the constrained models were significantly worse than all the unconstrained models. Furthermore, following Gefen et al. (2000), different combinations of two latent variables were combined into one in an alternate model and the resulting chi-square was compared to that of the original model. Here again the original model proved to be a better fit than any of the alternate models, providing conclusive proof of discriminate and convergent validities.

Data Analysis and Results:

We tested our theoretical model using regression analysis, developing a composite measure for the dependent and independent variables by taking an average of different items in a scale. Averaging of items involves the assumption that all the items contribute equally to the construct. However, such an

assumption is reasonable, as the scales are well established and we test the psychometric properties of the scale in our sample. There was no problem regarding multicollinearity between independent variables because the VIF values were less than 2.5. Three regression models were developed. In the first regression, listening, explaining, and perceived competence were entered as independent variables; and perceived confidence was entered as a dependent variable. In the second regression, listening, explaining, perceived competence, and perceived confidence were entered as independent variables; and relationship satisfaction was entered as a dependent variable. In the third regression, relationship satisfaction and confidence were entered as independent variables; and loyalty was entered as a dependent variable. Table III presents the mean, standard deviation and correlation of the variables. Table IV presents all the regression results. In regression 1, listening (b = 0.227, p </= 0.001), explaining (b = 0:316; p </= 0.001) and perceived competence (b = 0:553; p </= 0:001) have a significant positive relationship with confidence. In regression 2, confidence (b = 0:115, p </= 0.010), listening (b = 0:421; p </= 0.001), explaining (b = 0:313; p </= 0.001) and perceived competence (b = 0:290; p </= 0.001) have a significant positive relationship with relationship satisfaction. In regression 3, confidence (b = 0:389; p </= 0.001) and relationship satisfaction (b = 0:273; p </= 0.001) have a significant positive relationship with loyalty. Thus, all our hypotheses are supported.

Discussion of Results:

The results show that giving patients time to say what they would like to say and listening to them carefully improves their relationship satisfaction with their Physicians. When patients sense/perceive that the Physician is listening to what they are saying, it enhances their confidence in the Physician. This finding is in line with the literature (Ramsey and Sohi, 1997) that customers' perception of a salesperson's listening behavior plays a pivotal role in enhancing relational outcomes. Moreover, this study shows that listening behavior does have a significant direct effect on relationship satisfaction whereas Ramsey and Sohi's study found only an indirect effect on satisfaction. This study also contributes to the literature by testing the direct effect of Physicians' explaining behavior on patients' relationship satisfaction and confidence. Explaining is found to have a positive effect on these two relational outcomes. Interestingly, listening appears to be a relatively more important antecedent of satisfaction than explaining in our case. This study confirms that the perception of Physicians' competence has a positive impact on both relationship satisfaction and confidence, and this appears to be consistent with findings in other studies (Chandon et al., 1997; John, 1991; Parasuraman et al., 1985, 1988). When compared to communication behavior like listening and explaining, patients' perception of their Physician's competence contributes more to confidence building, while listening contributes more to relationship satisfaction. Between listening and explaining, explaining is found to contribute relatively more than listening in confidence building with the Physician. This indicates that the Physician's explanation provides the patients with clues to judge his/her competence and helps to build confidence in their Physician. Meanwhile, listening carefully to patients demonstrates the Physician's respect and concern for their patients' health problems and complaints; therefore creating satisfaction with the relationship. This study further confirms that relationship satisfaction does positively correlate with loyalty (Gro¨nroos, 1994; Zeithaml et al., 1996), particularly for the Physician-patient relationship. Meanwhile, both relationship satisfaction and confidence have a positive impact on loyalty, and confidence has more of an impact on patients' loyalty than relationship satisfaction. These findings suggest that enhancing a patient's confidence is likely to improve their relationship satisfaction with their Physicians, and eventually increase patients' loyalty with their service providers. Generally, the findings generated in this study are consistent with the literature (Bendapudi and Berry, 2006; DiMatteo, 1979; DiMatteo and Hays, 1980). Specifically, a Physician's good communication behaviors drive patient satisfaction, and are critical for trustworthy Physician-patient relationships. Apparently, one would expect patients to value the technical skills of Physicians the most. However, the technical quality of medical care is difficult for patients to evaluate even after receiving treatment due to their limited ability to judge the Physician's technical skills. Hence, they evaluate their relationship with the Physician based on what they are able to judge (Bendapudi and Berry, 2006). Therefore, it is logical to accept the key argument of this paper that patients are likely to assess the relationship satisfaction with their Physicians by evaluating their communication behaviors.

Implications of the study and Recommendations to Practitioners:

The findings of this study emphasize importance that Physicians must have good communication behaviors. It is also clearly evident that this study adds new knowledge to this field of endeavor, and further research in this area should be pursued. Furthermore, the findings of this study have important implications for medical practitioners,

healthcare managers, healthcare education curriculum developers and medical service organizations.

Implications for practicing Physicians:

First, practicing Physicians should note that the traditional approach to treating patients only with medicines will no longer suffice their patients' needs. Patients expect more than that from their Physicians. For example, patients want their Physicians to be more humane and exhibit more kindly behavior in their interactions with them. Therefore, Physicians should broaden their approach in treating patients by incorporating the needs of patients in their service delivery. Second, since effective communication can greatly contribute to the creation, development and retention of long-term relationships with their patients, Physicians need to seriously consider making their communication efficient and effective. Specifically, this involves building and retaining relationships with clients through better-than-average interaction and explaining behavior. Third, since retention of customer loyalty is vital and harder to achieve than simply attracting clients in the first place, Physicians, medical specialists, etc. should endeavor to enhance the level of patient loyalty by delivering professional and attentive customer-driven interaction behavior. Such loyalty can be maintained by providing high quality services to patients in terms of informative and beneficial communication. Fourth, Physicians need to respond to clients' confidence in them by providing quality services based on their needs and satisfaction. For example, many patients consider their Physicians as advisors and open their hearts to them in sharing personal issues with them in the hope of obtaining guidance in overcoming issues that are indirectly associated with their illness. Practicing Physicians should consider this important issue while interacting with patients. Fifth, Physicians need to improve their listening behavior by letting patients communicate what they actually want from their Physicians. Physicians should then assure their patients that the issues they raised have been heard and they will do what is necessary. Finally, Physicians should be fully aware of the service needs of patients. Their interaction strategy should be tailored to understand the unique communication needs of the individual patient for facilitating the development of mutual bonding.

Implications for Management:

First, in order to improve patients' satisfaction and increase their loyalty to the medical service providers, management should evaluate their Physicians' performance not only in terms of their technical proficiency but also their ability and willingness to effectively communicate with their patients during interactions. Second, management can formally introduce in-service training programs aimed at equipping every individual Physician with the knowledge and interaction skills needed for professional communication with patients.

Implications for Clinics/Hospitals:

First, a medical practice that invests in training Physicians with the aim of equipping them with a high level of interactive and professional communication skills is likely to gain a competitive advantage in their target markets. It does this by offering differentiated medical services to its clients and this strategy will result in expanding the client base for the relevant medical practice. Furthermore, these medical practices are likely to retain patients in the long-term. Second, such clinics will have to develop a code of practice to suggest that its Physicians actively engage in appropriate and formally recognized interaction behavior when they are with their patients. As Physicians' listening and explaining behaviors are instrumental in building good Physician-patient relationships and strengthening patients' confidence in their Physicians, strict implementation of these codes would be instrumental in creating happy and satisfied patients. Furthermore, occasional surveys of client satisfaction of services with special references to the interaction and listening behavior of Physicians would enable a healthcare service management group to be alert to any actions required to ensure that patients' needs are being met.

Implications for Medical Education:

Medical schools should integrate a specific course on professional communication into their medical degree curriculum so that medical graduates and specialists have the required communication and interaction skills when they go out into "the real world" to practice. Furthermore, during their internship programs Physicians should be encouraged to practice showing their respect and compassion for patients by active listening and explaining.

Conclusion:

Communication is a two-way process and therefore effective Physician-patient interactions and reciprocal communication can never be accomplished without an active involvement of patients in the process. The complex and personal nature of healthcare services encourages patients to build a strong relationship with their Physicians and this relationship is facilitated by appropriate interactions between them. To sum up, Physicians need to re-think their service delivery focus and consider a possible shift from mere treatment orientation to more behavioral orientation because patients want Physicians to be more caring and interactive in dealing with them; they do not want healthcare professionals to simply prescribe medicines. This change in Physicians' behavior would benefit both Physicians and patients and very likely result in better

relationship building and enhanced clients' confidence in Physicians. The obvious outcomes of this customer-driven shift in service orientation would be more loyal and satisfied patients, resulting in individual Physicians enjoying a better image and their organization enjoying the financial benefits of providing more personalized care services. While these outcomes have implications for all Physicians generally, this is more applicable to Physicians and the medical practices in an emerging economy with a large population such as India, where the Physician-population ratio is very low and as such Physicians usually have to see a large number of patients compared to medical specialists or GPs in developed countries. The reality is that in countries such as India Physicians have less time to spend on each patient and consequently patients have less healthcare-related information and education in emerging economies. It is essential that Indian medical practices develop a culture of fostering effective communication and explaining behavior and this will require communication skills training.

Corresponding Author:
Balaji. D
Full time PhD Research Scholar
School of Management Studies
Anna University: Chennai - 600025
Regional Office – Coimbatore,
Coimbatore - 641047, Tamil Nadu, INDIA
Email: *balablooms@gmail.com*

References

1. Batalden, P.B. and Stoltz, P.K. (1993), "A framework for the continual improvement of health care: building and applying professional and improvement knowledge to test changes in daily work", The Joint Commission Journal on Quality Improvement, Vol. 19, pp. 424-47.
2. Bergman, D., Arnetz, B., Wahlstrom, R. and Sandahl, C. (2007), "Effects of dialogue groups on physicians' work environment", Journal of Health Organization and Management, Vol. 21, pp. 27-38.
3. Bergman, D., Savage, C., Wahlstrom, R. and Sandahl, C. (2008), "Teaching group dynamics – do we know what we are doing? An approach to evaluation", Medical Teacher, Vol. 30, pp. 55-61.
4. Bohm, D. (2004), On Dialogue, Routledge, New York, NY.
5. Collins, D. and Holton, E. (2004), "The effectiveness of managerial leadership development programs: a meta-analysis of studies from 1982 to 2001", Human Resource Development Quarterly, Vol. 15, pp. 217-48.
6. Goleman, D. (1995), Emotional Intelligence, Bantam Books, New York, NY.
7. Isaacs, W. (1999), Dialogue and the Art of Thinking Together: A Pioneering Approach to Communicating in Business and in Life, Currency, New York, NY.
8. Jackson, B. and Parry, K.W. (2008), A Very Short, Fairly Interesting and Reasonably Cheap Book about Studying Leadership, Sage, Los Angeles, CA.
9. Kolb, D.A. (1984), Experiential Learning: Experience as the Source of Learning and Development, Prentice-Hall, Englewood Cliffs, NJ.
10. Krueger, R.A. and Casey, M.A. (2000), Focus Groups: A Practical Guide for Applied Research, Sage Publications, Thousand Oaks, CA.
11. Olausson, I. (1996), Dialog (Dialogue), Svenska Dagbladets fo¨rlag, Stockholm (in Swedish).
12. Ollila, S. (2008), "Strategic support for managers by management supervision", Leadership in Health Services, Vol. 21, pp. 16-27.
13. Reed, B. and Bazalgette, J. (2006), "Organizational role analysis at the Grubb Institute of Behaviourial Studies: origins and development", in Newton, J., Long, S. and Sievers, B. (Eds), Coaching In Depth. The Organizational Role Analysis Approach, Karnac, London, pp. 43-62.
14. Sandahl, C. and Edenius, J. (2004), "Group supervision for managers", in Linden, I.J., Edlund, C. and Larsson, M. (Eds), Supervision - Creation with Variations, Studentlitteratur, Lund, pp. 157-78.
15. Sandahl, C., Gerge, A. and Herlitz, K. (2004), "Does treatment focus on self-efficacy result in better coping? Paradoxical findings from psychodynamic and cognitive-behavioral group treatment of moderately alcohol-dependent patients", Psychotherapy Research, Vol. 14, pp. 388-97.
16. Sandberg, J. (2000), "Understanding human competence at work: an interpretative approach", Academy of Management Journal, Vol. 43, pp. 9-25.
17. Shalit, B. (1982), The Prediction of Military Groups' Effectiveness by the Coherence of their Appraisal, FOA, Stockholm.
18. Tyrstrup, M. and Glover Frykman, S. (2006), On the Brink of Failure: The Art of Impromptu Action in Everyday Leadership, Studentlitteratur, Lund.
19. Venkatesh.J and Balaji.D. (2012), "Relational Impact of Physicians' Interaction Behavior in Healthcare", International Research Journal Golden Research Thoughts, Vol. I; Issue VII; January 2012, ISSN: 2231-5063, pp. 76-80.
20. Yukl, G.A. (2006), Leadership in Organizations, Prentice-Hall, Upper Saddle River, NJ.

8/24/2012

The impact of praying and fasting on the mental health of students attending the Bandar Abbas Branch of Islamic Azad University in Iran in 2012

Azita Amirfakhraei [1, 2], Afsaneh Alinaghizadeh [3]

[1.] Lecturer, Department of Education, Islamic Azad University, Bandar Abbas Branch, Bandar Abbas, Iran
[2.] Administer student counsel center, Islamic Azad University, Bandar Abbas Branch, Bandar Abbas, Iran
[3.] Lecturer, Department of Education, Human Science Faculty, Baft Branch, Islamic Azad University, Baft, Iran
afakhraei2002@gmail.com, afakhraei2002@iauba.ac.ir

Abstract: Introduction: Mental health issues are common in Iran. This study examined the impact of praying and fasting on the mental health of students attending the Bandar Abbas Branch of Islamic Azad University in Iran in 2012. **Methods:** A total of 200 undergraduate students (85 girls and 115 boys) at the Bandar Abbas Branch of Islamic Azad University were selected as the sample using a multi-stage cluster random sampling process. The GHQ-28 mental health questionnaire was administered to them 2 weeks before Ramadan as a pre-test and 2 weeks after Ramadan as a post-test. **Results:** After analyzing data using a one-way ANOVA test and t-test, it was revealed that people who fasted the whole month of Ramadan or most of it, even they did so just for amusement, received more favorable scores on all the mental health subscales; meanwhile, reduced scores were evident after Ramadan among those who did not fast at all or, due to religious or medical reasons, could not fast. In addition, people who always or usually prayed also received higher scores on the mental health subscales. **Conclusion:** The results of this study indicate that fasting, even for amusement purposes, enhances individuals' mental health. In addition, people who always or usually pray have higher mental health scores than those who never or rarely pray.
[Azita Amirfakhraei, Afsaneh Alinaghizadeh. **The impact of praying and fasting on the mental health of students attending the Bandar Abbas Branch of Islamic Azad University in Iran in 2012**. *Life Sci J* 2012;9(3):2179-2184] (ISSN:1097-8135). http://www.lifesciencesite.com. 314

Keywords: Praying; Fasting; Mental health; Students; Bandar Abbas; Iran

1. Introduction

Religion has been one of the most discussed topics among theorists. Some theorists consider religion to be a form of mental illness and religious practices to cause deviant and obsessive neurosis; other theorists disagree and have deeply examined the role of religion in achieving mental health (Spilka et al., 2003; Wolf, 1997). A similar conflict exists in the context of experimental studies: Some studies have reported negative consequences of religion on mental health, noting a direct relationship between neurosis and strict piety (stifoss-hanssen) and inflexibility, while others have highlighted the positive impact of religion on mental health (Spilka et al., 2003). In an attempt to understand these conflicts better, the current study examined various factors (e.g., quality or type of religiosity and religiosity elements) from 115 studies and found that, generally speaking, mental health has a positive relationship with internal religion but a negative relationship with external religion (Argyle, 2000). Azerbaijani (2002) categorized various elements of religion into five dimensions: rituals, religious knowledge, religious feelings, ideology, and consequences (i.e., the application of religion in life). Praying and fasting are two religious rituals. According to Doorkim (1898), practices and rituals exist in all religions and are considered the common core of every religion. Several studies have highlighted the positive and significant effects of religious practices and customs on mental health and anxiety reduction. For example, YusefiLooyeh and Hassanpour (1998) examined the effect of intimacy with the Koran on mental health. Jalilvandvajehei (1998) studied the relationship between praying and anxiety, focusing on verse 14 "Pray to God if you want to have it in your mind" in the Koran's Sura Taha and verse 28 "Only by praying to God your heart will rest assured" in Sura Raad. Finally, Sadeghi and Mazaheri (2006) studied the effect of fasting on mental health. Bayani et al. (2006) focused on the relationship between religious orientation and anxiety and depression in students; their results demonstrated that strengthening and internalizing religious values can lead to enhanced mental health among students. In the Koran, the Sura Baqara says "Seek help in patience and prayer"; fasting teaches us patience as a kind of feeling and belief are formed during the fasting process when the individual puts aside the basic physiological needs using faith, social supports, mental images, abilities, and talents. In this way, the individual can cope with various situations, developing the skill to use knowledge is self-efficacy (Ghadiri, 2010).

To explain the relationship between religion and health, three mechanisms can be imagined. First,

religion encourages the person to adopt a set of virtuous personality traits that affect health. Second, organized religion brings social supports into practice that affects health. Third, religion prepares a person to deal more efficiently with stress (Karami et al., 2007). Numerous cross-sectional studies have demonstrated that people turn to spirituality to gain support and cope with their pains (Rippentrop, 2005). Christopher et al. (1995) found a positive correlation between frequency of church attendance and mental health, a weak negative correlation between praying and mental health, and a positive correlation between the belief in immortality and general health. In response to the need to determine which aspects of religion play a more major role in mental health, Ball (2003) found that adolescents of religion-oriented families enjoyed higher self-esteem, but in terms of psychological performance and sexual activities, there was no significant difference between adolescents from different families (in terms of religious orientation).

Praying is a spiritual performance that creates a relationship with the higher entity; it is a fundamental act in most major religions of the world, including Islam, Christianity, Judaism, and Buddhism. Praying can strengthen the sense of control and stimulate the internal power of the person. Praying facilitates relaxation and leads to a better mood, mental health, and tranquility (KarimAlahi et al., 2008). Praying leads to comfort, joy, and motivation, which elevate mood and increase motivation and sense of purposefulness (KarimAlahi et al., 2008). Although many studies on spirituality, religion, and health are of the correlation type, meaning the cause-and-effect relationship cannot be proved directly, evidence suggests a strong relationship between religious participation and good health as well as between awareness of spiritual commitment and good health (KarimAlahi et al., 2008). BahramiEhsan et al. (2008) found that participation in religious ceremonies and worship (such as praying and fasting) is followed by consequences such as formal psychotherapy. Emotional discharge and participation in collective religious ceremonies result in reduced stress and the elimination of emotional distress.

As communities expand and further development is promoted, people face increased, more diverse stress. Different strategies are used to mitigate such stress.The aim of this study is to investigate the effect of fasting and praying on the mental health of students attending Iran's Islamic Azad University in Bandar Abbas in 2012. The specific objectives of this research are as follows:

1. To evaluate the effectiveness of fasting on the mental health of students attending the Islamic Azad University in Bandar Abbas, Iran, in 2012 and
2. To evaluate the effectiveness of praying on the mental health of students attending the Islamic Azad University in Bandar Abbas, Iran, in 2012.

2. Material and Methods

This is a descriptive study. The statistical population of this study consists of all undergraduate students from Islamic Azad University in Bandar Abbas, from which 210 individuals were selected in the pre-test stage. After performing the post-test 50 days latter and as a result of sample loss, 200 persons were selected for the multi-stage cluster random sampling and analyzed. A general health questionnaire was administered in two stages with a 50-day interval—two weeks before Ramadan and two weeks after Ramadan. The following tools were used in the present study.

A. GHQ-28 mental health questionnaire:

This self-reported diagnostic questionnaire was developed by Goldberg and Hill (1979). Its main purpose is to distinguish between mental illnesses and health. Its 28 items fall within 4 subscales: physical symptoms, anxiety and insomnia, social dysfunction, and depression. A score of 14 or higher in any subscale indicates the participant's deterioration in that factor. Summing the scores of the four subscales results in an overall score in terms of general health. The questionnaire has been evaluated in different cultures in terms of validity. KhodaPanahi and Heydari (2005) examined the validity of the general health questionnaire through the three methods of re-assessment, description, and Cronbach's alpha, obtaining validity coefficients of 0.72, 0.93, and 0.90, respectively.

B. Researcher-developed questionnaire:

This questionnaire consists of two parts. The first part is a personal profile and includes items such as age, sex, and marital status of participants. The second part includes questions about how much individuals fulfilled their religious obligations during Ramadan. This section contains four options; participants are divided into four groups based on the option they select: the first group (I fast all or most days in Ramadan); the second group (I couldn't fast due to religious or medical reasons); the third group (I didn't fast during Ramadan at all); and finally the fourth group (I fasted a few days in Ramadan for amusement). The second section includes questions about praying to divide participants into four groups: those who always pray, those who often pray, those who sometimes pray, and finally those who never

pray. Participants completed the questionnaire during the post-test period and after the implementation of the general health questionnaire.

3. Results

According to the data summarized in Table 1, most participants were between the ages of 20 and 25, were male, and were unmarried.

Table 1. Demographic status of the experimental group

Variable		n (%)
Age	18-20	30 (15)
	20-25	145 (72.5)
	25-30	20 (10)
	>30	5 (2.5)
Sex	Male	115 (57.5)
	Female	85 (42.5)
Marital status	Single	109 (54.4)
	Married	91 (45.6)

Table 2. Data obtained in regard with praying

		Female n (%)	Male n (%)
To pray	never	19 (16.5)	12 (14.1)
	Some when	21 (18.2)	12 (14.1)
	often	35 (30.4)	21 (24.7)
	always	40 (34.7)	49 (47.7)

Table 2 presents the data on participants' praying. According to Table 2, most people (i.e., 47.7 percent) always pray while 14.1 percent often and sometimes pray. In Table 3, the mean and standard deviation of mental health subscales of participants who do not pray (Group 1), sometimes pray (Group 2), often pray (Group 3), and always pray (Group 4) are listed. In Table 3, the mean, standard deviation and one-way ANOVA of mental health subscales of people who do not pray, sometimes pray, often pray, and always pray are listed; the results indicate that those who often or always pray have higher mental health scores. Finally, Table 4 lists the mean, standard deviation, and comparison of before and after Ramadan in terms of mental health subscales of people who fast almost always during Ramadan, did not fast at all during Ramadan, fastedsome day during Ramadan for amusement, and did not fast during Ramadan due to religious or medical reasons. The results indicate that people who did not fast at all or did not fast due to religious or medical reasons scored lower on the mental health subscales after Ramadan.

Given that the number of people in the groups is not equal, a Scheffe post hoc test was used to determine the difference between means. The results in each of the mental health subscales were as follows: A significant difference emerged in the depression subscale among the means of groups praying 1, 3, and 4; in the anxiety and insomnia subscale among the means of groups 1, 2, 3, and 4; in the somatization subscale between groups 1 and 4; and in the social dysfunction subscale among groups 1, 3, and 4.

Table 3. Mean, standard deviation, and variance analysis of general health subscales of people with various conditions of praying

variables	**Groups**	**Mean**	**Std.Deviation**	**df**	**F**	**Sig**
somatization	Group 1	13.4	3.8	208	5.9	0002.
	Group2	12.4	3.8			
	Group3	11.5	3.6			
	Group4	10	3.3			
anxiety & insomnia	Group1	16.1	2.1	208	80.2	000.
	Group2	14.4	3			
	Group3	11.4	2			
	Group4	10.1	2.1			
depression	Group1	16.6	2.2	208	53.3	000.
	Group2	15.3	2			
	Group3	12.7	2.5			
	Group4	10.6	1.7			
social dysfunction	Group1	17	1.9	208	62.8	000.
	Group2	15	2.2			
	Group3	14.4	1.9			
	Group4	12	3.8			

Table 4. Mean and standard deviation of subscales, and the overall score of the general health questionnaire, and the four groups fasting in pre-test and post-test

variables	Group*	number	Mean	Std.Deviation	df	t-test	Sig
somatization	Post test Group1 Pre test Group 1	78	9.6 11.8	1.7 1.8	77	11.9	0.000
	Post test Group 2 Pre test Group2	38	15.2 14.1	2.2 2.5	37	-7.7	0.000
	Post test Group 3 Pre test Group3	35	10.1 11	2.1 2	34	10	0.000
	Post test Group 4 Pre test Group4	49	13.9 12	2.2 2.1	48	-9.1	0.000
Anxiety & insomnia	Post test Group1 Pre test Group 1	78	10.1 12.4	1.4 1.9	77	8.8	0.000
	Post test Group 2 Pre test Group2	38	15.7 14.4	2.3 2.5	37	-5.3	0.000
	Post test Group 3 Pre test Group3	35	11.2 11.8	2 1.9	34	6.1	0.000
	Post test Group 4 Pre test Group4	49	12.9 13	2 2.1	48	-5.8	0.000
Social dysfunction	Post test Group1 Pre test Group 1	78	1.7 11.4	1.2 1.9	77	10.59	0.000
	Post test Group 2 Pre test Group2	38	14.6 13.3	2.5 2.5	7	-13.3	0.000
	Post test Group 3 Pre test Group3	35	13.9 12.8	1.8 2	34	11.2	0.000
	Post test Group 4 Pre test Group4	49	12.8 13	2.3 2.1	48	-12.2	0.000
depression	Post test Group1 Pre test Group 1	78	7.1 10.1	1.8 1.4	77	12.3	0.000
	Post test Group 2 Pre test Group2	38	15.4 14.3	2.3 2.6	37	-4.1	0.000
	Post test Group 3 Pre test Group3	35	9 11.2	1.9 2	34	11.8	0.000
	Post test Group 4 Pre test Group4	49	13.2 12.9	2.1 2.3	48	-5.2	0.000

*The first group: Fast always during Ramadan; The second group: Did not fast at all during Ramadan; The third group: Fast some days during Ramadan for amusement; The fourth group: Did not fast during Ramadan due to religious or medical reasons

4. Discussions

The purpose of the present study is to investigate the effect of fasting and praying on people's mental health. The data demonstrated that fasting and praying have a positive impact on mental health promotion. This finding is consistent with the findings of YusefiLooyeh and Hasanpour (1998), Galehdar and Saki (2002), JalilvandVajeheie (1998), Sadeghi and Mazareie (2006), Bayani et al. (2008), Azarbayejani (2002), and Karami et al. (2007), although it is not consistent with the results of Froid (1964) and Ellis (1980). The different results are likely due to the quality or type of religiosity and the elements of religiosity considered.

Religion as an operational model of behavior is able to provide instructing principles for dealing with phenomena, enabling the religious person to achieve an efficient model for dealing with events and incidents by practicing and repeating these principles. According to Pargamen et al. (2000), through the acquisition and internalization process, religion can lead to healthier and better personality constructs. In the religious framework, a model is presented that leads to the formation of more modified personality traits or features; religious teachings also provide the possibility to form a more evolved personality model (BahramiEhsan et al., 2008).

Religion as a social phenomenon is the oldest social network of support. Religious teachings offer efficient and authentic models regarding devotion, affection, aid, and assistance. From this perspective, religion can play a role as a protective group. In such circumstances, receiving support from religious reference groups would be quite natural when facing problems. Thus, it seems that the effect of religion and religious rituals (such as praying and fasting) on mental health is the product of six different, yet complementary processes:

1. Religion can create sense; therefore, religion gives sense to good living and dying (BahramiEhsan et al., 2008).
2. Religion causes hope and increases people's optimism (BahramiEhsan et al., 2008).
3. Religion gives a sense of control and efficiency to people that is rooted in God and can compensate for the loss of personal control (BahramiEhsan et al., 2008).
4. Religion prescribes a healthier life for people that have a more positive impact on mental health (BahramiEhsan et al., 2008).
5. Religion is a set of positive social norms; obeying them leads to support and acceptance from others (BahramiEhsan et al., 2008).
6. Religion gives sense of the supernatural that undoubtedly has psychological effects (BahramiEhsan et al., 2008).

Based on Pargamen et al.'s (2000) theory, religious can intervene in the early assessment stages of life-threatening issues, acting as a mediator variable. It can also play a decisive role in the re-evaluation stage and, after the problem occurs, create more hopefulness and meaningfulness. In addition, religion can have a positive impact on the results and consequences of stressful factors during interpretation of the events. Those who have an internal religious orientation can better modify stressful factors when performing religious affairs such as praying and fasting, resulting in better mental health. In this regard, the role of religious attitude is stronger than merely performing religious practices. According to Bergin (1991), religion has a positive impact on the mental health of individuals with an internal religious orientation, whereas individuals with an external religious orientation not only do not benefit from the religion, but will also be plagued with negative consequences due to the lifestyle of people with an internal religious orientation (Karami et al., 2007).

In light of these findings, sincere attitudes toward religion should be protected from the negative impact of society. Internal religious orientation is far more important than the tendency to engage in religious rituals. This does not mean that this tendency to engage in rituals does not affect mental health; on the contrary, it does affect mental health. By examining simple correlations between dimensions of religious orientation and dimensions of mental health, it can be observed that adherence to beliefs and rituals is also related to all mental health dimensions. According to the theory of cognitive inconsistency (Festinger, 1957), another possible justification in this context is based on why externally religious people have lower mental health in performing religious affairs such as praying and fasting. When a person performs religious rituals in front of others, he or she will face external reinforcement and rewards. As a result, the individual's internal attitude about these rituals is weakened, and people will attribute these practices more often to consequences (external reinforcement and reward) than to their own attitudes (Karami et al., 2007).

The obtained results of the study show that fasting and praying are effective for enhancing students' mental health as well as reducing their depression, anxiety, and physical symptoms while promoting their social functioning. One limitation of the current study is the interval between tests, which caused the loss of some participants. The same study should be performed in other cultures and with people of different religions and ages; the results should be compared with the current study's results. If similar results are obtained, a suitable practical strategy can be developed to enhance people's mental health.

Acknowledgements:

The authors sincerely thank the students who participated in this study and Dr. Mehrdad Jalalian (Editor In-Chief, Electronic Physician Journal) for his guidelines on scientific writing (Jalalian, 2012).

Corresponding Author:
Azita Amirfakhraei
Department of Education, Islamic Azad University, Bandar Abbas Branch, Bandar Abbas, Iran
E-mail: afakhraei2002@gmail.com and afakhraei2002@iauba.ac.ir

References

1. Argyle Michael, 2000, Psychology and Religion, Routledge, London and New York.
2. Azarbayjani, Masoud (2002). Testing religious orientation by relying on Islam, publication institute of University and Islamic Seminary.
3. BahramiEhsan, Hadi et al (2008). Investigating between dimensions of religious orientation and mental health and psychological disorder.

Quarterly of developmental psychology, second year, No. 5, P. 84-90.
4. Ball,J.,Armistead,.,L.,&Austin,B.J.(2003). The relationship between religiosity and adjustment among African – American, female, urban adolescents. Journal of Adolescence. 26, 431-446.
5. Bayani, Ali Asghar et al. (2009). Investigating the relation between religious orientation and anxiety and depression in students, journal of fundamentals of mental health, tenth year, No. 3, P 209-214.
6. Bergin, A.E.(1991). Values and Religious Issues in Psychotherapy and Mental health. Journal of American Psychologist, 4, 394-403.
7. Christopher, G.,Ellison, J.D., Boardman, D.R., Williams, J. & Jackson, S. (1995). Religious involvement, stress, and mental health: Findings from the 1995 Detroit area study. Social Forces, Vol. 80, No.1, 215-249.
8. Galehdar, Nasrin and Mandana Saki (2002). The effect of Quran sound on reducing the anxiety of before test of students, presented in the first conference on religion role on mental health, Tehran, Iran University of Medical Sciences and Health Services.
9. Ghadiri, Mohammad Hossein (2010). Islamic fasting a path towards self-control, Andishe Qom publications.
10. Goldberg, D.P.& Hiller V.F. (1979). A Scale of the general health questionnaire. Psychological Medicine, 9, 139-145.
11. Jalalian M., Danial A. H. Writing for academic journals: A general approach. Electronic physician. 2012; 4(2): 474-476, Available online at: http://www.ephysician.ir/2012/474-476.pdf
12. Jalalian M. Writing an eye-catching and evocative abstract for a research article: A comprehensive and practical approach. Electronic Physician. 2012; 4(3): 520-524. Available online at: http://www.ephysician.ir/2012/520-524.pdf.
13. Jalilvand, Mohammad Amin, Ejehei, Javad (1997). Investigating the role of praying on anxiety of students of Tehran, MajalehNour, No. 85, P. 132-144
14. Karami, Jahangir et al. (2007). Investigating simple and multiple relations of religious orientation dimensions and mental health in students of Kermanshah Razi University, journal of educational sciences and psychology, Ahvaz Chamran University, third volume, 13th year, No. 3. P. 31-52
15. KarimAlahi, Mansooreh, Abedi, Heydar Ali (2009). Experiences of patients from praying in hospital, nursing research, volume 3, Nos. 10 and 11, P. 61-71
16. KhodaPanahi, Mohammad Karim, Heydari, Mahmood (2004). Investigating song of Kaba pilgrimage on mental health of pilgrims, journal of psychology, No. 3, 7th year, P. 154-158/
17. Pargament, K.I.(1990). God help me: Toward a theretical framework of coping for the psychology of religion research in the social scientific study of religious, 2, 195-224.
18. Rippentrop, A.E., Altmaier, E.M., Chen, J.J., Found, E.M.andKeffala, V. J.(2005) The relationship between religion/spirituality and physical health, mental health, and pain in a chronic pain population. Journal of Pain, Vol. 116, No.3, 311-321.
19. Sadehgi, Mansoorehsadat, Mazaheri, Mohammad Ali (2004). The effect of fasting on mental health, journal of psychology, ninth year, No. 3, Fall 84.
20. Spilka, B., et al (2003). The psychology of Religion, London, The Guilford press.
21. Wulf, DM (1991) Psychology of Religion, newyork, John wiley.
22. yusefilooyeh, Majid; Hasanpour, Fatemeh (1997). The impact of recitation of the Quran on reducing depression and anxiety, abstracts of the first conference on religion role on mental health, Tehran, Iran University of Medical Sciences and Health Services.

05/05/2012

Comparison of Whorl Types on the Palms of *Macaca mulatta* From the Taihang Mountains (Central China)

Xiaojin Zhao [1], Fengchan Wang * [1,2], Liguo Li [2]

1. College of Life Science, Henan Normal University, Xinxiang 453007, Henan, P R. China
2 . Faculty of Earth and Resources, China University of Geosciences, Beijing 100083, P R. China
wangfc2002@163.com

Abstract: Background and objectives: The object of the present research is a study of the palmar whorls, Several unique features are characteristic for the palmar whorls of *Macaca mulatta* from the Taihang Mountains in central China. **Materials and Methods:** By direct observation striking dermatoglyphs were obtained from 65 specimens comprising 22 males and 43 females. **Results:** The whorls in the interdigital Ⅱ-Ⅳ areas on the palms of *Macaca mulatta* demonstrate a significant bilateral difference. On the left palm the major pattern is Wr constituting nearly 82.4% of the whorl patterns, while approximately 65.6% of the right palm is occupied by Wu. **Conclusions:** The results showed that the Wr on the left palm and the Wu on the right palm might be bilaterally symmetrical. A comparison between *Macaca mulatta* and *Macaca fuscata* showed that in both species the characteristics of the palmar whorls are very similar. Genetic factors play an important role, while environmental factors should not be neglected.

[Zhao Xiao-jin, Wang Feng-chan, Li Li-guo. **Comparison of Whorl Types on the Palms of Macaca mulatta From the Taihang Mountains (Central China).** *Life Sci J* 2012;9(3):2185-2189] (ISSN:1097-8135). http://www.lifesciencesite.com. 315

Keyword:-*Macaca mulatta*; dermatoglyphics; palmar whorls; asymmetry.

1. Introduction

Dermatoglyphs are an essential morphological character in both human and non-human primates [1]. The complicated growth process of a dermatoglyph is affected by several elements such as the prenatal maternal environment, the level of testosterone during embryonic development and the palm shapes as well as by related genes[2,3,4]. During embryonic development the increasing influence of gene and environmental variations can cause abnormal developments in the dermatoglyphs [5,6].Dermatoglyph research is thus important for systematics and environmental control, life style, evolutionary grade and genetic pathology in different species. Bilateral asymmetry is a common phenomena in nature [2]. Currently only a few studies exist on the bilateral asymmetry of primate dermatoglyphs in China. Based on observations of rotational direction of palmar whorls in the interdigital II-IV area, this paper discusses their occurence and formation mechanism in order to provide basic information for a comparison of species and the evolution of primate dermatoglyphics.

2. Materials and Methods

Macaca mulatta inhabits the Taihang Mountains in northern Henan Province (N.Lat 34°54′～35°16′, E. Long 112°02′～112°52′) [7]. All the specimens of *Macaca mulatta* come from the Taihang Mountains. Details of gender are recorded in related documents. In this experiment we focus on 65 specimens consisting of 22 males and 43 females. According to the dental development and weights all the specimens are adult. The dermatoglyphs are obtained by photos or imprints. The images are analyzed by computer software Photoshop. The living *Macaca* are breeding in the rearing area of the School of Biological Science at Henan Normal University.

The object of the present research is a study of the palmar whorls. In general, the whorl has three patterns,pp. circular whorl, helicoidal whorl and deformed or degenerative whorl [8]. Circular whorls: the central line is composed of circles or concentric circles, sometimes with a certain deformation. Helicoid whorls have a central helicoidal zone with at least one spiral line rotating outside the center or near the center of the dermatoglyphs and the direction of the helicoidal whorls can be ulnar or radial. The deformed or degenerative whorls are mainly located in the interdigital III and IV area. These are rare, and do not have an apparent rotational direction and pattern center. Usually this type is difficult to confirm and it can be regarded as a transitional type or degenerative pattern.

The distribution of the whorls in the interdigital II-IV area on the palms is shown in Fig.1.

3. Results

The palmar whorls of *Macaca mulatta* appear mostly in the interdigital II-IV area, with a distribution frequency of 100%. Due to its rare occurence and uncertain rotational direction, Wv is classified as Wo. The distribution frequencies of Wu and Wo are shown in Table 1 and Table 2.

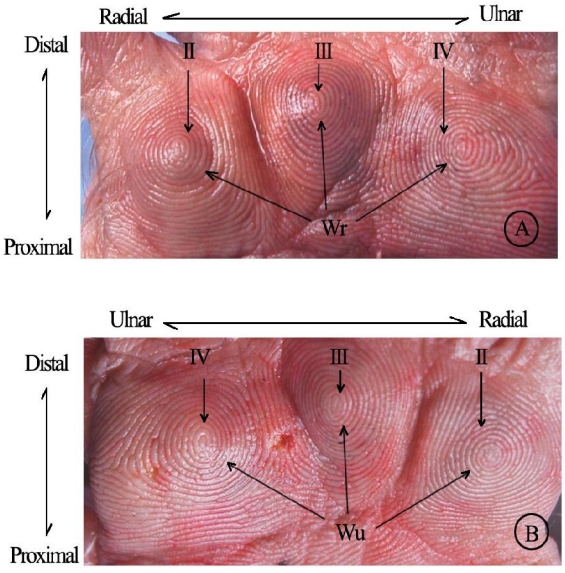


Figure1. Examples of most observable whorl types in the second, third, and fourth interdigital regions (Ⅱ, Ⅲ, and Ⅳ) between both hands in *Macaca mulatta*.

According to the rotational direction of the whorl an apparent bilateral discrepancy exists in the palmar whorls. The results are as follows,pp. (1) On the left palms the radical-rotation whorl (Wr) appears with a frequency of 83.1%~87.7% in the interdigital II-IV area, while the ulnar-oriented whorls in the same area have a frequency of 0.0%~4.6%. (2) On the right palms the ulnar-oriented whorls occur with a frequency of 60.0%-72.3% in the II-IV interdigital area, while the radical-oriented whorl (Wr) has a frequency of 9.2%-13.8%. (3) The left palmar Wr rotates in an anticlockwise direction as Wu does on the right palms. In other words, the rotational direction is the same on both palms. Neglecting the circular- and, deformed or degenerative whorls, the anticlockwise whorl constitutes 91.93% of all helicoidal whorls when the right and left palms are considered together and it demonstrates that the whorl has an apparent asymmetry of direction in the interdigital II-IV area. The frequency of Wu is very low in the interdigital II-IV area. Wu is not found in the interdigital III area and occurs only once in the interdigital IV area. (4) Wo is less frequent, the right side being greater than the left side and the middle greater than the bilateral.

Table 1. Occurrence frequency of Wr, Wu and Wo in the interdigital Ⅱ-Ⅳ patterns on the palms

Areas	Sex	Left				Right				Total			
		Wr	Wu	Wo	total	Wr	Wu	Wo	total	Wr	Wu	Wo	total
Ⅱ	♂	22	0	0	22	4	16	2	22	26	16	2	44
	♀	32	3	8	43	5	31	7	43	37	34	15	86
	♂+♀	54	3	8	65	9	47	9	65	63	50	17	130
Ⅲ	♂	21	0	1	22	3	15	4	22	24	15	5	44
	♀	36	0	7	43	3	24	16	43	39	24	23	86
	♂+♀	57	0	8	65	6	39	20	65	63	39	28	130
Ⅳ	♂	20	1	1	22	3	15	4	22	23	16	5	44
	♀	37	0	6	43	4	27	12	43	41	27	18	86
	♂+♀	57	1	7	65	7	42	16	65	64	43	21	130

Table 2. Distribution frequency of Wr, Wu and Wo on the palms of the Taihang *Macaca mulatta*

		Wr	Wo	Wu
Ⅱ	Left	54(83.1%)	8(12.3%)	3(4.6%)
	Right	9(13.8%)	9(13.8%)	47(72.3%)
Ⅲ	Left	57(87.7%)	8(12.3%)	0(0.0%)
	Right	6(9.2%)	20(30.8%)	39(60.0%)
Ⅳ	Left	57(87.7%)	7(10.8%)	1(1.5%)
	Right	7(10.8%)	16(24.6%)	42(64.6%)
total	Left	168(82.4%)	32(15.7%)	4(1.9%)
	Right	22(11.3%)	45(23.1%)	128(65.6)

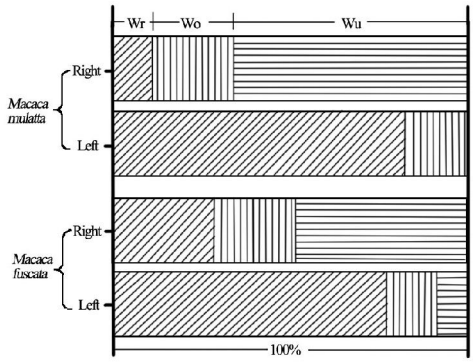


Figure 2. Comparisions of frequencies of Wr, Wo, and Wu in the second, third, and fourth interdigital patterns (Ⅱ, Ⅲ, and Ⅳ) between both hands

A comparison of the whorls in the interdigital area on the palms of Taihang *Macaca mulatta* and Japanese *Macaca mulatta* is shown in Fig.2. The result demonstrates that the frequency in the two populations of *Macaca mulatta* is similar to one another, with in decreasing frequency Wr-Wo-Wu on the left side and Wu- Wo-Wr on the right side.

4. Discussion

Dermatoglyphs are characteristic of primates. They are controlled by multiple genes and form between 13 and 19 weeks in the foetus. Dematoglyphs are inheritable, species-specific and stable. They are related with human physical strength, the degree of alertness and athletic abilities as well as some inherited diseases[8]. Previous studies mostly concentrated on the asymmetry of the numbers of dematoglyphic ridge on the palms and the influence of hormones during the early formative processes of the whorl [9]. Only a few studies have been devoted to the asymmetry of the palmar whorls.

Cauble and Mavalwa [10] studied dermatoglyphs on the palms of 70 *Macaca fascicularis*. Their results demonstrate that the rotational direction of the whorls has a striking discrepancy in interdigital III-IV patterns on the palms of *Macaca fascicularis* with the radial-oriented Wr on the left palm and the ulnar-oriented Wu on the right hand. Some studies of primates showed that the rotational direction of the patterns of hand are different from that of foot [11]. However they did not have a reasonable explanation for this phenomenon, and assumed that it is governed by the genetics of the genus *Macaca* or some other factors. Newell-Morris and Wienker [12]undertook detailed studies of the dematoglyphs on the palms of *Callicebus* and showed that the density of the pattern on the palms of three species of *Callicebus* is not related to sexual dimorphism and bilateral symmetry. They pointed out that their conclusion ran counter to research on other non-human primates. Additionally they mentioned that it is related with the dermatoglyphic differences in the different genera and species of primates. *Callicebus* may be different from Old World monkeys (such as *Macaca*) in the amount of sexual dimorphism and asymmetry [12]. Iwamoto[5,11]studied the whorls on the palms of 107 Japanese *Macaca*, and came to the conclusion that the apparent distinction in both palms in the interdigital II-IV pattern is based on the rotational direction of the whorls. His observation is similar to the statistical conclusion regarding the palmar whorls of Taihang *Macaca* reached in the present paper (Fig. 2). In his discussion he pointed out that the asymmetry of the interdigital whorl is negligable in the Japanese *Macaca* and other primates and that the origin of this asymmetry is difficult to understand [5,11]. The observations in the present paper are thus in accordance with the published record.

Although the reasons for the asymmetry of the palmar pattern in primates reproduction, size, types, position and the disparity of different taxa, and rare definite evidences could testify the asymmetry are controlled by genes and some environmental factors, many materials have proved the bilateral difference in palmar whorls in human and non-human primates and supplied with much evidence on physics, behavior and generation mechanism etc [13].

The formation of dermatoglyphs has been considered to be the result of genes and foetal environmental factors before the birth. Different human races have significantly different dermatoglyphic characteristics and these differences could help to unearth the history of organic evolution. There are both similarities and differences between the parental generation and filial generation, among siblings and in identical twins [14].

The rotational direction of the palmar whorls is inferred to be related to the gene regulation and control which has been proved experimentally. For instance, a double loop whorl on the palms of Taihang *Macaca mulatta* is located mainly on the proximal part of the hypothenar. Its rotational direction is radial with a double loop pattern (Zr) without bilateral asymmetry. In other words, Zr is displayed on the left palm as well as the right palm[15,16]. Arrieta et al. have studied the dermatoglypic characteristics of the palms of human twins and consider that the foetal factor is the main factor which effects the asymmetry line number in the interdigital a-b on the palms while the gene factor is minor [2]. This has been testified by other scientists.

One important result of this study is that Wr is displayed on the left palm and Wu on the right hand. Based on their anticlockwise rotational direction it is assumed that this phenomenon is bisymmetric and controlled by genes. Then due to some environmental factor Wo and Wu developed on the left palm and Wr on the right side, resulting in the bilateral asymmetry of the pattern.

The basis for this assumption is,pp. (1) The ridge counts and rotational direction of dermatoglyphs are controlled by genes and formed early on in the development of the embryo [13]. The embryonic environment and external environment may have some influence on the details of the dermatoglyphs, or even a substantial affect sometimes, but it is difficult to understand why both of the palms bear Wr when the formation of dermatoglyphs was completed, because the reverse restricted Wr to the left palm, with variation from Wr to Wu on the right hand. The exact mechanism responsible for this phenomenon is currently unknown. (2) In relevant publications it is

reported that the combinations of all types of whorls on the corresponding area on both palms have some internal relationship rather than a completely random one and indicate the degree of relationship between all types of whorl. The research of 90 kinds of combinations of lines left and right symmetry in the interdigital II-IV area on the palms of *Macaca mulatta* in Taihang showed that irregular combinations Wr/Wu 、Wr/Wo and Wo/Wu represent 89% of the total percentage, with the Wr/Wu type being particularly common (51.11%), while human Wo/Wo、Wr/Wr and Wu/Wu are less common (11% in total). This result demonstrates the irregular combination has a more intimate genetic affinity. Previous studies also support this assumption. For instance, Iwamoto[5] working on Japanese *Macaca mulatta* has shown that the main pattern in interdigital II-IV area is Wr with a percentage of 76.8% while the main pattern on the right palm is Wu with 48.0% of the total percentage. However this phenomena may not be applicable to humans. On the human finger Wr is greater than Wu on the left hand, while on the right hand it is quite the reverse [8]. (3) A high degree of asymmetry is characteristic of some interdigital areas, for instance, Wr appears in interdigital III and IV area on the palms of the Taihang *Macaca mulatta*, the frequency of Wu in interdigital III area and in interdigital IV being 0.0% and 1.5%, respectively. Moreover, according to Iwamoto in Japanese *Macaca mulatta* there is no Wu in the interdigital III and IV on the left palms [5]. It seems that this phenomenon is not purely accidental, at least in the genus *Macaca*. It is assumed that this characteristic is of taxonomic significance. (4) Sorenson-Jamison et al. [9] studied the influence of testosterone injection on the number of dermatoglyphs on the palms of *Macaca mulatta* before birth. They pointed out that the ridge number increased before the early period of gestation of humans but in monkeys the numbers decreased. For the two species the hormonal influence is striking but the effect is opposite, which would suggest a fundamental difference between humans and monkeys. During the life-span of a monkey, the palmar cactus retains a whorled pattern, while the palmar cactus in humans degenerates into a looped pattern or loses the pattern altogether[17].

According to the comparisons of two Japanese monkey and the observations in the present paper the main whorls on the palms of *Macaca mulatta* can be divided into three types,pp. Wr, Wu and Wo. The relationship between the different types is a very interesting issue. The frequency of the whorl types on the palms indicates that the order on the left palm is Wr→Wo→Wu but Wu→Wo→Wr on the right side. The result shows an inverse relationship. However, based on the above assumption, the result could be explained. The rotational direction is anticlockwise W → Wo → clockwise W, decreasing in frequency from anticlockwise W → Wo → clockwise W (Fig. 2). Thus it would appear that Wo is possibly a kind of transitional type. The whorls on the left side are more striking, which indicates during ontogeny the organism responds more positively to sinistral control, or that the effect of all kinds of interference factors is relatively weak. The possible reason for this phenomenon is as follows, (1) Asymmetry is an objective reality in the primate and it is normal during development that the symmetrical organism developed a striking asymmetry on account of the influence of ontogenetical interference factors, which have been proved repeatedly [18,19,20]. (2) According to some research the chimpanzee has handedness, the left hand and the right hand differ in the active frequency and flexibility of utilization and all these activities are controlled by different hemispheres[21,22,23], thus causing the bilateral difference of dermatoglyphs. (3) The numbers of finger ridges on both human hands are unequal, in 80% of all humans the number of finger ridges on the left hand is higher than on the right hand [8]. The high number of dermatoglyphs means an increased tactile sense. The patterns on the palms of primates has apparent bilateral asymmetry. This is possibly related to a functional difference between human and non-human primates. Further research will be needed to discover the exact factors responsible for these differences.

The above represents some of the issues related to in the characteristics, taxonomy and asymmetry of the whorls on the palms of *Macaca mulatta*. Many questions remain unsolved, for instance, the relationship between the bilateral differences and the function of both hands, the distribution of the whorls in the different interdigital areas, and the sexual and taxonomic significance of the differences between the whorls. None of these problems can be solved in the short term.

Acknowledgements

We are very grateful to Prof. Zhang Hongxu, who helped collect the dermatoglyphics data. This research was supported by grants from the Doctoral Science Foundation of Henan Normal University (2010, No. 5225441).

Corresponding Author:
Dr. Fengchan Wang
College of Life Sciences
Henan Normal University
Xinxiang, Henan P R. China
E-mail:wangfc2002@163.com

5. References

1. Li H, Tang SM, Yao JZ, Qaio SY. (2001): Evolution of interdigital patterns among primates, Acta anthropological sinca , 20(4):308-311.
2. Arrieta MI, Criado B, Martinez B, Lobato MN, Gil A, Lostao CM. (1993): Fluctuating dermatoglyphic asymmetry: genetic and prenatal influences. Anniversary Human Biology, 20: 557-563.
3. Jamison CS, Meier R, Campbell BC. (1993): Dermatoglyphic asymmetry and testosterone levels in normal males. American journal of physical anthropology, 90:185-l98.
4. Loesch D, Lisiewicz H, Czyzewska J. (1978): Genetical distance and dermatoglyphic characters. Ⅲ. Dermatoglyphic distances with twin pairs, between left and right sides, and between normals and 21-trisomics. Hum. Hered, 28:456-467.
5. Iwamoto M. (1964): Morpholocial studics of *Macaca fuscata*: I. Dermatoglyphics of the hand. Primates, 5: 53-72.
6. Reed T, Evans MM, Noron JA. (1979):, Maternal effects on fingertip dermatoglyphics. Am. J. Hum. Genet, 31: 315-323.
7. Qu WY, Li YJ, Xia XY, Lu QY, Li DS. (1989): A tentative discussion on the geographical distribution of the primates at Taihang mountains and in the north area of China. Journal of Nenan Normal University, 2: 95-97.
8. Ma WG, Yang HM. (2008): Practical dermatoglyphics for medicine. Science and Technology Literature Press, Beijing.
9. Palmer AR. (1994): Fluctuating asymmetry analysis:a primer. In:Markow TA. :335-364.
10. Cauble RG, Mavalwa J. (1973): The Palmar dermatoglyphics of *Macaca fascicularis*: A comparison with Macaca fuscata. Journal human Evolution 2: 137-152.
11. Iwamoto M. (1967): Morpholocial studics of *Macaca fuscata*: V. Dermatoglyphics of the foot. Primates, 8: 155-180.
12. Newell-Morris L, Wienker T. (1986): Dermatoglyphic patterns and pattern intensities of Callicebus (primates: Cebidae): Description and comparison of three species. Folia Primatol (Basel), 46 (1): 15-27.
13. Sorenson-Jamison C, Meier RJ. (1993): Campbell BC, Dermatoglyphic asymmetry and testosterone levels in normal males. American journal of physical anthropology. 90(2): 185-198.
14. Pechenkina EA, Benfer Jr RA. (2000): Vershoubskaya GG, Kozlov AI , Genetics and environmental influence on the asymmetry of dermatoglyphic traits. American journal of physical anthropology , 111(4): 531-543.
15. Zhao XJ, Lu Q. (2002): Study on the dermatoglyphics of the palms of Taihang *Macaca mulatta*. Journal of Changde Teachers University,14: 49-51.
16. Jin X, Zhao XJ, Ding JZ, Wang FC, Hu XL. (2011): Asymmetry in the palmar interdigital ridge-counts of *Macaca mulatta* in the Taihang mountains. Sichuan journal of zoology ,5:110-115
17. Jamison CS, Jamison PL, Meier RJ. (1994): Effect of prenatal testosterone administration on palmar dermatoglyphic intercore ridge counts of rhesus monkeys (*Macaca mulatta*). American journal of physical anthropology, 3: 409- 419.
18. Natekar PE, DeSouza FM. (2006): Fluctuating asymmetry in dermatoglyphics of carcinoma of breaat. Indian J Hum Genet , 12(2): 76-81.
19. Sukanta S, Danuta L, David C. (2003): Directional and fluctuating asymmetry in finger and a-b ridge counts in psychosis: a case-control study. BMC Psychiatry ,3: 3.
20. Markow TA, Gottesman II. (1989): Fluctuating dermatoglyphic asymmetry in psychotic twins. Psychiatry Research , 29: 37-43.
21. Sarringhaus LA, Stock JT, Marchant LF. (2005): Bilateral Asymmetry in the limb bones of the Chimpanzee (*Pan troglodytes*). American journal of physical anthropology , 128: 840-845.
22. Dhall U, Signh I. (1977): Anatomical evidence of one-sided forelimb dominance in the rhesus monkey. Anat Anz, 141: 420-425.
23. Falk D, Pyne L, Helmkamp RC, DeRousseau CJ. (1988): Directional asymmetry in the forelimb of *Macaca mulatta*. American journal of physical anthropology , 77: 1-6.

4/20/2012

Management Strategies for E-Learning System as the Core Component of Systemic Change: A Qualitative Analysis

Simin Ghavifekr [1], Mojgan Afshari [2], Amla Salleh [1]

[1]Faculty of Education, The National University of Malaysia (UKM), 43600 Bangi, Selangor, MALAYSIA
[2]Faculty of Education, University of Malaya (UM), 50603 Kuala Lumpur, MALAYSIA
sgh502@gmail.com

Abstract: In the current information age, e-learning system is a priority for educational organizations and institutions to face the new changes. Due to the dynamic characteristics of e-learning system, its implementation will results in a fundamental change at all levels and aspects of education system which is called systemic change. Accordingly, management strategies for the systemic change implementation specifically in Open and Distance Learning (ODL) institution, has been considered as the integral part of the change process to deliver and support learning flexibility and cost-effectiveness. This paper aims to answer questions regarding management strategies that can help them to deal with the new changes from implementation of e-learning system in an ODL institution. However, the data analysis for this qualitative research found that planning, organizing, guiding and monitoring are the main strategies for the change management team in directing the implementation of e-learning system successfully. "E-learning System" as the core component of educational systemic change, is the main theme for this study. The results of in-depth analysis including emerged sub-themes, sub-sub- themes and the sub-sub-sub-themes are presented in this paper.
[Ghavifekr S, Afshari M, Amla S**. Management Strategies for E-Learning System as the Core Component of Systemic Change: A Qualitative Analysis.** *Life Sci J* 2012;9(3):2190-2196] (ISSN:1097-8135).
http://www.lifesciencesite.com. 316

Keywords: Change management; e-Learning system ; open & distance learning; systemic change

1. Introduction

E-learning is one of the most effective technological changes that has happened to the field of education. In the current information age, e-learning system is a priority for educational organizations and institutions to face the new changes. Due to the ability in providing a flexible learning environment, e-learning is widely used in Open and Distance Learning (ODL) institutions in many countries as Malaysia. In result, during the past 20 years, conventional campus education has changed gradually to an e-learning-based mode, to improve the quality and flexibility of their delivery system that is much preferred by working adults (Ghavifekr & Sufean, 2011). However, it has been considered that for the success of e-learning adoption in ODL institutions, much more than just a minor adjustment in the current practices of higher education are needed (Fullan, 2001; Senge, 1999; Uys & Siverts, 2001). Bates (2000) considers the recent changes from integration of e-learning, as the revolution in thinking about teaching and learning, which has directed the higher education specially ODL institutions to go through technological changes as an alternative solution for their system's improvement . In this regard, the main part of the revolution is related to the management's strategies for changing the way that ODL institutions have planed and organised in order for achieving maximum effectiveness. However, managing process of change is a crucial and important task for improving the speed and sophistication of teaching-learning delivery system in universities (Ghavifekr & Sufean, 2011).

However, e-learning implementation in line with globalization and information highway, has influenced ODL institutions to recognize change management strategies as an important tool for their organisational growth and development. In this context the Malaysian higher education institutions are looked upon by the general public to managing change in the form of educating future workforces that are technology savvy, innovative and conversant in technical know-how, so as to enable the nation to be competitive (Hashim, 2007). Hence, the need for effective ICT-based governance is one of the main elements for change management strategies in the Malaysian education system which will ensure that technology investment decisions are optimized in the system and well planned (Suhaimi et. al., 2007).

2. Statements of the Research Problem

The recent attention to change management can be attributed to the belief that managing change particularly in education system is challenging and it is therefore necessary to perform strategic planning (Senge, 1999; Uys and Siverts, 2001; Fullan, 2001). In this regard, lack of strategic management is one of the main challenges which educational organizations and universities are facing in the current changing society (Coimbra Group of Universities in Europe, 2002; Richards, O'shea, Connolly, 2004; Rossiter, 2006;

Uys and Siverts, 2001; Zellweger, 2006). However, in today's demanding environment, the key challenge facing educational planners and management teams is related to their ability to identify a long-term vision, mission and strategies that can be delivered effectively through the best practice of strategic management techniques to deal with the new changes in a systemic approach. In case of open and distance learning, the recent technological changes from e-learning implementation, have a major systemic implication on the education system that needs to be carefully planned , organized , guided and monitored .This is in order to make it more flexible, effective and efficient to be used by adult learners (Ghavifekr & Sufean, 2010).

In the Malaysian education system, the essential role of change management strategies for implementing learning technologies, is a basis for competitive advantage of ODL institutions in the country(Ghavifekr et al., 2012). Previous research (Hashim, 2007; Poole et al.2004: Rahimah, 1998; Raja Maznah, 2004) show that directing and managing e-learning is a complex process which requires change management strategies to deal with the new changes. This is due to the current issues and challenges related to the use of learning technologies in the Malaysian higher education. Moreover it is because of the essential role of technology as being an integral part of open and distance education system.

3. Research Objective and Question

The main purpose of this paper is to examine "E-learning System" as the core component of systemic change with the four management functions including planning, organizing, guiding, and monitoring. In addition, this paper aims to identify management strategies that involved in dealing with e-learning implementation in context of a Malaysian ODL organisation, which is the first open and distance institution in the country.

4. Method

For the purpose of this study a qualitative research methodology was used and data were collected through three different sources including open-ended interviews, direct observation, and official documents revision techniques for the duration of six months in an open university in Malaysia. The official documents reviewed and analysed in this study were including mission statement, strategic and resource allocation plans, the university's published Annual and Monthly Reports, newspapers, public records, and research articles which have been presented in local and international seminars and conferences by the officials. The observation and document review techniques had been used in providing further interpretation of the interview data. The total of 35 interviewees were from various groups including top management, deans of the faculties, directors and heads of the supporting centers and departments, as well as the senior tutors who have been working at the open university since it has been published twelve years ago. All the materials and interviews were recorded, transcribed and analyzed by using the open coding, axial coding and selective coding techniques. In order to organize and manage the data more systematically, the raw data were analyzed using NVivo 8.3 computer software. Using the computer software helped the researcher to find in-depth and detailed data on management key strategies and policies regarding implementation of systemic change in the case open university. In addition, the procedures for coding and categorizing e-learning system implementation as the main theme of this study were guided with the Ladder of Analytical Abstraction (Milles & Huberman, 1994) as a guideline for the qualitative data analysis. The results of the emerging sub-themes, sub-sub-themes , and sub-sub-sub-themes are based on examination of planning, organizing, guiding, and monitoring as the four key functions of management are presented in the following sections.

5. Data Analysis and Findings

5.1 E-Learning System , the Core Component of Systemic Change

Since the establishment of the case open university in the year 2000, e-learning has been considered as the key element in implementing new changes in the ODL organization. This study found that the decision to implement e-learning system has been played an important role in the development and improvement of the university's position locally and internationally. This is due to the rapidly increasing of students' enrolment in the institution during the last twelve years of practicing ODL in the Malaysian society (Anuwar Ali, 2008). The result of this study indicates that implementing e-learning system was considered as a catalyst for the institution's adult learners in accessing to the proactive learning environment. In this study, proactive learning environment refers to a more flexible and learner-centered environment that provides dynamic and active interactions between the learners and tutors through an online forum as well as face–to- face tutorials. The analysis showed that e-learning system considered as the core component of change that led the university to provide opportunities for working – adult learners to persuade their higher education. This is in line with the country's developmental vision to reach the large numbers of IT-savvy workforces and ICT infrastructures by the year 2020. Moreover, e-learning was considered as an influential factor in

increasing learner intake at the institution. As pointed out by a top management of the ODL institution, for more progress in the future, the university needed to be equipped with the appropriate capacity to sustain e-learning system and ICT-based activities. The analysis data showed that the main vision of the institution leaders and the change management team for implementing e-learning system, was to achieve the desired goal of "democratization of education" . In this regard, e-learning system meant to be an enabler tool to meet higher education aspirations using flexible, accessible and affordable system in order to provide lifelong learning opportunities for all and to help the government in the democratization of education (The Annual Report, 2008, p. 5).

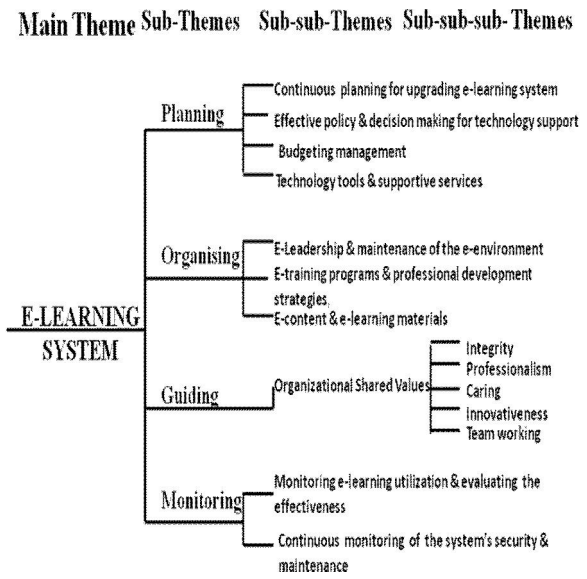


Figure 1 .The overview of systemic change management strategies for e-learning system

The outline of the sub-themes, sub-sub themes, and the sub-sub-sub-themes for this study shows in Figure 1. These themes have emerged from in-depth analysis on the e-learning system as the main component of systemic change. As shows in this figure, e-learning system has been examined with the management key functions ; planning, organizing, guiding and monitoring. The detailed explanation on the above figure is presented in the following sub-sections .

5.1.1 Planning E-learning System

The analysis showed that main reason for implementation of the new changes in the ODL institution was to improve the system with using technology in teaching and learning processes. This study found that for the effective utilization of learning technologies such as e-learning and Information-Communication Technology (ICT) for education and training purposes, clear vision and strategic planning are the two main prerequisites. While having a clear vision can help the management of change to answer the question of "what to change", strategic planning for change would guide the system in addressing the question of "how to change". This is because in vision and planning phase, the desired goal of the organization which is the purpose of the change would be set up. The analysis suggested that the importance of strategic planning would be more essential when an organization going through the technological change with the reason of system improvement. In this study the analysis suggested that in the ODL institution, planning for change from e-learning system comprises four strategies as follows:

- Continuous planning for upgrading e-learning system

Since the main goal of the institution was to develop quality education through advanced technologies, strategic analysis and planning phase played a crucial role in the process of managing e-learning changes in the case university. In this context, management strategies were focused in developing high quality adaptive content. This prerequisite was part of the management strategies for upgrading the e-learning system. Through such a continuous planning, the institution's management was able to respond to the market needs. Therefore, developing and enhancing learning experiences towards the development of a knowledge-based society was centered in this strategic planning for the change management team.

- Effective policy and decision making for technology support

The next strategy in planning for the new changes was related to effectual policy and decision making for technology support. This study found that, investments for e-learning system were an important task for the change management team. This is becouse the top management believed that lack of appropriate policies to support the successful implementation of learning technologies, would lead to the failure of the change process. However, effective policies were required not only to assist in building "e-learning culture" among the organisation members, but also to make sure that there are sufficient facilities and resources to supply e-learning system.

- Budgeting management

Budgeting management was the other sub-sub-themes in management planning for e-learning implementation which emerged from in-depth analysis. In this study budgeting management refers to

the management strategic planning for resourcing and financing related to change implementation. All the budgeting strategies, needed to be approved by the change management team before being practiced. Accordingly, the main task for the change management team was to prepare a guideline for all the budgeting plans for the whole university. This guideline which is regularly reviewed and evaluated every semester, was depended on the budget that the university needed for maintenance of its activities regarding e-learning system implementation. Moreover, budgeting management was including adequate funding to support the needed purchases for sufficient hardware, software, and services of the advanced learning technologies. In addition, employing appropriate and skilled staf including both academic and non-academic, for working in such an e-learning environment also needed sufficient budgeting.

- Technology tools and supportive services

As being the first ODL institution in Malaysia and in order to be a provider of flexible learning, one of the major concentrations of the top managent team was focusing on technology tools and supportive services. This strategy was necessary to ensure that all the technology services to maintain e-learning system were accessible to the distance learners. In this regard, Learning Management System (myLMS) was the main e-learning services which supports the teaching and learning processes. To achieve effective and efficient outcome, my LMS has been designed to be more user-friendly for the adult learners. Moreover, it has been designed to enrich the learning experiences through participation in online discussion (Anuwar Ali, 2008; Zoraini Abas, 2009). The institution's e-learning supportive services had been used not just by students, but also by all the organisation members in order to support the academic and administrative activities.

5.1.2 Organizing E-learning System

After planning for e-learning system, there was a need for considering the important role of organizing elements in the planned strategies. This study found that in the ODL institution, organizing strategies for e-learning system was more related to the organization's structure. In this context, to reach the objective outlined in the planning process, it was essential to structure the activities of the organization. This is due to the management's key strategy in assigning skilled employees who are relevantly capable to work in the technology-based environment. In addition, understanding the employees and their capabilities towards the available resources, was critical task for the management team in dealing with the new changes. Based on the objective of this study, an in-depth analysis was made on the organizing strategies for e-learning system and the emerging three sub-sub themes were narrated in the following sub-sections:

- E-leadership and maintenance of the e-environment

This study found that as e-learning was the core element for systemic change, quality performance of the ODL organisation was mainly depended on the management of the technology. In this regard, for effective organizing of the technology-based education system, there was a need for people to perform as e-leadership and e-management. In this study, e-leadership refers to the variety of management's activities in appraising the educational needs and technological experiences of the target learners. Analysis showed that innovation and research was among the main criterion for e-leadership activities in their critical task of managing the technology-based environment. The role of e-leadership in preparing the organization for systemic change was another strategic task for such a leadership style. E-leadership's ability in managing the change process while maintaining balance within all the organizational levels and aspects, had a significant effect in the success of the e-learning implementation process. This is because e-leadership was an efficient style of leadership that ensured the consistent quality improvement of the ODL institution.

- E-training programs and professional development strategies

According to the analysis, providing e-training programs for various individual groups was among the management key strategic planning in dealing with the new changes from e-learning system implementation. These programs aimed to enhance the professional development of the university's human capital. Moreover, the e-training programs designed for continuous preparation of the human resources on utilization of the new technologies including effective staffing and tutoring methods and strategies. The participants in the e-training programs were both non-academic and academic staffs including tutors and facilitators. During the e-training programs, usage of the Learning Management System (myLMS) as well as the services which are available in the LMS also demonstrated by the professionals in the field. Analysis showed that in the context of the ODL institution, professional development was aimed at having sufficient numbers of the correct people to ensure the general maintenance of the Information Communication Technology (ICT) and its infrastructure. In addition, developing e-learning

solution to deal with the new changes was among the key criteria for professional development at the institution.

- E-content and e-learning materials

Since the establishment, e-learning was the open university's primary mode for learning delivery system. Accordingly, continuous improving of the e-content and e-materials with the purpose of quality online learning, was an essential strategy for the management. Data analysis showed that the desire to develop more e-content and e-materials in the form of online modules via technology servers was the main reason for e-learning change initiatives. This strategy was in line with the university's mission to expand accessibility to quality education as well as providing lifelong learning opportunities through e-learning adoption. However, adoption of flexible mode of learning while providing a proactive and dynamic learning environment, helped in the development of more competitive and affordable cost for the target working–adult learners. It also resulted in the rapid increase of students' enrolment locally and internationally.

5.1.3 Guiding E-learning System

The analysis revealed that a set of organizational shared values was an effective strategy for the management particularly in guiding planned changes in the e-learning system. In this regard, the shared values of the institution acted as a guideline for the organization to move forward in achieving organisational desired goals and objectives. Moreover, the interrelationships and interconnections of the institution shared values resulted in promoting the culture of change among the organizational members. These shared values were include Integrity, Professionalism, Caring, Teamwork, and Innovativeness. These values were the common ground for all members of the organization in their daily activities in order to help the leaders in guiding the system for implementation of the new changes. Moreover, the shared values also acted as strategies, philosophy, and basis of the change management actions in dealing with the e-changes. In addition the shared values had an essential role in enhancing the organizational motivation for change.

5.1.4 Monitoring E-learning System

Apart from planning, organizing, and guiding which were the three effective management strategies for the success of the systemic change process at the case open university, monitoring of such strategies was also critical. This study found that when an organization going through new changes for the purpose of system improvement, there was a need for monitoring strategies to ensure that the planned objectives have achieved. Through regular monitoring, the change management team were able to see the performances of the various units, centers and the faculties. Based on the analysis, the more efforts the management put in continuous monitoring of the e-learning system, the better results they would get regarding organisational planed goals and objectives. The results of in-depth analysis based on emerged sub-sub themes from monitoring e-learning system, were two strategies as follows:

- Monitoring e-learning utilization and evaluating the effectiveness

This study found that for an e-learning system to be more effective and efficient for the benefit of students' learning, there was a need for regular feedback from both tutors and the learners on effectiveness of the system. Receiving these feedbacks helped the change management team in continuous monitoring of the e-learning utilization by providing opportunities for being more detailed on efficiency of the learning objectives. In addition, doing research on the surrounding technology changes, helped the management to have comprehensive picture on the effectiveness of the new changes. However, monitoring strategies of the management has resulted in the utilization of more interactive and automated learning technologies since the open university's establishment. Using "Google Analytic" was one of these effective strategies. This service helped the technology management to get the data and to understand this data on how much improvement that was needed to put into the system. The Google Analytic provided detailed information on the data usage including numbers of hits, the time the hits, the peak times of the hits, and the time that the system was under bottom line by the users. This service also helped the technology management in financial planning for the following years. Therefore, based on these information, the change management team had ensured that the system would not face any problem for the years ahead.

- Continuous monitoring of the system's security and maintenance

Finally, e-learning system's security was part of the vital needs for preventing the system from unauthorized accessibility at the institution. In the case open university, there are specific teams that their responsibility was to maintain the e-learning system activities by securing the data from unauthorized accessibility. Moreover, these teams also have the

responsibility for availability and performance of the system and storing the information from being lost or inaccessible. By monitoring students' login through Google Analytic, the institution's technology management were able to enhance the security of unauthorized access. Thus, when students log in to the e-system, the management was able to track the place and the browsers, as well the websites and links that they were accessing. The present e-learning system at the ODL institution provides all the information related to the security of the system's usage, such as audit trial that can do on each transaction done by the users. In this regards, continuous monitoring was the key strategy to maintain the security of the present technology. For more effectiveness, from time to time the technology authorities trying to improve the system based on the users' requirement and the organizational policies.

5. Discussion and Conclusion

Over the last few years, adoption and integration of various learning technologies has become a central part of educational systems, making positive effects on teaching and learning outcomes. In this regard, implementation of e-learning system specifically in context of distance education organizations where the technology has a fundamental effect on organizational performance, has brought many changes in response. In line with Uys (2007) idea on the essential role of e-learning for ODL institution, this study found that e-learning system is a priority for distance educational organizations and institutions to face the new technological changes .

As explained in this paper, implementing e-learning in educational system had resulted in providing a more open and flexible and learner-centered teaching and learning environment which is more expedient for the distance-learners and cost effective for the universities. Similarly, Fullan (2001, 2003, 2007) affirmed that e-learning adoption made fundamental alterations in educational systems which direct the teaching and learning process to a more learner-centered status. Consequently, the new changes from e-learning adoption begins with explicit vision on educational culture as well as fundamentals that maintain the learning process namely pedagogy, course design, instruction, evaluation, and the management's strategy and policy.

This paper elaborated that in context of open and distance education, management of change is referred to the planned strategies in dealing with new changes from implementation of advanced technologies such as e-learning system. In such a context, dealing with the changes, as well as defining and implementing procedures and technologies to benefit from changing opportunities is the main responsibility for the change management. As mentioned in this paper, there are four main strategies that need to be considered by management of change in dealing with the new changes from e-learning system. Specifically in an ODL institution, each of these strategies comprises of some key dynamics and interaction that involve in the change management process.

In line with Fullan (2001), this paper explained that the requirements for e-learning system infrastructure, consists of hardware, software and high-speed Internet connectivity, as well as regular maintenance, continuous monitoring, planned upgrades and appropriate students-tutors interactions ratio. However, addressing present issues and enhancing the quality of education to achieve future progress, was the main intention of the management to plan their strategies for the new changes implementation.

Corresponding Author:
Dr. Simin Ghavifekr
Center of Learner Diversity
Faculty of Education
National University of Malaysia (UKM)
43600 Bangi, Selangor, MALAYSIA
E-mail: sgh502@gmail.com

References

1. Ghavifekr,S., & Sufean, H. (2011). Managing Systemic Change in a Technology-based Education System: A Malaysian Case Study. Volume 28, Pages 455-464 of Procedia - *Social and Behavioral Sciences on Science Direct,* ISSN: 1877-0428 by Elsevier Publication. This paper presented at the World Conference in Educational Technology Researches (WCETR/2011) 6-10 June, Near East University & Gazi University, Kyrenia – North Cyprus.
2. Fullan, M. (2001). *Leading in a culture of change*. San Francisco, CA: Jossey-Bass.
3. Senge, P. (1999). *The dance of change: The challenges to sustaining momentum in learning organizations*. New York, NY: Doubleday.
4. Uys, P., & Sieverts, S. (2001). Managing technological transformation in Higher Education: A Southern African perspective. In *Proceeding of the 22nd World ICDE (International Council for Distance Education) Conference* Dusseldorf, Germany. Retrieved from; http://www.globe-online.com/philip.uys/www.globe-online.com,philip.uys,icde2001.htm
5. Bates, A.W. (2000). *Managing technological change: Strategies for college and university leaders*. San Francisco, CA: Jossey-Bass.

6. Hashim, Y. (2007). Value literacy as conduit for managing change in higher education institutions. In Sufean Hussin et al. (Eds.), *The whirlwind in educational management and policy*. Kuala Lumpur: UM Publication.
7. Suhaimi, B., Rose Alinda, B., Othman, B., & Azizah, B. (2007). *An Integrated Framework for IT Governance in the Malaysisan Ministry of Education*. Paper presented at Postgraduate Annual Research Seminar. Retrieved from http://www.pps.fsksm.utm.my/pars2007/pars/pars/after%20correct/Information%20System%20Management/suhaimiismail-correct.pdf
8. Coimbra Group. (2002). *European Union policies and strategic change for learning in universities* Brussels: Report of the project "Higher Education Consultation in Technologies of Information and Communication" (HECTIC).
9. Richards, L, Connolly, M., & O'Shea, J. (2004). Managing the concept of strategic change within a higher education institution: The role of strategic and scenario planning techniques. *Journal of Strategic Change*, *13*, pp. 345-359.
10. Rossiter, D. E. (2006). *Embedding e-learning in universities: Analysis and conceptualization of change processes*. (Unpublished doctoral dissertation, Queensland University of Technology, Australia).
11. Zellweger, F. (2006). *The strategic management of E-Learning support: Findings from American research universities*. Münster, Germany: Waxman.
12. Ghavifekr,S., & Sufean, H. (2010). Management as Visionary Planning for Dealing with Systemic Change: A Case of Malaysian Open Distance Learning Institution. *OIDA International Journal of Sustainable Development*, ISSN 1923-6654, Vol. 1, No. 4, pp. 79-85**.** The paper also presented at The Summer Congress /2010 . June 22-25. Laurentian University , Canada,Ontario.
13. Ghavifekr, S., Afshari, M., & Ayoufu, W. (2012). Management strategies for Organizational Implementation of Systemic Change: A Qualitative Analysis. The paper has been presented at the International Conference of Management (ICM), 11-12 June, 2012, Langkawi ,Malaysia.
14. Poole, M. S., & Van de Ven, A. H. (2004). *Handbook of organizational change and innovation*. Oxford University Press.
15. Rahimah, H. (1998). Educational development and reformation in Malaysia: Present and future. *Journal of Educational Administration*, *36*(*5*), 462 - 475. Retrieved from http://www.emeraldinsight.com/10.1108/09578239810238456
16. Raja Maznah, R. (2004). E-learning in Higher Education Institutions in Malaysia. Retrieved from http://www.e- ntor.edu.pl/_xml/wydania/7/102.pdf .
17. Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis* (2nd ed.) Thousand Oaks, CA: Sage.
18. Anuwar, A. (2008). Issues and Challenges in Implementing e-Learning in Malaysia. *Open University Malaysia*. Retrieved from http://asiapacific-odl2.oum.edu.my/C33/F80.pdf
19. Open University Malaysia (OUM). (2008). *Annual Report 2008*. Kuala Lumpur: Group of Authors.
20. Uys, P. (2007). Enterprise-wide technological transformation in higher education: The LASO Model. *International Journal of Educational Management, 21*(*3*), 238 - 253.
21. Fullan, M. (2003). *Teaching in the knowledge society: Education in the age of insecurity*. New York, NY: Teachers College Press.
22. Fullan, M. (2007). *The new meaning of educational change* (4th ed.). New York, NY: Teachers College Press.

7/31/2012

A Cultural Study of The Effect of Language Transfer on Politeness Strategies employed by Iranian and Turkish Students

Sohrab Rezaei

Assistand Professor Allameh Tabatabaei University,Tehran,Iran
Sohrab_rezaei@yahoo.com

Abstract: This study has been an attempt to investigate the effect of learning English as a foreign language on employing politeness strategies by Iranian and Turkish students. Two groups of Iranian grade four university students majoring English and Farsi languages and two groups of Turkish grade four students majoring English and Turkish languages have been selected as subject for the study. The results have revealed that for Iranian participants, there is evident differences between EFL and NL learners in their choice of politeness strategies in different interactions. These differences can be interpreted as coming from English into EFL learners' linguistic performance. A general comparison has revealed that language transfer effect on Turkish EFL learners is not so great but comparing this group to Iranian EFL learners, clearly shows that language transfer effect on Iranian EFL learners is more than Turkish EFL learners. These differences can be interpreted as a result of cultural differences between Iranian and Turkish EFL learners on one side and the Transfer effect coming from English language into Persian language and culture more than Turkish culture and language or it can be claimed that due to closeness of Turkey to western culture and languages, the possible language transfer effect has already come into Turkish participants linguistic and cultural behavior.
[Sohrab Rezaei. **A Cultural Study of The Effect of Language Transfer on Politeness Strategies employed by Iranian and Turkish Students.** *Life Sci J* 2012;9(3):2197-2210] (ISSN:1097-8135). http://www.lifesciencesite.com. 317

Key words: language transfer, politeness strategies, positive politeness, negative politeness, native language, foreign language, TEFL

Introduction

There have been different approaches to the study of language. Some have focused on the structure of the language while others have looked at language in the light of its culture and its context of occurrence. Speakers of different languages exhibit different verbal and non verbal behavior in their interactions. The possibilities of misunderstanding can be seen when two totally different cultures come into contact with each other. There are many examples of cross–cultural misunderstanding in the literature on sociolinguistics, pragmatics, and intercultural communication.

Recently it has become widely accepted that verbal communication is not simply a means of conveying information, but also an equally important means of establishing, maintaining, and even terminating social relationships with other people. Various scholars have repeatedly emphasized the interrelationship of a culture of a society and its language. Consequently, linguistic theory cannot restrict its attention to the study of the linguistic code and ignore the general social communicative conduct, since they are closely interrelated.

Researchers have proposed several theoretical frameworks in pragmatics and sociolinguistics. One of the most outstanding frame works which has attracted the attention of most scholar all around the world is that of Brown and Levinson (1978) presented in their extensive essay "Some universals in language usage: Politeness Phenomena." Brown and Levinson present a cohesive and comprehensive theory of politeness in which linguistic devices are realizations of specific politeness strategies.

Review of literature

The communicative approach to language was one of the main reasons of pragmatic studies. There have been several definitions of pragmatics most of which share the general notion of 'studying language in use". Jame (1980) defined pragmatics as "human, broad, macro linguistics which aims to achieve a scientific understanding of how people communicate and to incorporate the functional aspect of language in to the study of languages and, to search the ways in which people put language to use". (Ibid. P.100).

Politeness Principle

Leech (1983) in his *Principles of Pragmatics* attempts to develop his previous work (*Language and Tact* in 1980) and expands and elaborates on Grice's (1975) views. He presents an extensive analysis of politeness in terms of maxims with respect to a more general pragmatic framework in which politeness features count as a very important pragmatic factor regulating interaction.

He characterizes his approach to pragmatics as 'rhetorical' in the sense that the focus is placed on a goal-oriented speech situation, in which speaker's [**s's**] use of language is to produce a particular effect in the mind of hearer [**h**].

Politeness Theory

Brown and Levinson (1987), henceforth (B&L) propose a theory of politeness which draws its basic concepts from Grice's CP. They believe that the CP defines an unmarked or asocial presumptive framework for communication with the essential assumption of "no deviation from rational efficiencies without a reason" (p. 5). But they do not seed the modifications of the Gricean program as wholly successful. (See 2.3 for discussion).

B&L also draw on speech act theory though less heavily than the CP. At first, they took this theory as a basis for a mode of discourse analysis, but then they found it not so promising as speech act theory forces a sentence-based, speaker-oriented mode of analysis where their own thesis requires that utterances are often equivocal in force.

The alternative they took is that they avoided taking such categories as the basis of discourse analysis and chose other more demonstrable categories. In what follows, these categories and notions, as depicted in their lengthy description of their theory (1987) are reviewed.

The notion of face and face threatening acts

Basic to Brown and Levinson's model, is a Model Person who is a willful fluent speaker of a natural language. All Model Persons are endowed with two qualities: 'rationality and face' as means to satisfy communication and face-oriented ends. They have borrowed the term 'face' from Goffman [1967] and from the English folk term that is related to the notions of being embarrassed or humiliated or losing face.

In B & L's view, face consists of two related aspects: (1) negative face: the basic claim of territories, personal preserves, right to non-distraction, i.e., to freedom of action and freedom from imposition, and (2) positive face: the positive self-image or 'personality' (crucially the desire of every member that his wants be desirable to at least some others.

The other notion that B&L's theory rests on is the notion of face threatening acts (FTAs). They assert that either or both of an individual's face, i.e., the negative face and the positive face can be threatened by certain face threatening acts, which are defined in terms of whose face, Speaker's (S's) or Hearer's (H's) is at stake and which face want is threatened.

Strategies for doing FTAs

The next notion that B&L's theory rests on is the strategies for doing FTAs. They believe that in the context of the mutual vulnerability of face, any rational agent will seek to avoid these FTAs or will use certain strategies to minimize the threat. In deciding to do the FTA, they can go *on record* or *off record*.

In going on record, an actor makes it clear to participants what communicative intention led the actor to do an act (A).On the other hand, if an actor goes off record in doing A, then there is more than one ambiguously attributable intention so that the actor cannot be held to have committed him/herself to one particular intent.

Positive politeness

The linguistic realizations of this strategy are very much like normal linguistic behavior between intimate individuals where expressions of solidarity, informality and familiarity are routinely exchanged. But the only feature that distinguishes positive politeness redress from normal everyday intimate language behavior is an element of exaggeration, which, in turn, introduces an element of insincerity. Nevertheless, this insincerity in exaggerated expressions of approval or interest, such as, "How absolutely marvelous! I can't imagine how you manage to keep your roses so exquisite, Mrs. B "(ibid. p. 103) implies that the S really sincerely wants H's positive face to be enhanced. (See ibid. p. 102 for illustration).

Negative politeness

In negative politeness, strategies are addressed to H's negative face, i.e., his desire to have his freedom of action unhindered. This is the heart of respect behavior and its function is to minimize the particular imposition that the FTA effects. In the western cultures, negative politeness is the most elaborate and the most conventionalized set of linguistic strategies and fills the etiquette books. The forms of politeness are characterized as expressions of restraint, formality and distancing, and its linguistic realizations can be exemplified as: be conventionally indirect, give deference, and apologize. The output strategies given for negative politeness (see ibid. p.131 for illustration) are all useful forms for social distancing and in so doing S wants to put a social brake on his course of intentions; unlike positive politeness

Off-Record

There are two major strategies within this super strategy making up fifteen minor strategies.The first type involves 'invite conversational implicature via hints triggered by violation of Gricean maxims'.The second major strategy, namely, 'be vague or ambiguous' involves violation of Manner maxim.

The circumstances or the sociological variables

B & L argue that these following sociological variables, i.e., social distance (D), relative power (P), and absolute ranking of impositions in the particular culture are intended as actor's assumptions of such ratings which are mutually assumed between S and H within certain limits.

D is a symmetrical social dimension of similarity/difference in which S and H stand for the purposes of this act. More often, it is based on an assessment of the frequency of interaction and the kind of material or non-material goods, including face, exchanged between S and H.

P is an asymmetrical social dimension of relative power. This is the degree to which H can impose his/her plans and self-evaluation. They mention that there are mainly two sources of power that can be authorized or unauthorized: material control (over economic distribution and physical force) and metaphysical control (over the actions of others). Usually, both of these sources of power are at play.

R is a culturally and situationally defined ranking of impositions, which is based on two scales, or ranks that are empirically identifiable for negative-face FTAs. The first ranking is in proportion to the expenditure of *services* including the provision of time, and the second of *goods* including non-material goods, such as information, as well as the expression of regard and other face payments.

There have been numerous studies on B&L's theory and have found this concept apparently successful. But the claim for universality of this theory has been called into question from both an empirical and theoretical viewpoint by a number of authors. O'Driscoll (1996) who strongly argues in favor of the universality of this theory summarizes the oppositions as follows. Within the mainland Chinese culture, this concept has been used for an exposition of the communicative norms and has been claimed to be irrelevant to this culture. Similarly, although one study has found the concept fruitful for illuminating the Japanese system of honorifics, several other studies have shown that there are some very common situations and linguistic enactments in Japanese culture to which it does not seem to be applicable. Siffianou (1992) finds this concept very useful for comparing British and Greek norms of politeness, but Pavlidou [1994] finds it hard to apply it to a comparison of Greek and German habits on the telephone. It has also been claimed that this concept has no place in an exposition of Igbo society. Finally, Wierzbicka (1985) shows that face does not seem to entail values in Polish culture. In sum, three aspects of this criticism can be perceived: (1) objections to the universality of B&L's face and its constituents, (2) B&L's exposition of its role in politeness, and (3) data found to be inapplicable.

Koutlaki (2002) mentions that B&L's theory has received criticism mainly because of their (1987, p. 24) assertion that "some acts are intrinsically threatening to face and thus require softening". For a review of B&L's theory with respect to non-western languages see Koutlaki (1997, 2002).

Aims and objectives of the study

The main aim of this study has been to investigate the effect of language transfer on employing politeness strategies by students from two different cultural/ linguistic situations in order to discuss the extent to which it is universal. It has attempted to investigate how it is visualized in Farsi and Turkish language and cultures. The major speech acts to be studied here in this research are favor asking, complaining and griping.

The participants in this study have represented eight cultural/ linguistic communities:

a) Iranian male and female native speakers of Farsi studying Farsi language and literature at grade four undergraduate level in different universities in Tehran.
b) Iranian male and female native speakers of Farsi studying English language or English literature at grade four undergraduate level in different universities of Tehran.
c) Turkish male and female native speakers of Turkish majoring Turkish language and literature at grade four undergraduate level in university of Istanbul.
d) Turkish male and female native speakers of Turkish studying English language or literature at grade four undergraduate level in university of Istanbul.

It is worth mentioning that the participants mentioned in groups "b" and "d" above have been studied to see the instances of deviation from the norms of Turkish or Farsi languages in the speech acts of these students as a result of studying English and getting familiarity with it. It can be considered as transfer effect not from L1 to L2 but vice- versa, as Weinreich (1983) defined it as a two – way process.

The inclusion of two groups of undergraduate EFL students in the study can reveal the influence of any possible transfer effect from English to their use of their native language and will show whether being familiar with English language and studying it can cause any difference in selecting and using communication strategies between these groups and those who do not have more knowledge of English.

Research question:

This study has aimed to find an answer to the question, "Does studying EFL at undergraduate level have any influence on the selection and realization of

politeness strategies of native speakers of Farsi and Turkish languages?"

Instrumentation

A written discourse completion task (WDCT) including 24 situations, has been used to collect data as the instrument for this research.

Data collection

The procedures for gathering the data have been as follows: As for the NST and Turkish EFL groups, the researcher asked the Istanbul University to help him in doing the task. Since the subjects were senior students in two fields namely EFL and teaching Turkish literature and language ,which is called NL henceforth , needed measure were taken to ask for permission from the officials. Then a copy of questionnaire was give to those students who were interested to take part in the study. They were told that no time limitation was set to do the task and were given enough time to return the questionnaires.

As for the Persian EFL and NSP groups, the researchers as well as several colleagues attended different classes at several universities and explained to the classes the type of informants were needed with respect to their parents' and their own mother-tongue. To those who volunteered, a copy of the WDCT was given and they were asked to take it home and return it to their professor within a month.

All the groups under study have been asked to fill out a background questionnaire which required them to provide information about their age, degree(s) held or being sought, their first language, their parents' first language, language(s) spoken at home, place of birth and residence in the past and proceed along the instructions provided for completing the WDCT.

Language transfer and politeness strategies.

One of the most important aims of the present study has been to investigate the possible differences between EFL and native language (NL) learners and to find out whether the study of native language or EFL makes any change in the employment of politeness strategies by the subjects from Iranian and Turkish societies.

The effect of language transfer on Iranian EFL and NL learners' choice of politeness strategy.

This section has intended to find out the probable impact of studying EFL in the choice of politeness strategies by Iranian males and females in general .From another point of view it can survey the probable impact of native language in EFL learners' choice of politeness strategies. Table 1. shows the frequency and type of strategies employed by Iranian interlocutors.

*Table -1. Language transfer and politeness strategies used by **Iranian** interactors.*

Crosstab

			DEGREEOFPOLITNESS					Total
			BOR	PPS	NPS	OFFR	DON'T	
LANGUAGE	NATIVE	Count	287	447	639	685	305	2363
		% within LANGUAGE	12.1%	18.9%	27.0%	29.0%	12.9%	100.0%
	EFL	Count	433	484	719	600	141	2377
		% within LANGUAGE	18.2%	20.4%	30.2%	25.2%	5.9%	100.0%
Total		Count	720	931	1358	1285	446	4740
		% within LANGUAGE	15.2%	19.6%	28.6%	27.1%	9.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	101.676(a)	4	.000
Likelihood Ratio	103.327	4	.000
Linear-by-Linear Association	79.976	1	.000
N of Valid Cases	4740		

A 0 cells (.0%) have expected count less than 5. The minimum expected count is 222.34.

As it has been revealed in table 1, a Chi Square has been applied to the data obtained from Iranian subjects under study. The observed value of Chi-Square is101 which is greater than the critical value of Chi-Square at 4 degree of freedom.i.e.9.49.This means that there is a significant difference between Iranian male and female interlocutors in their interaction .This can lead to the fact that there is language transfer effect in Iranian EFL learners' choice of strategy. The order of strategies employed by Iranian EFL learners is NP, OFF-R, PP, BO-R, and NTA, but this order for Iranian learners of native language is OFF-R, NP, PP, BO-R and NA. While the most preferred strategy by EFL learners is NP, the native speakers of Persian prefer to use OFF-R strategy most of the time. This can be regarded as the effect transferred from English to EFL learners' performance. These results obtained here can also be interesting if we consider the two groups use of BO-R and NA strategies. 12% of Iranian native speakers have employed the BO-R strategy while this is 18% for FEL group. At the same time while 12.9% of native speakers have used NA strategy, this percentage is 5.9 %for EFL group. Both of these choices explicitly reveal the language transfer effect on Iranian learners.

1-1. Language transfer and rank of imposition for Iranian interlocutors.

The effect of language transfer has been once more studied concerning the relative rank of imposition by Iranian EFL and NL learners. The results obtained from applying Chi-Square to the data have been presented in table 1-1.

*Table 1-1.The effect of **language transfer** on rank of imposition for **Iranian** interlocutors.*

Crosstab

			LEVELOFDIFFICULTY			Total
			EASY	DIFFICULT	VERY DIFFICULT	
LANGUAGE	NATIVE	Count	1034	892	437	2363
		% within LANGUAGE	43.8%	37.7%	18.5%	100.0%
	EFL	Count	1451	725	201	2377
		% within LANGUAGE	61.0%	30.5%	8.5%	100.0%
Total		Count	2485	1617	638	4740
		% within LANGUAGE	52.4%	34.1%	13.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	174.481(a)	2	.000
Likelihood Ratio	176.951	2	.000
Linear-by-Linear Association	174.440	1	.000
N of Valid Cases	4740		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 318.06.

The Chi-Square observed is 174.48 which is greater than the critical value of Chi-Square at 2 degree of freedom which is 5.99.This is a sign of differences between two groups of Iranian EFL and NL learners. While 61% of EFL learners feel easy in their interaction, this percentage for NL learners is 43.8%.The root of this difference lies in the transfer effect from English into their native language. The same fact is attributable for the high level of imposition. While only 8.5% of EFL learners have chosen the very difficult level or high rank of imposition, this percentage for NL learners is 18.5% which in its turn shows significant difference between two groups of Iranian.

2-The effect of language transfer on Turkish EFL and NL learners' choice of politeness strategies.

The same procedure has been taken for the two groups namely EFL and NL learners of Turkish language in order to see the possible differences between these two groups on one side and to survey the possible differences

between Turkish and Iranian groups and to find out the rate of language transfer effect on Turkish and Persian native speakers .The results have been revealed in table 2 as follows:

*Table 2.The effect of **language transfer** on **Turkish NL and EFL** learners' choice of politeness strategies.*

Crosstab

			DEGREEOFPOLITNESS					Total
			BOR	PPS	NPS	OFFR	DON'T	
LANGUAGE	NATIVE	Count	365	590	506	619	148	2228
		% within LANGUAGE	16.4%	26.5%	22.7%	27.8%	6.6%	100.0%
	EFL	Count	397	560	597	600	124	2278
		% within LANGUAGE	17.4%	24.6%	26.2%	26.3%	5.4%	100.0%
Total		Count	762	1150	1103	1219	272	4506
		% within LANGUAGE	16.9%	25.5%	24.5%	27.1%	6.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.495(a)	4	.022
Likelihood Ratio	11.505	4	.021
Linear-by-Linear Association	1.307	1	.253
N of Valid Cases	4506		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 134.49.

Crosstab

			LEVELOFDIFFICULTY			Total
			EASY	DIFFICULT	VERY DIFFICULT	
LANGUAGE	NATIVE	Count	1313	654	302	2269
		% within LANGUAGE	57.9%	28.8%	13.3%	100.0%
	EFL	Count	1383	760	227	2370
		% within LANGUAGE	58.4%	32.1%	9.6%	100.0%
Total		Count	2696	1414	529	4639
		% within LANGUAGE	58.1%	30.5%	11.4%	100.0%

As it has been revealed in table 2, a Chi Square is applied to the data obtained from Turkish subjects under study. The observed value of Chi-Square is11.425 which is greater than the critical value of Chi-Square at 4 degree of freedom.i.e.9.49.This means that there is difference between Turkish male and female interlocutors in their interaction though it is not so great. The order of strategies employed by Turkish EFL learners is OFF-R, PP, NP, BO-R, and NA, but this order for Turkish learners of native language is OFF-R, NP, PP, BO-R and NA. This is in line with the results obtained from other parts of the study. The results obtained here can also be interesting if we consider the two groups' use of BO-R and NA strategies. While 16.4% of Turkish native speakers have employed the BO-R strategy, this is 17, 4% for FEL group. At the same time while 6.6% of native speakers have used NA strategy, this percentage is 5.4 %for EFL group .Both of these choices reveal the language transfer effect on Turkish learners but this effect is not the same as on Iranian participants.

2-1. Language transfer and rank of imposition for Turkish EFL and NL learners.

The effect of language transfer has once more been studied concerning the relative rank of imposition for Turkish EFL and NL learners to see whether there is any difference between Turkish EFL and NL learners in their feeling of imposition in interaction. The results obtained from applying Chi-Square to the data obtained from this group have been presented in table 2-1as follows:

*Table 2-1.**Language transfer** and **rank of imposition** for **Turkish EFL and NL learners.***

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	18.207(a)	2	.000
Likelihood Ratio	18.241	2	.000
Linear-by-Linear Association	4.326	1	.038
N of Valid Cases	4639		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 258.74.			

The Chi-Square observed is 18.207 which is greater than the critical value of Chi-Square at 2 degree of freedom which is 5.99.This is a sign of differences between two groups of Turkish EFL and NL learners. But this difference is not as great as observed in case of Iranians. While 58.4% of EFL learners feel easy in their interaction, this percentage for NL learners is57.9%. The root of this difference lies in the transfer effect from English into their native language. The same fact is attributable for the high level of imposition. While only 9.6% of EFL learners have chosen the very difficult level or high rank of imposition, this percentage for NL learners is 13, 3% which in its turn shows significant difference between two groups.

3. The effect of language transfer on Iranian female EFL and NL learners.

Here once more the data has been processed in order to find out the effect of language transfer on Iranian female learners of NL and EFL. The results have been delineated in table 3 as follows.

*Table 3.Language transfer and politeness strategies employed by **Iranian female EFL and NL learners**.*

Crosstab								
			DEGREEOFPOLITNESS					**Total**
			BOR	**PPS**	**NPS**	**OFFR**	**DON'T**	
LANGUAGE	**NATIVE**	**Count**	166	241	296	326	134	1163
		% within LANGUAGE	14.3%	20.7%	25.5%	28.0%	11.5%	100.0%
	EFL	**Count**	170	209	356	366	76	1177
		% within LANGUAGE	14.4%	17.8%	30.2%	31.1%	6.5%	100.0%
Total		**Count**	336	450	652	692	210	2340
		% within LANGUAGE	14.4%	19.2%	27.9%	29.6%	9.0%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	26.093(a)	4	.000
Likelihood Ratio	26.313	4	.000
Linear-by-Linear Association	.811	1	.368
N of Valid Cases	2340		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 104.37.			

As it has been revealed in table 3, a Chi-Square is applied to the data obtained from Iranian female subjects under study. The observed value of Chi-Square is 26.093 which is greater than the critical value of Chi-Square at 4 degree of freedom.i.e.9.49.This means that there is a great difference between Iranian female EFL and NL learners in their interaction .This can lead to the fact that there is language transfer effect in Iranian female EFL learners' choice of politeness strategy. The order of strategies employed by both Iranian EFL and NL learners is OFF-R, NP, PP, BO-R, and NA. But the number of those who have chosen different strategies only for BO-R strategy is similar to each other .This is in line with the results obtained from other parts of the study. The main differing point is employing NA strategy which is 11.5% for NL but only 6.5 for EFL learners. This can be regarded as the effect transferred from English to EFL learners' performance.

3-1. Language transfer and rank of imposition for Iranian female EFL and NL learners.

The effect of language transfer has been once more studied concerning the relative rank of imposition for Iranian EFL and NL female learners. The results obtained from applying Chi-Square to the data have been presented in table 3-1.

*Table 3-1.**Language transfer** and rank of imposition for **Iranian female EFL and NL learners.***

Crosstab

			LEVELOFDIFFICULTY			Total
			EASY	DIFFICULT	VERY DIFFICULT	
LANGUAGE	NATIVE	Count	573	403	187	1163
		% within LANGUAGE	49.3%	34.7%	16.1%	100.0%
	EFL	Count	730	349	98	1177
		% within LANGUAGE	62.0%	29.7%	8.3%	100.0%
Total		Count	1303	752	285	2340
		% within LANGUAGE	55.7%	32.1%	12.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	50.506(a)	2	.000
Likelihood Ratio	51.024	2	.000
Linear-by-Linear Association	50.242	1	.000
N of Valid Cases	2340		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 141.65.

The Chi-Square observed is 50.506 which is much greater than the critical value of Chi-Square at 2 degree of freedom which is 5.99.This is a sign of a lot of differences between two groups of Iranian female EFL and NL learners. While 62.0% of EFL learners feel easy in their interaction, this percentage for NL learners is 49.3%. The root of this difference lies in the transfer effect from English into their native language. The same fact is attributable for the high level of imposition. While only 8.3% of EFL learners have chosen the very difficult level or high rank of imposition, this percentage for NL learners is 16.1% which in its turn shows significant difference between two groups of Iranian females.

4-The effect of language transfer on Iranian male EFL and NL learners

Here once more the data has been processed in order to find out the effect of language transfer on Iranian male NL and EFL learners. The results have been delineated in table 4 as follows.

*Table 4. The effect of **language transfer** on **Iranian male** EFL and NL learners' choice of politeness strategies.*

Crosstab

			DEGREEOFPOLITNESS					Total
			BOR	PPS	NPS	OFFR	DON'T	
LANGUAGE	NATIVE	Count	121	206	343	359	171	1200
		% within LANGUAGE	10.1%	17.2%	28.6%	29.9%	14.3%	100.0%
	EFL	Count	263	275	363	234	65	1200
		% within LANGUAGE	21.9%	22.9%	30.3%	19.5%	5.4%	100.0%
Total		Count	384	481	706	593	236	2400
		% within LANGUAGE	16.0%	20.0%	29.4%	24.7%	9.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	136.934(a)	4	.000
Likelihood Ratio	140.181	4	.000
Linear-by-Linear Association	134.440	1	.000
N of Valid Cases	2400		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 118.00.

As it has been revealed in table 4, a Chi Square is applied to the data obtained from Iranian male subjects under study. The observed value of Chi-Square is 136.934 which is greater than the critical value of Chi-Square at 4 degree of freedom.i.e.9.49. This means that there is a great difference between Iranian male EFL and NL learners in their choice of politeness strategies for their interaction .This can lead to the fact that there is language transfer effect in Iranian male EFL learners' choice of strategy. The order of strategies employed by 2 groups are very interesting. Iranian male NL learners have preferred the order of their strategies as, OFF-R, NP, PP, NA and BO-R at the end but this order is completely different for male EFL learners. Here the order is NP, PP, BO-R, OFF-R and NA.

The main differing point is employing NA strategy which is 14.3% for NL but only 5.4% for EFL learners. This can be regarded as the effect transferred from English into male EFL learners' performance. Another important point is the two groups' choice of BO-R strategy. While 21.9% of EFL group have used this strategy only 10.1% of NL group have employed this strategy. Here is one of the most supporting points for the effect of language transfer on EFL learners' performance in their native language.

4-1. Language transfer and rank of imposition for Iranian male EFL and NL learners.

The effect of language transfer has been once more studied concerning the relative rank of imposition for Iranian male EFL and NL learners. The results obtained from applying Chi-Square to the data have been presented in table 4-1.

*Table 4-1. **Language transfer** and rank of imposition for **Iranian male** EFL and NL learners.*

Crosstab

			LEVELOFDIFFICULTY			Total
			EASY	DIFFICULT	VERY DIFFICULT	
LANGUAGE	NATIVE	Count	461	489	250	1200
		% within LANGUAGE	38.4%	40.8%	20.8%	100.0%
	EFL	Count	721	376	103	1200
		% within LANGUAGE	60.1%	31.3%	8.6%	100.0%
Total		Count	1182	865	353	2400

	% within LANGUAGE	49.3%	36.0%	14.7%	100.0%

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	133.168(a)	2	.000
Likelihood Ratio	135.586	2	.000
Linear-by-Linear Association	132.607	1	.000
N of Valid Cases	2400		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 176.50.

The Chi-Square observed here, is 133.1, which is greater than the critical value of Chi-Square at 2 degree of freedom which is 5.99.This is a sign of a lot of differences between two groups of Iranian male EFL and NL learners. While 62.1% of EFL learners feel easy in their interaction, this percentage for NL learners is 38.4%. The root of this difference lies in the transfer effect from English into their native language. The same fact is attributable for the high level of imposition. While only 8.6% of EFL learners have chosen the very difficult level or high rank of imposition, this percentage for NL learners is 20.8% which in its turn shows significant difference between two groups of Iranian males.

5. The effect of language transfer on Turkish female EFL and NL learners.

Here once more the data has been processed in order to find out the effect of language transfer on Turkish female NL and EFL learners. The results have been delineated in table 5 as follows:

*Table 5. The effect of **language transfer** on **Turkish female** EFL and NL learners' choice of politeness strategies.*

Crosstab

			DEGREEOFPOLITNESS					**Total**
			BOR	**PPS**	**NPS**	**OFFR**	**DON'T**	
LANGUAGE	**NATIVE**	**Count**	182	374	282	309	43	1190
		% within LANGUAGE	15.3%	31.4%	23.7%	26.0%	3.6%	100.0%
	EFL	**Count**	213	263	280	282	66	1104
		% within LANGUAGE	19.3%	23.8%	25.4%	25.5%	6.0%	100.0%
Total		**Count**	395	637	562	591	109	2294
		% within LANGUAGE	17.2%	27.8%	24.5%	25.8%	4.8%	100.0%

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	24.680(a)	4	.000
Likelihood Ratio	24.783	4	.000
Linear-by-Linear Association	.654	1	.419
N of Valid Cases	2294		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 52.46.

As it has been revealed in table 5, a Chi Square is applied to the data obtained from Turkish female subjects under study. The observed value of Chi-Square is 24.680 which is greater than the critical value of Chi-Square at 4 degree of freedom.i.e.9.49.This means that there is difference between Turkish female EFL and NL learners in their interaction .This can lead to the fact that there is language transfer effect on Turkish female EFL learners' choice of strategy.

The order of strategies employed by Turkish EFL group is OFF-R, NP, PP,BO-R and NA, but for NL learners is PP, OFF-R, NP, BO-R, and NA. The number of those who have chosen different strategies is

interestingly different for two groups .The EFL group have marked PP as the most frequently used strategy while NL group have used OFF-R as their mostly preferred strategy. .This is different from the results obtained from Iranian female groups. The main differing point is employing the NA strategy which is 3.6% for NL but 6.0 for EFL learners. This can be regarded as the effect transferred from English to EFL learners' performance.

5-1. Language transfer and rank of imposition for Turkish female EFL and NL learners.

The effect of language transfer has been once more studied concerning the relative rank of imposition felt by Turkish female EFL and NL learners. In order to do this a Chi-square was applied to the data. The results obtained from applying Chi-Square to the data have been presented in table 5-1.

*Table 5-1.**Language transfer** and rank of imposition for **Turkish female** EFL and NL learners.*

Crosstab

			LEVELOFDIFFICULTY			Total
			EASY	DIFFICULT	VERY DIFFICULT	
LANGUAGE	NATIVE	Count	614	411	165	1190
		% within LANGUAGE	51.6%	34.5%	13.9%	100.0%
	EFL	Count	696	383	117	1196
		% within LANGUAGE	58.2%	32.0%	9.8%	100.0%
Total		Count	1310	794	282	2386
		% within LANGUAGE	54.9%	33.3%	11.8%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.275(a)	2	.001
Likelihood Ratio	14.319	2	.001
Linear-by-Linear Association	14.122	1	.000
N of Valid Cases	2386		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 140.65.

As the data in this figure has shown, the observed Chi-Square is 14.275 which is meaningful at 2 degree of freedom. It is clearly seen from the results that NL learners of Turkish feel more imposition than EFL learners. Although both groups have chosen the same order for rank of imposition but 58.2% in the EFL group have ranked the easy level while this percentage for NL group is 51, 6%.At the same time the choice of third level of imposition is completely meaningful for two groups.13.9 % in NL group have reported very difficult or high level of imposition while only 9.8% in FEL group have reported high level of imposition.

6. The effect of language transfer on Turkish male EFL and NL learners' choice of politeness strategies.

In order to find out the effect of language transfer on Turkish male NL and EFL learners' choice of politeness strategies, the data has been analyzed once more. A Chi-Square was applied and the results have been delineated in table 6 as follows.

*Table 6.**Language transfer** and choice of politeness strategies by **Turkish male** EFL and NL male learners.*

Crosstab

			DEGREEOFPOLITNESS					Total
			BOR	PPS	NPS	OFFR	DON'T	
LANGUAGE	NATIVE	Count	183	216	224	310	105	1038
		% within LANGUAGE	17.6%	20.8%	21.6%	29.9%	10.1%	100.0%
	EFL	Count	184	297	317	318	58	1174

		% within LANGUAGE	15.7%	25.3%	27.0%	27.1%	4.9%	100.0%
Total		**Count**	367	513	541	628	163	2212
		% within LANGUAGE	16.6%	23.2%	24.5%	28.4%	7.4%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	34.201(a)	4	.000
Likelihood Ratio	34.394	4	.000
Linear-by-Linear Association	7.099	1	.008
N of Valid Cases	2212		
a 0 cells (.0%) have expected count less than 5. The minimum expected count is 76.49.			

As it has been revealed in table 6, a Chi-Square is applied to the data obtained from Turkish male subjects under study. The observed value of Chi-Square is 34.201 which is greater than the critical value of Chi-Square at 4 degree of freedom.i.e. 9.49. This means that, there is a significant difference between Turkish male EFL and NL learners in their choice of politeness strategies in their interaction .This can lead to the fact that there is language transfer effect on Turkish male EFL learners' choice of strategy. The order of strategies employed by two groups are the same i.e. OFF-R, NP, PP, BO-R and NA. The number of those who have chosen different strategies is interestingly different for two groups .The main differing point is employing the NA strategy which is 10.1% for NL but 4.9% for EFL learners. This can be regarded as the effect transferred from English to Turkish male EFL learners' performance.

6-1. Language transfer and level of difficulty for Turkish male EFL and NL learners.

The effect of language transfer has been once more studied concerning the relative rank of imposition for Turkish male EFL and NL learners. The results obtained from applying Chi-Square to the data are presented in table 6-1.

*Table 6-1.**Language transfer** and rank of imposition for **Turkish male** EFL and NL learners.*

Crosstab						
			LEVELOFDIFFICULTY			**Total**
			EASY	**DIFFICULT**	**VERY DIFFICULT**	
LANGUAGE	**NATIVE**	**Count**	699	243	137	1079
		% within LANGUAGE	64.8%	22.5%	12.7%	100.0%
	EFL	**Count**	687	377	110	1174
		% within LANGUAGE	58.5%	32.1%	9.4%	100.0%
Total		**Count**	1386	620	247	2253
		% within LANGUAGE	61.5%	27.5%	11.0%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	28.061(a)	2	.000
Likelihood Ratio	28.245	2	.000
Linear-by-Linear Association	1.033	1	.309
N of Valid Cases	2253		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 118.29.

As the data in this figure has shown the observed Chi-Square is 28.061 which is meaningful at 2 degree of freedom. It is clearly seen from the results that NL learners of Turkish feel less imposition than EFL learners for levels 1and 2, but for third level EFL learners have reported better than NL learners... Although both groups have chosen the same order for rank of imposition but 58.5% in the EFL group have ranked the easy level while this percentage for NL group is 64.8%.At the same time the choice of third level of imposition is completely meaningful for two groups.12.7% in NL group have reported very difficult or high level of imposition while only 9.4% in FEL group have reported high level of imposition.

Conclusion

Regarding language transfer effect, the results have revealed that for Iranian participants, there have been evident differences between EFL and NL learners in their choice of politeness strategies in different interactions. These differences can be interpreted as coming from English into EFL learners' linguistic performance. More EFL learners use NP strategy while more NL learners use OFF-R strategy. It means that NL learners try to be more conservative than EFL learners. Again EFL learners use NA strategy less than NA learners; instead, they use BO-R strategy more than NL learners. Concerning the rank of imposition Iranian EFL learners have felt less imposed in their interactions than Iranian NL learners. All these differences can be interpreted as a result of language transfer effect coming from English into Iranian EFL learners linguistic performance.

A general comparison has revealed that language transfer effect on Turkish EFL learners hasn't been so great but comparing this group to Iranian EFL learners, has clearly shown that language transfer effect on Iranian EFL learners has been more than Turkish EFL learners. These differences can be interpreted as a result of cultural differences between Iranian and Turkish EFL learners on one side and the Transfer effect coming from English language into Persian language and culture more than Turkish culture and language or it can be claimed that due to closeness of Turkey to western culture and languages, the possible language transfer effect has already come into Turkish participants linguistic and cultural behavior.

Comparing rank of imposition for Iranian female EFL and NL learners, the analysis has shown that Iranian female NL learners have been more imposed than Iranian female EFL learners in their interactions. A proof of this claim is employing NP and OFF-R strategies by most Iranian female EFL learners while Iranian female NL learners try to use NA strategy more than female EFL learners. So EFL learners have tended to be more active in their interaction than NL learners. These differences can be signed as language transfer effect.

Comparing Iranian male EFL and NL learners, it is clear that Iranian male EFL learners have tended to be more frank and direct in their interactions than Iranian male NL learners .A proof of this claim is the use of BO-R strategy by male EFL learners two times more than male NL learners in their choice of politeness strategies. At the same time EFL learners use NA strategy two times less than NL learners. These differences can be interpreted as a sign of language transfer into Iranian male EFL learners' linguistic performance. Iranian male EFL learners feel less imposed in their interaction than Iranian NL learners .The rank of imposition felt by Iranian male NL learners is two times more than the rank of imposition felt by Iranian male EFL learners for less imposing rank level and two times less for more imposing rank level.

Comparing Turkish female EFL and NL learners reveals the fact that these two groups have done differently in their interactions. Turkish female EFL learners have used PP strategy most of the time but Turkish female NL learners have used OFF-R strategy. BO-R strategy is also used by female EFL learner's more than female NL learners. Turkish female EFL learners feel less imposed than female NL learners.

Comparing Turkish male EFL and NL learners, shows that the results have been again different for two groups. This difference may be interpreted as a sign of language transfer effect on Turkish male EFL learners' linguistic performance. The main difference has been the use of NA strategy by male NL learners more than male EFL learners. Male EFL learners have also reported less imposition than male NL learners in their interactions.

Corresponding Author:
Sohrab Rezaei
Assistand Professor Allameh Tabatabaei University
Tel:+982122195144
Mobile:+989363224553
E-mail:Sohrab_rezaei@yahoo.com

REFERENCES

2- Austin, J. L. (1998). How to do things with words. In A. Kasher (Ed.), *Pragmatics: Critical concepts: Vol. 2. Speech act theory and particular speech acts* (pp. 7-28). London: Routledge.
3- Billmyer, K. & Varghese, M. (2000). Investigating instrument-based pragmatic

Variability: Effects of enhancing discourse completion tests. *Applied Linguistics, 21*, (4), 517-552.
4- Boxer, D. (2002). *Applying sociolinguistics: Domains and face-to-face interaction* Amsterdam: John Benjamins.
5- Brown, J. D. (2001). Pragmatic tests: Different purposes, different tests. In K. R. Rose & G. Kasper (Eds.), *Pragmatics in language teaching* (pp. 301-327). Cambridge: Cambridge University Press.
6- Brown, P & Levinson, S. (1987). *Politeness: Some universals in language Usage*. Cambridge: Cambridge University Press.
7- Cohen, A. D. (1996). Speech acts. In S. L. MacKay & N. H. Hornberger (Eds.), *Sociolinguistics and language teaching* (pp. 383-420). Cambridge: Cambridge University Press.
8- Council of Europe. (2000), A common European Framework of Reference for Languages.
9- Goddard, C. & Wierzbicka, A. (1994). Discourse and culture. In T. A. van Dijk (Ed.), *Discourse as social interaction, Vol 2: Discourse: A multidisciplinary introduction* (pp. 231-257), London: Sage Publications.
10- Goddard, C. (1997). Cultural values and 'cultural scripts' of Malay. *Journal of Pragmatics, 27,*183-201.
11- Goddard, A. & Patterson, L. M. (2000). *Language and gender*. London: Routledge.
12- Goddard, C. (2001). Sabar, ikhlas, setia – patient, sincere, loyal? Contrastive semantics of some 'virtues' in Malay and English. *Journal of Pragmatics, 33*, 653-681.
13- Halliday, M. A. k. (1999). The Notion of "Context" in Language Education", In M. Ghadessy (Ed), *Text and context in functional linguistics*. (pp. 1-24).
14- Amsterdam: John Benjamins Publishing Company. Jorgensen, J. (1996). The functions of sarcastic irony in speech. *Journal of Pragmatics, 26,* 613-634.
15- Kasper, G. & Blum-Kulka, S. (Eds.) (1993). *Interlanguage pragmatics.* New York: Oxford University Press.
16- Koutlaki, S. A. (1997). *Persian system of politeness and the Persian concept of face with some reference to EFL teaching to Iranian native speakers*, Unpublished doctoral dissertation, University of Wales, Cardiff.
17- Koutlaki, S. A. (2002). Offers and expressions of thanks as face enhancing acts: tae'arof in Persian. *Journal of Pragmatics, 34,* 1733-1756.
18- Labov, W. (1998). The intersection of sex and social class in the course of Linguistic change. In J. Cheshire & P. Trudgill (Eds.) *The sociolinguistics Reader: Vol.2, Gender and discourse* (pp. 7-52). London: Arnold.
19- Laforest, M. (2002). Scenes of family life: Complaining in everyday conversation. *Journal of Pragmatics, 24*, 1595-1620.
20- Marandi, S. S. (1997). *The construct validity of Searle's speech act classification*. Unpublished master's thesis, Tehran University, Faculty of Foreign Languages, Tehran.
21- O'Driscoll, J. (1996). About face: A defence and elaboration of universal dualism. *Journal of Pragmatics, 25*, 1-32.
22- Rose, K. R. (1994). On the validity of discourse completion tests in non-western Contexts. *Applied Linguistics, 15* (1), 1-14.
23- Searle, J. R. (1998). The structure of illocutionary acts. In A. Kasher (Ed.) *Pragmatics: Critical concepts Vol. 2: Speech act theory and particular Speech acts*. (pp. 48-64), London: Routledge.
24- Sifianou, M. (1992). *Politeness phenomena in Greece and England*. Oxford: Oxford University Press.
25- Wierzbicka, A. (1994). 'Cultural scripts': A new approach to the study of cross-Cultural communication. In M. Putz (Ed.) *Language contact, language Conflict*. Amsterdam: John Benjamins Company.

Electronic References

1-
www.logos.uoregon.edu/explore/socioling/politeness.html
2-www.bowland-files.lancs.ac.uk/staff/greg/204/linguistic politeness
3-www.amazon.com/exec/obidos/tg/detail
4-www.wpel.net/v14/v14n1 bell.
5-www.asian-efl-journal.com
6-www.linguistlist.org
7-www.stanford.edu.coppock/face
8-www.carla.acad.umn,edu/speech acts/requests
9-www.shu.ac.uk/wpw/politeness/bargiela.html
10-www.wikipedia.org/wiki/politeness
11-www.changing minds.org/explanations/theories/politeness.
12-www.hull.ac.uk/php/sbsjrc/politeness and research project writing doc.

8/12/2012

Evaluation the Level of Development in Regions of Mashhad Municipality, Iran

Mohammad Rahim Rahnama[1], Masood Davarinezhad[2*], Mohammad Reza Mabhoot[3]

[1.] Associate Professor of Geography and Urban Planning in Ferdowsi University of Mashhad. Rahnama@um.ac.ir
[2.] PhD Student of Geography and Urban Planning in Ferdowsi University of Mashhad
[*] Corresponding author Email: masood.davarinezhad@stu.um.ac.ir
[3.] PhD Student of Geography and Urban Planning in Ferdowsi University of Mashhad. rmabhoot@stu.um.ac.ir

Abstract: In this research, Cluster Analysis Method (CAM) is used to evaluate level of development and classification of Mashhad municipality regions by five factors including education position, level of income, ownership, level of satisfaction from municipality and personal status, and ultimately achieve to a combined and united index. In this method, all indexes have been classified according to internal-regional differences and groups in which their internal-regional differences are less than their external-regional differences which have been classified in one group. Finally, above mentioned indexes have been clustered by using Dendrogram model of SPSS software, and its results had been reflected as maps and charts in paper. The results of this research show that different regions of Mashhad municipality have not been for similar level of indexes and chart represents that regions of Mashhad city had been divided to two clusters as beneficial cluster and unbeneficial cluster, and each cluster divided to several sub clusters.

[Mohammad Rahim Rahnama, Masood Davarinezhad, Mohammad Reza Mabhoot. **Evaluation the Level of Development in Regions of Mashhad Municipality, Iran.** *Life Sci J* 2012;9(3):2211-2219] (ISSN:1097-8135). http://www.lifesciencesite.com. 318

Keywords: Development, Sustainable Development, Spatial Division, Cluster Analysis Model

Introduction and Issue Design

Development means to improve qualitative and quantitative level of life for all people of society, and it is a subject which was mentioned by planners and politicians from past periods and nowadays, it has been made as a known device in decision making and governmental policy making. One of the main and fundamental discussions in social and economical general programming system is balanced development issue which can be considered in form of balanced development of regions and different parts of society. Paying attention to homogeneous of regions as having facilities, capabilities and all welfare indexes are subjects which can affect resource allocation in way of achieving to qualitative and quantitative national macro programs, and organize policy making scale by the purpose of equalizing regions. This kind of homogeneity, first of all needs to identify features of different regions, becoming familiar with potential economical resources and kind and level of their privation as of having development indexes. By studying developed indexes in different regions and calculating regional differences can be act to solve the problem of duality and by optimum allocation of resources and credits between different regions, it can be come closer to development and social justice (Shahnoshi and et al, 2006:2).

Mashhad city is known as the biggest city in Khorasan Razavi province by 200 Square Kilometers width and 2.5 million populations and is one of the most important metropolitan cities of the country. This city is famous as one of the main tourism and pilgrimage cities of the country and moreover tourism and pilgrimage reasons, presently it become famous in cultural, scientific, political and economical dimensions, in the way that for different reasons, including presence of more than 12 million travelers and pilgrims each year and being in road of Asian highway, it recently have been benefited special commercial and economical facilities and also as administrative center of one of important Iran's customs locates in this city. However, a quick view to appearance of this city shows heterogeneity and gaps between different regions of city as level of development that according to the significant importance of this city, it is necessary to solve these differences.

There are different methods and models such as Scalogram analysis, Taksonomi, Factor analysis and Morris model in order to evaluate level of benefit and regional development that each one of them have good and bad features (Haghi, 1999:183) and the final purpose of choosing these factors is knowing present situation and to determine and analyze their distance to ideal situation and it would help urban management for optimum distribution of facilities and services. Regarding this description, this research try to determine level of development in Mashhad municipality regions, this affair will be much more beneficial for next uses and it also will help programmers. In order to determine present

situation of indexes, several indexes have been considered which are related to development of each region and then regions is classified by cluster analysis. This classification is a device which can represent necessary strategies in order to allocate human and financial resources. Present paper devotes to determine degree of development in these regions according to different indexes, with purpose of knowing differences between different regions of Mashhad city.

Research Background

Ali Mohammad Zahrabi and Reza Mokhtari MalekAbadi calculated development situation of having eleven regions of Esfahan city in a paper by this subject: "Analyze development indexes in having eleven regions of Esfahan city) and classified these regions by using eleven developmental indexes in scale of economical, fundamental, cultural, social and educational, health and cure indexes by using Spearman method and as a result determined priorities of regions for servicing (Zahrabi & Mokhtari, 2006:411).

Hossien Bahravan, in a plan by subject of «Cultural preparation and urban justice in twelve regions of Mashhad municipality», paid to how to fair distribution of cultural parameters in regions of Mashhad city according to factors of fair distribution including qualification, public beneficial and need. He used documental combined method and secondary analysis of measurement data and resulted that cultural facility distribution in regions is unbalanced in comparison with average level of city and there is more unbalanced regarding its role in present situation (Behravan, 2006:1). Naser Shahnooshi et al, paid to classify different regions of Mashhad city according to 40 indexes in different social-educational, family welfare, social welfare, fundamental groups by numerical Taksonomi method and main factor and they resulted that none of these regions don't have favorable level of development and between the regions themselves, in current situation, some regions have more distance with other regions which caused to duality between regions. Mir Najaf Moosavi paid to this matter in his M.A thesis in 2003 in Yazd University under the subject of «Evaluate degree of development in Iran regions by using economical, social and … indexes». Mohammad Reza Rezvani evaluated level of development in villages of this town by two methods of Taksonomi and Morris, under the subject of «Evaluate and Analyze level of development in rural areas of Sanandaj town» in geography and regional development magazine.

Importance and Necessity of Research

Results of present research can lead to represent suitable pattern for classification of internal parts of city, in order to suitable services and enhance position of Mashhad city as a matter of religious, cultural and enhance its importance around the country. This research also can represent a good pattern for urban managers in order to support better urban services in Mashhad and be a suitable guide for managers. Determining profiting regions according to different indexes which can be a good guide in make future politics in urban planning. The importance and worth of research is appearwhile it can take a suitable device to authorities in order to achieve a logical balance between different regions. On the other hand and as urban management point of view, city divided to special districts for imprint ability of each district that advantageous of classification are as followed:

-Urban development according to adjustment long term pattern

- Distribution of population urban disperse regarding to functions of urban regions

- Making relative calmness and mental health for inhabitants, because of their access to needed facilities

Goals of Research

Regarding this research, as a result of recognition and achieving to evaluate level of Mashhad city possession, the main goal of this research is studying differences and inequality between regions regarding position and level of possessing indexes such as education, income, ownership, satisfaction from municipality and occupational position and classification of municipality regions regarding level of possessing mentioned indexes.

Research Hypothesis

This research had been done to answer the following hypothesis:

It seems that distribution of facilities and services hadn't done equally between Mashhad municipality regions.

Research Method

During recent decades, using quantitative methods in urban and regional planning had been developed increasingly (Hossienzadeh Dalir, 2001:145). One of these methods is cluster analysis. This is one of the most applicable methods in regional geography studies. In fact, that's a method for scaling rural, urban and etc. As in this scaling places which is in one scale are very similar to each other (HekmatNia and Mosavi, 2006: 236). In other words, cluster analysis technique has been called as a method for decrease data, regarding the fact that observations in each cluster can be representation for average of other observations on that cluster (Shannon et al, 2003:41). In multidimensional evaluation programs, cluster evaluation can often use for effective primary classification of variables

(Toms et al, 2001:5) and also is used to describe diversity of methods and classification of indexes with similar features (Kennedy, 1974:216). There are different methods for making dense clusters in hierarchical cluster analysis method such as Single Linkage, Average Linkage, Complete Linkage, Wards method and Centroid Method; these methods are different from each other as point of calculating the distance between clusters. Choosing each one of these methods depends on statistical data and goal of programming (HekmatNia and Moosavi, 2006:237). Cluster analysis of a general subject is used for a hierarchy of mathematical methods which is used to find similarities between materials in a set. The goal of most of research activities understands the fact that which one of available materials in one class is similar or different; however, this method is the best classification method. In this method, the groups with more similarities classified as one group.

Based on abovementioned information and regarding to studied factors, analytical- descriptive approach is ruled on this research. Statistic data for 40 number of Mashhad municipality regions were available. Studied indexes include five main indexes, education situation, income statue, ownership, level of satisfaction from Mashhad municipality and occupational place. Necessary information has been gathered from Public Hose and People Census in 2006 and also environmental visits from studied regions, then cluster analytical model was used to classify Mashhad urban regions and then level of inequalities had studied.

Theoretical Basis

Development: development means gradual growth in order to be more powerful and more developed (Oxford Dictionary, 2000). Development is a qualitative concept which is located against growth and it can be known the same as increase quality of life. In development definition, Brookfield says: development should have been defined according to development towards welfare purposes such as decrease poverty, unemployment and inequality and generally speaking, moreover including amount of production and income, development is a process that includes fundamental changes in institutional, social, administrative structures and also public views of people. Scientists have different definitions from development: in development definition, Denis Goulet says: « in addition to economical and social goals, development must have cultural and political goals, development cover all social system changes, the changes that move society toward a humanistic statue other than current inappropriate situation». Paul Streeten also believes that the final goal of development must provided continuous improvement in people's situation and give it's advantageous to everybody (Masoomi Eshkevari, 1997:42).

Most of famous and big intellectuals in world of economy such as Adam Smith, Bauer, Clark, Hirschman, Louis, Myrdal and Russo think of development as one meaning and that's fundamental evaluation from old society to new society (Taghvayee and Ahmadi, 2003:42). Basically, development is fundamental change in economical, social and cultural variables of every society and it'sfulfillment needs to make an arrangement between its different dimensions. Sustainable economical development is impossible without cultural, social and political development and cultural, social and political development can't do anything without scientific and logical view to economical development issue in long term. On the other hand, in order to arrange national and partial goals with regional facts, it is necessary to consider district and regional development in scale of partial and macro development politics, in order to compatible macro politics with economical, social and cultural capabilities of region (Amin Bidokht, 2006:17).

One of development basis is generality and its integration in avoiding social and economical unbalances in regions (Technique, 2003:2). Therefore justice distribution of facilities and advantageous of development are important features of healthy and dynamic economy among majority of population. In order to fulfill this matter, programmers attempt to decrease inequalities and unbalances by performing various anti privation programs and multidimensional development, positive aspects of development. The first step in this field is composing of efficient programs which are agreed on realities, achieving to superior goal of social justice and recognizing available condition. The main goal of development is multilateral growth and sublimity of human societies. So, knowing and understanding of condition and necessities of humanistic societies and different dimensions of their needs are as necessary actions in this field in order to achieve development and being placed on its way. What is obvious, is the fact that this necessity don't put into discussion equally and facilities and resources aren't equal everywhere (Rezvani, 2004:1).

Sustainability: the term sustainability has been referred vastly in order to describe the universe in which humanistic and natural systems can live continuously till far future (De Casteri, 2002:34). In this field according to the importance of sustainability, it can be mentioned to holding several international conferences during 1972 till 2002 which in all of them sustainable development was one of the main challenges for program directors. In fact sustainable development means multilateral

economical, social and environmental development; the goal of this kind of development is to find ways that help human beings to fulfill their needs without destroying environmental capacities in all dimensions (Badri and Eftekhari, 2000:11).

There aren't stable and determined indexes in order to evaluate sustainability, so current and future situation is unpredictable based on these indexes. In most cases, according to special indexes which had been used to evaluate sustainability in national and local level and also based on condition of each country and historical periods, By the end of 1990s, kind of convergence had been made for better recognition of dimensions of sustainable development and in sustainability studies simultaneously have been noticed to economical, social, political and environmental dimensions (Yag, 2004:36).

Sustainable Development: new concept of sustainable development has been rotted in thoughts of environmental moves. This concept has related to Ms "Barbara Ward" for the first time in 1970 (Barou, 1997:45). Before 1970s, Shomakher used sustainability in concept of economical structures and renewed resources and production and services (Shomakher, 1999:31). In United Nation's universal conference of environment and development (1987), in Harm Bratland's report with the subject of "Our Joint Future", sustainable development has described as a process which fulfill current needs without destroying abilities of future generation (Tosun, 2001:289). By formation of Earth Conference in Rio de Janeiro (in 1992), the topic of sustainable development had been challenged all over the world in which emphasized on community's partnership for improve and enhance environment situation and city sustainable development (Culling worth & Nadin, 2002:225).

In 1996, conference of ecosystems (Human's habitant) was held in Istanbul, Turkey, as fundamental steps had emphasized in field of social approach in urban management, enhance living condition for suburbanites, correct housing policy and paying attention to health and city environment (Pag, 2004:67). Sustainable development is a process which is improving economical, social, cultural and technological condition towards social justice and in order to don't pollute ecosystem and destroy natural resources (Maleki, 2003:37). In other words, it can be stated that concept of sustainable development means a development that don't be destructive environmentally, be appropriate in technical view, be durable in economical view and be acceptable in social view; as sustainable development in a country or environment can fulfill according to human resource of ecological potential, technology and financial resources which are owned to that environment or country and such a development only will be sustainable in mentioned environment (by arranging all four factors) (Darvish and Rahbar, 2005:21).

The most important factors of sustainable development include: 1- human beings (children and women), 2- environment, 3- culture, 4- learning, 5- science, 6- ethnic, 7- security, 8- cooperation, also its main basics include: 1- governments, 2- international organizations, 3- people (Nastaran, ZangiAbadi and Kholghi Pour, 2007:62).

Also, goals of sustainable development are not limited to time or place. Justice between generations and inter generations as social, geographical and governing society, maintaining natural environment in scale of its tolerable capability, use the minimum amount of renewable resources, diversity and economical durability, self dependent society, individual welfare and fulfill fundamental needs had stated as main features of these goals (MoosaKazemi, 1999:5).

Place of sustainable development in urban development: urban sustainable development is one of the most important axes in sustainable development. In order to study urban sustainable development, the basis criteria are evaluating available indexes in this field that generally show situation of society. In reality, indexes are useful information which is the representation of sustainable or unsustainable situation of urban residual system and state urban regions sustainability in order to complete foresight (Tabibian, 1999:58).

Sustainable urban development is a phenomenon with wide and complicated effects that is effective in growth and creation of cities and paying attention to economical, social and environmental and ecological factors. What is important today is becoming aware of weakness and weakness of social, economical, environmental and ecological development dimensions, that can be a very important factor in order to remove problems and issues to achieve economical welfare and social health and reach to sustainable development and finally obtain social justice. In this way, urban planning generally and cities sustainable development programming specially both are try to order urban space, for access to urban facilities and services and appropriate distribution of different urban uses. On the other hand, as a result of providing the best living condition and suitable relation between different uses for urban habitants; decline poverty and inequality and lining to basis of social justice and geographical equality is as fundamental actions of urban sustainable development (HekmatNia and Mosavi, 2006:35).

Urban sustainability has been mentioned more by city growth and growing constant concentration and economical activities in city centers, specially in less developed countries (Moosa Kazemi Mohammadi, 2001:96), because don't paying attention to cities sustainability will leads to increase available issues and matters in cities more than before such as inequality and poverty, decrease level of quality of life, house statue and physical development of cities, unemployment and mendacious employment and crime and depravity. Therefore, ignoring to sustainability in development process not only make negative effect on cities, but also will made negative effects in suburbs and small humanistic residuals (villages) which this matter make it necessary that noticing to sustainability of cities is depends on region development and regional optimum planning. Drakakis Smith suggests approaches and basis of sustainable development as a basis in studies of cities development in sustainable urbanization process, which noticing to equality and equality in economical growth, social justice and citizenship rights, access to services and fundamental needs and enhance awareness toward environment, will be an appropriate movement to more efficiency in using resources, environment and social justice, which in turn will impel cities toward sustainability (Drakakis- Smith, 2000:8-9).

Urban development, as a spatial concept which contains changes in land use and level of density, to fulfill city resident's needs for house, transportation, free time and food, will obtain sustainable development which it will be residential and livable environmentally, durable in economical viewpoint and sustainable and cohesive in social view during the time and citizens will have fair income, suitable house and healthy and convenient life (Shekoyee and Moosa Kazemi Mohammadi, 1999:125).

The principal of justice between generations, social justice (inter generation justice), intra borders responsibilities, mutual dependency of human and nature, kind life on earth and maintain diversity of ecology, effective cooperation of all people and groups in decision making who their life will be affected by these decisions, noticing to local culture and knowledge, sexual equality, peace and security and access to reliable information, all of these matters have been introduced as principles for sustainable development (Filho, 2000:10). So, analysis and evaluate some sustainable indexes in regions of Mashhad city's municipality could help urban managers in evaluating level of sustainable basis in providing citizen's fundamental needs, in scale of plan and constructive programs of structural, social and economical development.

Analysis and Evaluation of Findings

In this research, it has tried to study some characteristics of Mashhad municipality by considering different regions. Indeed, it needs to know features of different regions and their inequalities in order to future programming in this city, by this knowledge, it could have study reason for differences and start to plan for those regions which locate in lower levels. For this reason, we studied 40 regions of Mashhad municipality and used Clustering Analysis and SPSS software technique. This analytical method is used for classification of different regions. In fact in this method, regions which locate in one group have the most similarities with each other and less similarity with other regions out of that cluster. Necessary information for this research also had obtained by census in 17000 pcs questionnaires, results had been reflected in table 1.

As mentioned earlier, studied indexes in this research include:

1-Education status includes literacy, illiteracy, university education and diploma.

2- Ownership includes rent or possession.

3- Income statue includes over poverty line and below poverty line.

4- Satisfied from municipality

5- Occupational state includes income, job situation (clerk, governmental jobs, private sector, etc.).

One of fundamental issues in cluster analysis is evaluating similarity (closeness) or difference (distance) between people as having the studied adjective. Calculation approach depends on nature of adjectives and their qualitative and quantitative features and/or a combination of them. Now, because in this research, adjectives have different indexes, in order to calculate the distance between data (in order to determine farness and/or their similarity) it must use standard data. There are different methods for standardized. The most common approach for making data standard is statistical standard approach by using following formula:

$$X^*ij = \frac{Xij - \overline{X}oj}{Sj}$$

In which Xij and X^*ij are respectively jth region and ith region in primary phase and made standard and $\overline{X}oj$ and Sj are respectively average and standard deviation of jth adjective. After making the data standard, substitute them with real data and then calculate range, maximum, minimum, total sum, average, standard deviation and variance of the data to continue the work.

Table (1): Descriptive Data of Studied Indexes in Mashhad City Regions

Descriptive Statistic								
	Number of Regions	Domain	Minimum	Maximum	Total Sum	Average	Standard Deviation	Variance
Literacy	40	23.40	75.30	98.70	3666.10	91.6525	6.03456	36.416
Illiteracy	40	23.40	1.30	24.70	333.90	8.3475	6.03456	36.416
Academic	40	42.80	2.30	45.10	738.90	18.4725	12.53708	157.178
Diploma	40	26.40	10.40	36.80	923.40	23.0850	7.06147	49.864
Proprietary	40	39.20	41.10	80.30	2577.80	64.4450	7.64031	58.374
Rental	40	25.70	19.20	44.90	1126.10	28.1525	5.48494	30.085
Over Poverty	40	12.20	3.10	15.30	340.70	8.5175	2.89145	8.360
Below Poverty	40	68.40	9.70	78.10	1655.00	41.3750	18.57203	344.920
Satisfaction by Municipality	40	40.36	27.70	68.06	1931.36	48.2840	7.33284	53.771
Occupational Situation	40	11.30	51.85	63.15	2278.84	56.9710	2.65584	7.054
Income	40	148074.75	55458.59	203533.34	4648472.92	116211.8231	36393.73756	1.325E9
Reliable Data	40							

Source: writers

As mentioned earlier, cluster analysis has been done by different methods. Hierarchical Techniques are one of them and is done when number of clusters doesn't be clear before. This method itself divided to two groups includes Agglomerative group and Divisive group that in this research, Agglomerative method have been used.

This method has different types which are different from each other. Here, Average Linkage between Groups is used. In this method, at first each region itself forms a cluster which here we have 40 clusters. In next steps similar clusters have been integrated with each other step by step and form a big cluster, as in last step all regions locate in one cluster. The criteria which is used for cluster integration is the average of two by two distance between regions of one cluster with regions in other cluster. If two clusters come close to each other, they will integrate in next step.

In order to represent clusters, Dendrogram had shaped to show steps of forming a new cluster (diagram number 1). After drawing Dendrogram diagram its turn to analyze results of diagram. One cluster must have been chose to do necessary investigations. It is clear that the precision of analysis decreases while increasing each step of Dendrogram diagram and if number of clusters is low, the conclusion which was done accordingly won't be accurate. Moreover, if number of clusters is high, it can be done in one of following ways:

1- The favorable number of clusters in Dendrogram diagram is a place where it has been observed large distance between integration of two clusters.

2- $\sqrt{\frac{N}{2}}$ Number has been considered as favorable number of clusters that N is number of units.

So if consider the first step here, two clusters is favorable number of clusters that these two clusters include following regions:

$$A_1 = (21, 37, 2, 24, 6, 38, 17, 3, 16, 26, 1, 8, 39, 40, 34, 35, 33, 5, 29, 32, 31, 10, 30)$$

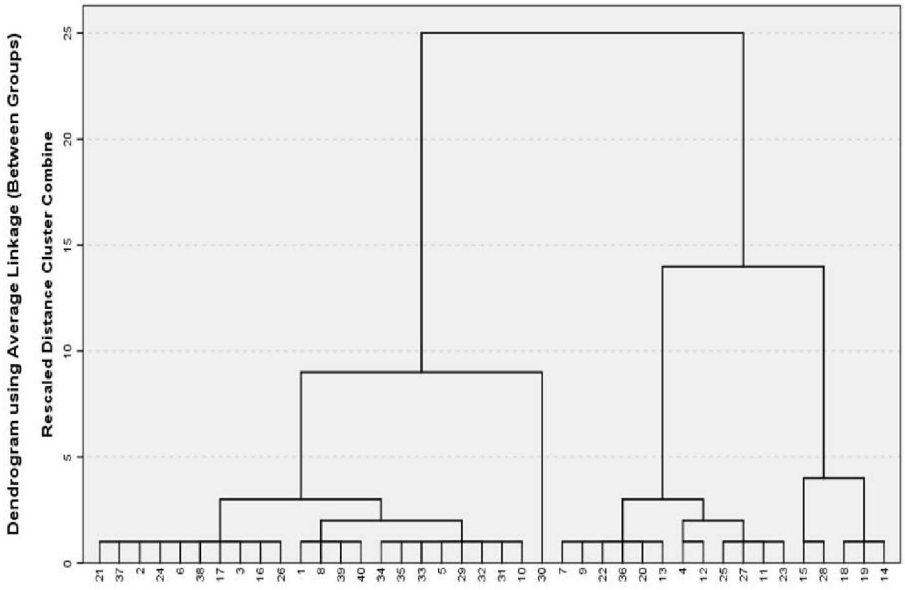
$$A_2 = (7, 9, 22, 36, 20, 13, 4, 12, 25, 27, 11, 23, 15, 28, 18, 19, 14)$$

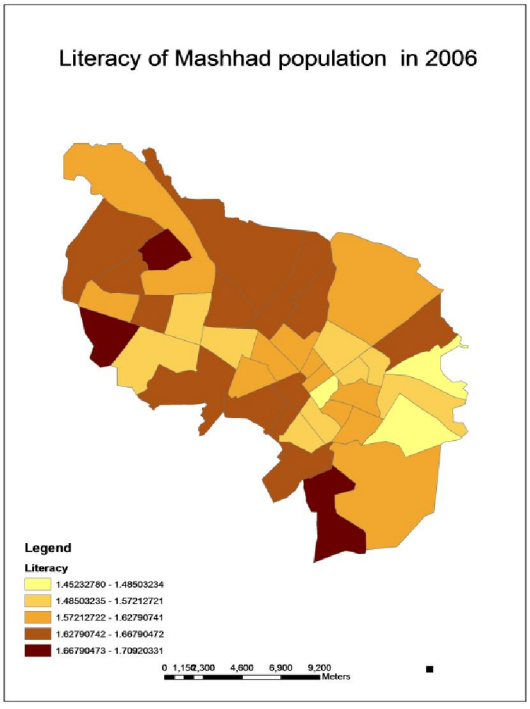
That A_1 is as first cluster and A_2 is used as second cluster; this clustering had been done in fourteenth step. But by considering second method, four clusters $\left(\sqrt{\frac{40}{2}} = 4.47 \cong 4\right)$ have achieved, that these clusters containing regions are as following:

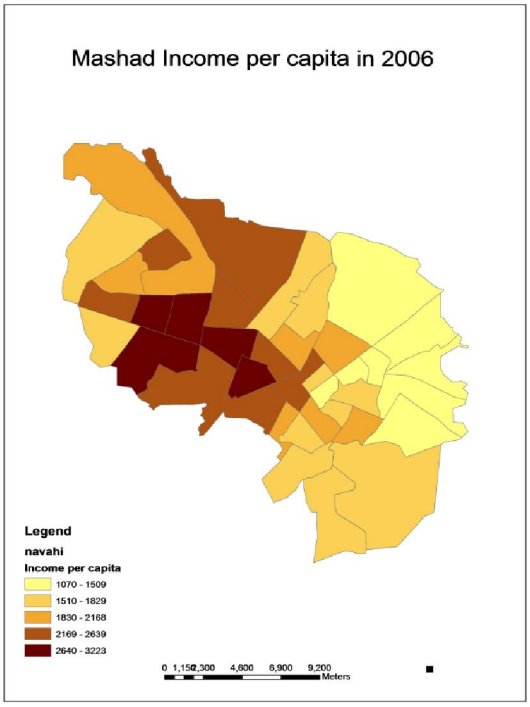
$$A_1 = (21, 37, 2, 24, 6, 38, 17, 3, 16, 26, 1, 8, 39, 40, 34, 35, 33, 5, 29, 32, 31, 10)$$
$$A_2 = (30)$$
$$A_3 = (7, 9, 22, 36, 20, 13, 4, 12, 25, 27, 11, 23)$$
$$A_4 = (15, 28, 18, 19, 14)$$

That A_1 had been considered as first cluster and A_2 as second cluster and A_3 as third cluster and A_4 as fourth cluster, which this clustering had been done in fourth step. It should mention that in this analysis, the criteria for clustering are evaluating main variables such as education statue, income statue, ownership, satisfaction from municipality and occupational position. Based on these variables, internal regions of each cluster have the most similarities with each other. As a result, similar policies can be used for them.

Diagram number 1: Clustering classification of Mashhad municipality regions according to studied indexes







Map 1: The map of clustering regions of Mashhad city according to level of education
Map 2: The map of clustering regions of Mashhad city according to level of income

Conclusion:

In this research, in order to evaluate level of development and classification of regions in Mashhad city according to five indexes as education statue, level of income, ownership, satisfaction by municipality and occupational position and achieving to a united and combined index by using Cluster method, that in this method. Indexes have classified according to inter region differences and groups that their inter region differences are less than external regional differences have placed in one group. Ultimately, by using Cluster (Option) in SPSS software, above mentioned indexes has clustered by using Dendogram, the result has been determined as diagram and map. The results achieved from the diagram that is represented division of Mashhad city regions is mainly as two clusters that each one of clusters divided to several sub clusters, that this matter shows the fact that different regions of Mashhad city aren't the same as each other as having above mentioned indexes that this matter confirm research hypothesis.

Suggestions:

1- While population dispersion over Mashhad city is unbalanced, so planners and authorities of regional municipalities must pay attention to fund and urban programming.
2- Use of tariff mechanisms for devoting optimum facilities to city (by encouragement and exemption), it can bring us closer to decrease regional differences.
3- It is necessary that programming had done according to capacities and potentials and limits of each region (according to capacity of population in each region, studying structure of age of habitants, their income and occupation and etc.).
4- It is necessary to spend part of income in rich regions for poor regions, so the city naturally revised and it will correct unbalances internally.
5- According to see the necessity of spending part of incomes in rich regions in more poor regions and practically they try to do it (fund for deprivation) it is necessary to define more appropriate criteria for it.
6- The municipality must attempt to remove inequalities in some indexes.
7- Policy and decision making must have done according to studies and knowledge of level of region development.
8- Using tariff mechanisms for devoting optimum facilities in city (by exemptions and encouragement) can bring us closer to decrease differences between regions.

References:

1. Amin Bidokht, Ali Akbar, (2006), Evaluate level of development in Semnan province towns, Educational magazine of geography growth, ministry of Education.
2. HekmatNia, Hassan, Moosavi, Mir Najaf, (2006), Evaluate urban sustainable development indexes in regions of Yazd city, The first geography and 21th century conference, Azad Islamic university, Najaf Abad unit.
3. Darvish, Mohammad, Rahbar, Esmaeel, (2005), Training Desert and Desertification research, Forest and Grassland magazine, No 42.
4. De Casteri, Franchesca, (2002), Sustainable development Chair, translated by Mohsen Hakimi, Nature and Resource magazine, Third year, No 1.
5. Rezvani, Mohammad Reza, (2004), Evaluate and analyze level of development in rural regions in Sanandaj town, geography and regional development magazine, Ferdowsi university of Mashhad, third number.
6. Shahnooshi, Naser, Golriz Ziayee, Zahra and Hamid Reza Bagheri, (2006), determining level of development of Mashhad city regions, Proceedings of the first urban management and planning conference, Mashhad.
7. Shokoyee, Hossien, Moosa Kazemi Mohammadi, Seyed Mahdi, (1999), urban sustainable development economical social factors, Quam Case Study, The first sustainable development conference in urban regions, Tabriz university.
8. Shomakher, A.F, (1999), Small is beautiful, economy with humanistic dimensions, translated by Ali Ramin, Soroosh press (Media), Tehran.
9 Tabibian, Manochehr, Bahreiny, Seyed Hossien, (1998), the model of analyzing quality of urban environment, Ecology Quarterly, 24 period, No 21.
10. Zahrabi, Ali Mohammad, Mokhtari Malek Abadi, Reza, (2006), Analyze indexes of development in eleventhly regions of Esfahan city, Proceedings of the first urban management and planning conference, Ferdowsi university of Mashad19.
11. Fani, Zohre, (2003), Small cities, another approach to regional development, Publication of Organization of municipalities around the country, Tehran.
12. Barou, C.G, (1997), Sustainable Development, The concept of worth and action, Translated by Seyed Ali Badri, Geographical Research Quarterly, No 44, Mashhad.
13. Masoomi Eshkevari, Seyed Hassan, (1997), Principles and methods of regional planning, Someh Sara press, Second edition.

14. Maleki, Saeed, (2003), Sustainable city and urban sustainable development, Revolution and House quarterly, No 102.
15. Moosa Kazemi Mohammadi, Seyed Mahdi, (1999), analyzing urban sustainable development, Guam case study, Tarbiat Modares University, Tehran.
16. Moosa, Kazemi, Mohammadi, Seyed Mahdi, (2001), Urban sustainable development: Concepts and views, Geographical research quarterly, No 62, Mashhad.
17. Nastaran, Mahin and Ali ZangiAbadi, (2007), Sustainable development, Social, economical, scientific, cultural, work and society monthly magazine, Institute of work and social support.
18. Yag, Sedrick, (2004), Sustainable cities in developing countries, translated by Naser Moharamnejad and Neshat Hadad Tehrani, Center of architecture and urbanization study and research publication, Tehran.
19. Cullingworth, Barry of Vincent, (2002), Nadin, Town and Country Planning in the UK،Routledge, London.
20. Drakakis، Smith، David, (2000), Third world Cities، Second Edition, Routledge, London.
21. Filho, W.L، Dealing with Misconception on the concept of sustainability، International journal of sustainability in Higher Education.
22. Kennedy, J.1974. Review of Some Cluster Analysis Methods, AIIE Transactions, and volume 6, No. 3.
23. Badri Seyed Ali, Rokn Al Diin Eftekhari, Abdo Reza, (2003), Evaluation of Sustainability: concept and method, Geographical research, 2,69, 34-9.
24. Shannon, W. Culverhouse, R. and J, Duncan. 2003, analyzing micro array data using cluster analysis, Ashley Publications Ltd. 4.41-54
25. Toms, M., Mark, A, Cummings, H and G David .2001. Using Cluster Analysis for Deriving Menu Structures for Automotive Mobile Multimedia Applications, SAE 2001 World Congress Detroit, Michigan March, 5-18.
26. Tosun،Cevat, (2001), Challenges of Sustainable Tourism Development in Developing world: The ease of Turkey، Journal of Tourist Management.
27. Bell, Simon and Mourse Stephan, (2007), Sustainability Evaluation, translated by Siavash Dahanian, Naser Shahnooshi and Yadolah Azarin Far, Ferdowsi university of Mashhad publication.
28. Behravan, Hossien, (2006), Cultural Preparation and urban justice in Mashhad municipality twelfth regions, set of papers of the first conference of urban planning and management, Ferdowsi university of Mashhad.
29. Taghvayee, Masood, Ahmadi, Abdol Hossien (2003), Determining and analyzing level of fruition in rural regions of towns and districts of Kerman Shah province, Quarterly of village and development from Jahad publication.
30. Hossien Zadeh Dalir, Karim, (2001), regional planning, Samt publication, First edition.
31. Haghi, Mohammad Ali, (1999), Structures Planning (Proceedings), Architecture and urbanism research and study center, Tehran.
32. Hekmat Nia, Hassan, Moosavi, Mir Najaf, (2006), Use of model in geography with emphasis on regional and urban planning, Elm Novin publication, First edition.

8/2/2012

Review of the legal status of surrogate wombs in Iran and France and its positive and negative consequences

Siamak Arianpoor

PhD student of law, Dushanbe, Tajikistan
Arianpoors@gmx.com

Abstract: Many couples all around the world are suffering from infertility, so that doctors in different countries are trying to treat it. Different methods of infertility treatment have made many couples able to have children or to be hopeful about the future. One method is "renting a womb" which has had positive and negative consequences. Donating the embryo or gamete donation to married couple was passed by the Islamic Parliament in July 19, 2003 and the Guardian Council approved of it in the July 29, 2004. According to this law, the permission of breeding an embryo of a mother's egg and a father's sperm in a surrogate woman's womb was issued in exchange of some money. But the law of embryo donation or surrogate womb has solved some of these problems and has let the mothers, who cannot carry their child in their womb for different reasons, bear their child in a surrogate womb under certain conditions. Therefore lots of problems have been solved. This article aims to express the legal status of renting a womb in Iran and France and to compare its positive and negative consequences.
[Siamak Arianpoor. **Review of the legal status of surrogate wombs in Iran and France and its positive and negative consequences**. *Life Sci J* 2012;9(3):2220-2224] (ISSN:1097-8135). http://www.lifesciencesite.com. 319

Keywords: surrogate womb, rights, positive and negative consequences

1. Introduction

Marriage is one of the most important affairs emphasized in different religions, thoughts, ideologies, etc. One of the most significant features that religions raise in support of marriage is reproduction and development of human generation, So that this matter has affected other aspects of marriage and sometimes the couple's infertility has led to an unpleasant life and even divorce. Infertility is a common worrisome problem for couples and nearly 15% of couples are suffering from it. According to available reports, it is increasing in human societies. According to American National Center of health statistics, infertility is increasing. Infertile couples have increased from 14.4% in 1965 to 18.5% in 1995. Therefore, we are facing some obstacles in promoting legal and newly established centers of surrogate mothers to reduce the rate of divorce. The importance of the family and its critical role in formation of human societies and the attempts made to keep and protect the family has made any ignorance or indifference about the new matters that arise in this area unjustifiable. One of these matters is artificial fertilization (James S.et.al.2010).The right of having a child for infertile couples should not make an excuse for ignoring moral principles or for having a child through abnormal ways or out of the framework of marriage ethic traditions. Gamete and embryo donation and other artificial methods are the matters that have been discussed in details by scientists and physicians in recent years. In earlier years that medical science had not progressed so well, it was not possible to diagnose which one of the couple was infertile, but due to the patriarchal culture ruling the societies, women were often considered faulty and thus the first remedy for bearing a child was the men's remarriage so that the new wife would bear a child and the infertile wife was responsible to bring him up (Wilson MJW. 2005). This prescription is often against women's desire, because they have to tolerate the presence of another woman in their lives, which might cause love and interest between the husband and the second wife and therefore endanger the status of the first wife. Over the year's novel ideas emerged and humanitarian and feminist thoughts offered a solution which of course already existed as well, but was later paid more attention to and it was "child adoption". It doesn't seem to be a good solution either, since although it didn't have the problems of the first solution that is the presence of another woman; it also had some deficiencies which were more complicated than the first one. In the first solution, the child was at least in one aspect attributed to his father and this attribution would reduce the child's problems, but in the second one, the child in not attributed to any of his parents at all, and this lack of attribution, will consequently cause various problems such as privacy, inheritance, and alimony which in turn cause many problems for both couples and children. As the time passed and the science progressed, the science of medicine attempted to treat infertility and found out some important solutions. Medical breakthroughs would not only help determine the infertile partner, but also sought out the causes and even offered some solutions. In this case, some problems are easily resolved by prescribing some medications but some other problems such as the womb's inability to carry

a fetus, inability of the woman's eggs to mate with the man's sperm, infertility of the sperm, and etc. are not treated by just taking some medications and need special treatment and operations. Medical breakthroughs have offered some treatment for such diseases in recent years, but after solving these problems new problems emerged which were not solved by doctors. In this regard and with emerge of these new problems, it was necessary for the jurists and scholars to comment about it. Therefore, before making any comments, some researches must be done on the new methods of treating infertility to determine and clarify different aspects of the problem (Lacayo R. 1986).

1.1. The view of Jurisprudence on surrogate wombs in Iran

Whenever, due to sexual dysfunction of the couple or any other problems, it is not possible for a woman to get pregnant through natural methods of sexual intercourse, abnormal methods such as injecting a man's sperm into a woman's egg are used which include certain conditions and sentences which will be discussed in this article.

The religious decree: There isn't much difference between contemporary lawyers and jurists in the permissibility of such insemination. Only a few jurists believe it is impermissible. Famous contemporary lawyers and jurists consider such insemination as quite permissible; because it doesn't ruin the principles and rules governing the legal relationship between spouses at all and moreover, it is compliant with logic and intellect and is socially acceptable and protects public interests. On the other hand, not any Hadith or narration from the religious books or tradition has denied it. The most important reason that the jurists have cited is Esalaholabahe. The point that all jurists have unity on is that during fertilizing sperm with artificial methods, committing acts contrary to chastity is not permitted and the legitimacy of the goal doesn't justify the illegitimate device.

2.1. Posted decree: The child resulting from this method

There are fewer differences in views regarding the legality of the child born by this method, in other words although there are some differences in religious decrees about the above mentioned method , there is little difference in terms of the child parents and its legitimacy and his attribution to the couple , since even those scholars or jurists who consider artificial insemination impermissible , don't hesitate over the relative legitimacy of this method as the child has all the necessary conditions for accession to the legal parentage of the sperm owners such as the legal parental relationship between the man and the woman and the birth of the child during their legal marriage with regard to the bearing time and other relative matters. The only criticism of this method of reproduction might be that in this situation, the common method of sexual intercourse between the married couple is not followed, while it is not the only way of legitimate relationship particularly that there is no doubt in legitimacy of the ways in which the child is born by a married couple or even in a surrogate womb. The difference between this method in which a fetus is carried and grown in a surrogate womb out of his mother womb and the first method is that in the first one only insemination is done artificially while in the latter one the fetus spends all or part of his life in a surrogate womb out of his mother's womb until he is born. Whenever a fetus cannot grow in his mother's womb because of the dysfunction of the mother's womb, and therefore grows in a surrogate womb, the religious and posted decrees do not differ a lot from those of the first situation. But it could b said that in this case if fertilization is done naturally and if the sperm is fertilized through the couple sexual intercourse, and then the fetus is grown out of the mother's womb in a surrogate womb or in vitro or places like that, the possible accession of child's birth to the couple is stronger and the this procedure is more legitimate. Scholars and jurists have not expressed any opposite views over this assumption especially that couples seldom resort to such actions without necessity or urgency. The necessity of preserving a fetus life and not violating any principles of legitimate action and the accession of child to his parents are the best reasons for implementing the above mentioned religious and posted decrees.

3.1. The law of surrogate womb in Iran

Renting a surrogate womb is one of the methods of treating infertility which has developed recently all around the world and in Iran. Renting a womb is transferring one or more fetuses, resulting from the fertilization of eggs and sperms of infertile couple, to the womb of a surrogate woman. In this case, the womb of the surrogate mother is only a host for the fetus and genetically has no similarity to the created embryo. Only those couples do so whose wives do not have uterus or their uterus has been removed by surgery or cannot carry the fetus because of various diseases like diabetes, heart disease, hypertension, or malignant diseases. In fact in renting a womb, there is in vitro fertilization of mother's egg and father's sperm and the created fetus is then replaced in the womb of a surrogate mother who is fertile and the infant who is born will inherit genetic

characteristics of his own parents. Of course, according to doctors, although the surrogate mother does not affect the fetus physically or genetically or in appearance, she might sort of affect the fetus spiritually or mentally. Couples who are willing to donate embryo , should be carefully examined by doctors for infectious diseases such as HIV+ , viral or genetic diseases , and physical health and if there is no problem in these matters , their embryos will be used. The text of the embryo donation to infertile couples is as the following:

Article 1: According to this article, all the infertility treatment centers are permitted to transfer the embryos created by in vitro fertilization of legal and legitimate couples to the wombs of surrogate women who have been proved to be infertile themselves or their husbands or both after getting married and according to medical tests, while observing the religious rules and principles and the conditions mentioned in this law. So that, the embryo of a fertile couple through in vitro fertilization is placed in the womb of a surrogate woman to continue his natural life and grow and be born.

Article 2: Embryo donation request should be commonly made by the couple and must be submitted to the court and in case of being qualified; the court will let them to get such donation to have a child. The conditions of donating embryo to infertile women are as following:

A: According to valid medical certificate, the couple is not able to have a baby but the wife is capable of carrying an embryo.
B: The couple must be morally qualified.
C: The couple must not be separated.
D: None of the couple must have refractory diseases.
E: None of the couple must be addicted to drugs.
F: The couple must have Iranian nationality.

Article 3: Duties and responsibilities of the couple receiving the embryo and the born child is like those of parents and their children in terms of custody, training, alimony and respect.

Article 4: Applicants qualification will be examined by the family court out of turn and without considering the process of civil procedures and the couple disqualification is revisable.

Article 5: The regulation of this law will be prepared by the ministry of Health and medical training and in collaboration with the ministry of justice and will be approved of by the cabinet. Therefore it can be implied that according to Iranian law, whenever the sperm of a foreigner in injected to the womb of a woman who has a legal husband , and is capable of being fertile by her own husband , the created child belongs to her legal husband , but if she is not able to be fertile by her husband or if we make sure that the embryo is not of her husband's sperm , then certainly the child doesn't belong to her husband (Ferash Law), since it is a religious famous sign and reasoning and its validity is against uncertainty and in above discussion we are sure that the husband of surrogate woman had no role in the creation of the child and the created embryo has been transferred to the womb of surrogate woman.

4.1. Surrogate womb in French laws

The child belongs to applicant couple and includes all the terms and conditions of legitimate relationship such as inheritance, alimony, guardianship, custody, marriage prohibition, respect, and so on. In fact the relationship between the children who is reproduced by medical aids of applicants, on contrary to traditional rules, is not the result of natural and biological fact, but is due to the law. French legislator has cited the child to applicant man and woman and has required identifying this relationship and has rejected the parental denial.

Table 1: legal status of surrogate womb in Iran and France

The legal status of surrogate womb in Iran and France	France	Iran
	1. The child belongs to applicant couple 2. The effects of legitimate relationship such as inheritance, alimony, guardianship, custody, marriage prohibition, respect, and so on are undertaken by the child applicant couple. 3. In fact the relationship between the children who is reproduced by medical aids of applicants is due to the law. 4. It has cited the child to applicant man and woman and has required to identify this relationship and has rejected the parental denial	**1.** Embryo donation request should be commonly prepared and submitted by the couple who are applying for a child. 2. Duties and responsibilities of the couple receiving the embryo and the born child is like those of parents and their children in terms of custody, training, alimony and respect. 3. The couple must have Iranian nationality. 4. According to valid medical certificate, the couple is not able to have a baby but the wife is capable of carrying an embryo. 5. Applicants qualification will be examined by the family court out of turn and without considering the process of civil procedures and the couple disqualification is revisable.

5.1. Positive and negative consequences of surrogate womb

Using a surrogate womb is common in most countries. It's common In Iran as well and has been legalized since 2003 and is increasing. Although the history of these laws in foreign countries goes back to the last few decades, it is relatively novel in our country and people do not know much about this topic. But many couples are suffering from infertility. Doctors in different countries are trying to treat it. Different methods of infertility treatment have made many couples able to have children or to be hopeful about the future. One method is "renting a womb" which has had positive and negative consequences.

6.1. Positive consequences

First: Reduction of divorce rate in country and solving the problem of infertile couples.

Second: A righteous child has genetically all the characteristics of the parents who own the semen and is preferred to illegitimate methods or adoption.

Third: This method helps women who do not have problems in ovulating and their infertility is due to other factors. Therefore a high percentage of infertility problems are solved.

Fourth: Surrogate womb has been studied psychologically and psychiatrically for about 15 years (nearly 4000 cases) and the possible damage to the volunteers has been investigated, but no damage has been reported so far.

Fifth: In terms of jurisprudence the child who grows in a surrogate womb is legitimate and legal.

7.1. Negative consequences

First: This approach is not culturally acceptable by all people and most of them are unaware of it, therefore there isn't a good opinion about a person who grows in a surrogate womb.

Second: The possibility of transmitting diseases like AIDS and Hepatitis and so on from the surrogate mother to the infant

Third: The possibility of transmitting infectious diseases (such as AIDS, Hepatitis, and so on) and viral diseases from embryo donating couples to the embryo and then the surrogate mother.

Fourth: The child awareness of this medical process and his attitude towards this issue.

Fifth: Possibility of various abuses of this method such as financial abuses.

Sixth: Family dissatisfaction especially the children and spouses of "volunteers for surrogate womb"

Seventh: Legally, there are still some problems in applying this method (Louw A. 2007)

2. Conclusion:

Considering what was stated in the lines and pages of this article, it could be concluded that:

Various assumptions are rising under the title of artificial insemination and the religious decree of the majority of them is permissible according to majority of the researchers and thus there will be a legitimate relationship as the posted decree. Although this phenomenon has certain positive consequences and has kept the families together, the vast and unconditional use of this method will be followed by looking at the surrogate mother as a tool and the possible reduction of two-parent families.

Moreover, the concept of family will become meaningless, and it will be used to clone human beings and to do researches while making some genetic changes in cells. Therefore, there must be some restrictions to limit this method only to those couples who can't be naturally and safely fertile. Justice is another moral point which is raised in this technology. Economic use of surrogate mothers will cause the use of human as a tool and the exploitation of low-income women and will serve and benefit the rich. Determining some ways to control the payment in exchange for surrogate motherhood and converting it to a humanitarian action rather than an income source, can remove this moral defect. Another moral point is protecting the rights and safety of those involved in this process specially the child who is born in this way. Considering full advice and consultation for those engaged in this process by independent experts and advisors can keep the autonomy right of people in choosing this method freely and consciously. It can sort of guarantee the acceptance of the child and the protection of his rights during pregnancy and after birth. To observe the principle of non-harm it is necessary to do all the relevant medical tests and cares to prevent any hurt to the surrogate mother and the child. Expressing medical issues in this matter is of great importance. It could be understood from the jurists' points of view that some of them are not justified sufficiently on the grounds of some actions , therefore expressing medical issues will not only justify the jurists but also will cause the researchers to comprehend various aspects of the matter.

Table 2: positive and negative consequences of surrogate womb

	Negative consequences	Positive consequences
positive and negative consequences of surrogate womb	1. This approach is not culturally acceptable by all people; therefore there isn't a good opinion about a person who grows in a surrogate womb. 2. The possibility of transmitting diseases like AIDS and Hepatitis and so on from the surrogate mother to the infant. 3. The possibility of transmitting infectious diseases (such as AIDS, Hepatitis, and so on) and viral diseases from embryo donating couples to the embryo and then the surrogate mother. 4. The child awareness of this medical process and his attitude towards this issue. 5. Possibility of various abuses of this method such as financial abuses. 6. Family dissatisfaction especially the children and spouses of "volunteers for surrogate womb" 7. Legally, there are still some problems in applying this method.	1. Reduction of divorce rate in country and solving the problem of infertile couples. 2. A righteous child has genetically all the characteristics of the parents who own the semen and is preferred to illegitimate methods or adoption. 3. This method helps women who do not have problems in ovulating and their infertility is due to other factors. Therefore a high percentage of infertility problems is solved. 4. Psychologically and psychiatrically no damage has been reported so far. 5. In terms of jurisprudence the child who grows in a surrogate womb is legitimate and legal.

8/25/2012

Acknowledgements:

An author is grateful to the persons for financial support to carry out this work.

Corresponding Author:
Siamak Arianpoor
E-mail: Arianpoors@gmx.com

References

1. James S, Chilvers R, Havemann D, Phelps JY. 2010. Avoiding legal pitfalls in surrogacy arrangements. Reprod BioMed Online; 21: 862-7.
2. Lacayo R. 1986.Is the womb a rentable space? Time; 128: 36.
3. Louw A. 2007.Surrogate motherhood. In: Davel CJ, Skelton AM, eds. Commentary on the Children & #x2019; s Act. Cape Town: Juta, 19-8 (loose-leaf).
4. Shenfield F, Pennings G, Cohen J, Devroey P, de Wert G, Tarlatzis B. ESHRE Task Force on Ethics and Law 10: surrogacy. *Hum Reprod* 2005; 20: 2705-2707.
5. Wilson MJW. 2005. Pre-commitment in free-market procreation: surrogacy, commissioned adoption, and Limits on human decision-making capacity. J Legis; 31: 329-37.

Hossein Ibn Mansur Hallaj in the Mirror of the Dramatic Literature

Mohammad Najjari, Kamel Ahmad Nezhad

Azad Islamic university, Tehran branch, faculty of Persian literature and foreign languages
MNajari75@gmx.com

Abstract: This article studied the recognition of the Hossein Ibn Mansur Hallaj's figure in the field of dramatic literature and it analyzed the figures presented of him with the documentation and real historical reports to clarify the relationship between his real image and what has been reflected in the dramatic literature and to determine the reproductive amount of Hallaj's character in the field of dramatic literature. In this study, four plays, Three Persian and one Arabic works- have been analyzed.
[Mohammad Najjari, Kamel Ahmad Nezhad. **Hossein Ibn Mansur Hallaj in the Mirror of the Dramatic Literature**. *Life Sci J* 2012;9(3):2225-2233] (ISSN:1097-8135). http://www.lifesciencesite.com. 320

Keywords: Hallaj, history, Dramatic literature, Hallaj's image, mysticism

1. Introduction

Possibly, it is exaggerated to say that some researchers believed that mysticism is the highest manifestation of the human religious life; however, it can be regarded as the most daring desirable completion and the highest religious enthusiasm in the religious life. In its different perspectives, the psychology of those who have tried in the boundary of the normal life to find their ways to the widespread horizons, which are not included in the region of experience and objective perception, can be searched. A direct relationship with the above-mentioned is inevitably based on a special perception beyond the formal perception among the people, and Islamic mysticism, and Christian mysticism is undoubtedly its most complete form. Anyway, in theoretical perspective, the perceptive discovery is mysterious and it often frees the human from its boundary as its followers believe, and gives the connection chance to the existence which is beyond the self-boundary. Furthermore, in the practical perspective, mysticism tries to achieve the stages of development and purification. The belief in the possibility of this stage, both theoretically and practically makes the phrase of *Ana al Hagh [I'm the Truth]*, in what it has been quoted from Hallaj, justifiable, and these and similar words are regarded as the symbols of spiritual drunkenness, and its way is considered as "drunkenness" and Bayazid and Hallaj are the pioneers, against which is the "awareness" followers, and Junayd is the pioneer. Among the drunkenness mystics, one can refer to Hossein Ibn Mansur Hallaj, who is an appealing and controversial character. Hallaj, who was later called as the paramount follower of the monotheist, and was granted the title of "SM Al-Movahedin *[SM Monotheists]*" by the Sofia, could win the attentions and make friends and enemies for himself. His friends, since from his age until today, have praised him with their various literary works in the Persian and Arabic poetry and have introduced his life as the unique sample of a divine mystic and have considered him as a good paradigm for the future followers. From the report text of Hamd, his son, to Attar's "Tadhkerat al-Awlīya", all the writers tried to present a mystic image of the executed Hallaj and visualized his mystic experience interestingly. In this research, regarding the significance of Hallaj in the field of Islamic mysticism, and due to his effective role in the field of literature, especially Persian literature, this study tried to present a real image of the Hallaj's life and then analyze the four plays which are written about Hallaj's character.

1.1. Hallaj's Brief Biography

"Abu Abdollah Hossein Ibn Mansur Hallaj" was born in 234 AH (858 AD) in the village of Tour, in the Northern angle of "Beyza" seven miles away from Shiraz. His main nickname is written as "Abu al-Mogheis," but the nicknames of "Abu Amareh," "Abu Mohammad," and "Abu Masoud" has been also mentioned (MOHAMMAD IKRAM CHAGHATAI, 2008). He is called as "Mansur Hallaj" by mistake since it is his father's name, and his real name is Hossein. When he was a child, Hallaj moved to Vaset with his father, and grew up in there. The people of Vaset spoke in Arabic; therefore Hossein spoke in Arabic and forgot Persian gradually. The people of Vaset were Sunni, and Hambali. There was a memorizing house in Vaset, where Mansur went until he was twelve years old and learned Quran, and memorized according to some quotation. Hallaj was sixteen years old when he learned the mysticism and religious way with Sahl al-Tustari. Sahl taught the elementary points to Hossein, and practiced "Arba'een Interlocutor." The term of Hallaj's service with Sahl, is nearly two years, then Hallaj quit him and went to "Amr Ibn 'Uthman al-Makki." In 886 AD, Hallaj abandoned Sahl, and travelled to

Baghdad, and as Amr suggested, he secluded himself, repented, and shaved his hair in the normal way, and wore the Sufi cloak (Sabar Afiaqe .2005). Hossein married to "Um Hossein" "Abu Yaghoob Aghta's daughter" after a while, and had three sons, named: Soleyman, Mansur, Hamd, and one daughter, and had only this wife until the end of his life and when he went on a travel, his wife's brother was responsible for his family (Mason Herbert W. 1995). This marriage did not satisfy the master, and as some interpreters believe, this issue caused Hallaj to be separated from Amr al-Makki at the end, because Amr al-Makki and Hossein's father-in-law always argued, and Hallaj tried to tolerate the situation according to Junayd's suggestion, so that he finally was impatient and went to Mekka, and separated from his old master. However, Zarrinkoob, believes that the dissatisfaction reason of Amr al-Makki, and Abu Yaghoob Aghta, is the popular reception and a lot of disciples who gathered around Hallaj (Mason Herbert W. 1995). Anyway, after separation from Amr, in 888 AD, Hallaj, joined to Junayd Baghdadi, and participated his meeting until twenty years. At such meetings, he met some popular faces of Sufia, including Abulhossein Noori, Shebli, and Ibn Atta. Hallaj went to Mecca to carry out Hajj in 270 AH (894 AD), at the age of twenty-six, for the first time. For the second time, Hallaj, went to Mecca in 282 AH (906 AD), and stayed there for one year, and then returned Baghdad. However, after a while, Hossein separated from Junayd, the reason of which, was inside Hallaj's divulging job, and he states the issues that either should be revealed, or he did not understand them completely, and therefore, people like his master, accused him of ignorance, or nonsense expressions. The separation of Hallaj from Junayd can be regarded as his separation from the official Sufis of that time, so he abandoned Baghdad and moved to Shooshtar in 284 AH (908 AD). Hamd, Hallaj's son, writes about his father's separation from Junayd: when my father went back from Mecca, came to Baghdad, and met Junayd. He asked him a question, but received no answer. My father was annoyed and came back to Tustar with my mother. He was there for two years. He was welcomed. The contemporaneous Sufis were jealous of him. Amr al-Macci, wrote some letters continuously about him to the people of Khozestan, and accused him of significant sins. My father took off his Sufi cloak, and wore a sleeved-robe, and a cassock, and joined non-religious people, and went to trips. For five years, he went to Khorasan, Transoxiana, and the Oxus River to Taleqan, from there he went to Sajestan, and Kerman and invited people to worship God, and wrote many books for the people of Fars, and learned a lot from the religious people (Massignon, 2004: 59). After five years, he went to Fars from Ahwaz, and then went to Baghdad, and stayed there with his family and relatives, and spoke in public. Then, he travelled to Basra, and in 291AH (915 AD), he went to Mecca from Basra, for the second time in accompany with four hundred disciples. In 294 AH (918 AD), Hallaj went to Mecca, for the third time, and when he returned Baghdad, built a small Kabe in his house. He was praying God in the cemetery at nights, and spoke in the streets in the days, and cried in Bazars: O' Muslims, Give my Right from God, because, he neither leaves me with existence to be attached to, nor he separates me from self to be free from that, it is the coquetry, which I cannot eliminate (Van Cleef, Jabez L. (2008).).

Most of the historians believe that the first man, who gave the sentence to kill Hallaj, was "Mohhamad Ibn Davood," the founder of Zahiriyah sect, which was among the formal jurisprudence of the Sunnite. However, as some have mentioned correctly, the Ibn Davood's sentence, who passed away twelve years before Hallaj, was not the factor to arrest and murder Hallaj. It is quoted that at the time of Ghazi Ibn Sorayj, the Shafi'i jurist did not accept Ibn Davood's sentence and rejected the legal judgement against Sufis. For this reason, and the private plaintiff's lack of power, Hallaj escaped the perilous situation; however, after a while, the leaders of the Nahvi School of Basra, who were against him, published the story of his statement "Ana Al-Hagh *[I'm the Truth]*." Hallaj said I'm the Truth and it made both the Shiite and Sunni's scholars angry with him. At the same time, a riot took place against the governors that did not have any results, though Ibn Furat Ghali achieved the ministry post. He was looking for "Hossein Ibn Hamdan" due to riot, and ran into "Hossein Ibn Mansur Hallaj" the Ibn Hamdan's consultant. Therefore, considered him as well, but at last, Hallaj escaped from Ibn Hamdan's followers and went to Ahwaz. At the meanwhile, four of his disciples were arrested. For three years, he escaped from one city to another city and finally inhabited in Shush, and was arrested there. On Rabi' al-Awwal 25th, 301 AH (August, 7th, 921 AD), he was ridden on a camel, and took to Baghdad with his servant and wife's brother, and locked up. When he was entering Baghdad, the harbinger was crying that he was one of the Qarmatians' agents. Come and know him. When Hallaj was interrogated, his beard was shaved, and he was bitten with the width of the sword. Then his servant and he were crucified alive in the Eastern and Western sides of the river. He was therefore sometime, and then he was untied, and transferred to the jail. In 303 AH (927 AD), the Caliphate suffered from a severe fever, and Hallaj

healed him. In 305 AH (929 AD), he revived the Omani parrot of the prince Razi Ibn Jafar Al-Moghtader. At the same time, he started writing his new book "Kitab al-Tawasin," and Ibn Atta achieved it in 309 AH (933 AD), and kept it with him. In 306 AH (930 AD), a dispute took place between Hamed Vazir (the Minister), and Ibn Issa, on the issues related to the levy, which caused that Hamed to arise the Hallaj's story again to weaken Ibn Issa, the minister's deputy and Nasr Ghoshoori, the head of the government doormen (both of whom were Halaj's fans). In the meanwhile, one of Hallaj's manuscripts was found, which was written "raze the Kabe." Therefore, he was regarded as the Qarmatians, and gives the sentence to kill him. Most of the interpreters of Hallaj's thoughts from the Sufia's ancients to such orientalist as Massignon, interpreted this sentence as "raze the Kaba of body's idols," however, during the history, the Sunni and Shiite jurists, among the modern researchers, only Mir-Fetros, has interpreted this sentence as the destroying the Kaba, situated in Mecca. Abu Omar, and Abdullah Ibn Makram, could issue his killing sentence with accompanying other jurists and Shariah scholars. Among them, only Ibn Atta defended Hallaj. Among the interrogations and inquiries, Nasr Ghoshoori and the Caliphate's mother could transfer Hallaj to the prison of Dar Al-Sultan but in the meanwhile, a man was stopped in the province of Dinavr in Kermenshah carrying a letter from Hallaj, at the top of which it was written "From the merciful, the Compassionate, to X son of X." The letter was sent to Baghdad, and Hallaj was asked to identify his handwriting. He confirmed that he had written the letter. He was asked: "do you claim divine omnipotence?" he answered "No, but it is the thing, which is named as "*Ayn Al-Jam*, the essential union," and many Sufis believe in it, and when he was asked if the other agreed you, he introduced Ibn Ata, Abu Muhammad Jozairi, and Abu Bakr Shibli (Massignon Louis.1983). To confirm Hallaj's idea, Jozairi and Shibli were questioned on this issue, and those two tried not to enter into this issue; however, at last they were forced to answer. Jozairi called Hallaj, a pagan, and issued a verdict on his murder; however, Shibili called him only a deviant, and did not say anything about his murder. At the same time, Hamed went to Caliphate who was patient, and informed him of the danger of probable riot, and asked him to murder Hallaj as soon as possible. Caliphate issued his murder command.

On the night before the murder, Hallaj said his prayer, and complained God because of his fate, then when he found and accepted that "these are the souls, the witness of the event, travel from this world…" and shed tears in front of God and said: "I cry in front of you, be mournful!, for these hearts, which have been full from these manifestation clouds, where the oceans of wisdom are accumulated…" (Massignon Louis.1983). Finally, on Dhu al-Hijjah, 24th, 309 AH, (March, 26th, 922 AD), around 301 (Solar year, Iranian Calendar), Hallaj was taken among people, while he was wearing a hat on his head. First he was whipped, and then his hands and feet were cut off, and then he was executed. The day after that, his head was cut off, and burnt his body, and poured his ash from the top of the minarets to Tigris.

Then, his head was sent to Khorasan. However, many of the people did not believe his death, and some claimed that they had seen him after his death.

After his death, many stories and Forgeries were made about him by his friends and enemies about his imprisonment, and execution.

The historians have mentioned his works. The most important of his works have been listed by Ibn Nadim, in his famous book, Al-Fihrist (Muḥammad ibn Isḥāq Ibn al-Nadīm.1929). However, except Ibn Nadim's list, some more works including a book about magic and two Diwans, which are not written by him, as well as a work named…..(Sabar Afiaqe .2005).

2.1. Studying Hallaj's Figure in Dramatic Literature

In this part, the researcher is going to study and introduce four plays, which are written about Hallaj. The way to introduce each work is as the following: first, the title, the dramatist name (the translator's name, if any exists), and then the storied plan of the play are mentioned and the characters are identified and introduced.

3.1. First Play

1.3.1. The title: Halaj's Threnode

The Dramatist: Bagher Moeen

The Storied plan: the play is designed in five scenes.

In the first scene, three male passers, preacher, farmer, and a merchant, face with the scene of executing one old man –Hallaj. A group of people, especially Sufis, have mourned around the corpse. Their curiosity makes them investigate about this old man. At the same time, the preacher, identifies Shibli Sufi, and decide to follow him to execute the murderer of the old man. In the second scene, during a return to the past of Shibli with Hallaj, talks about his recent words, and suddenly Ebrahim Ibn Fatik arrives and informs Hallaj, of the sensitivity of the government about his relationship with the rebels. In the third scene, we see the same three passers, who talk about Hallaj before his arrest with the people of the street including one lazar, one lame, and three

Sufis about Hallaj's words and sermons. In the meanwhile, three patrolmen arrive and arrest Hallaj under the accusation of the heterodox, and took with them. In the fourth scene, we see Halaj in accompanied with two prisoners, and one guard. Hallaj affects the two prisoners during a conversation, and causes him not to escape when there is a chance to do that. Here, due to the resistance and magnanimity that Hallaj shows, makes the prison guard apologize. The fifth scene takes place in the court to issue the verdict about Hallaj. Three judges, Abu umar, Ibn Soleyman, and Ibn Surayj, discuss together before bringing Hallaj to the court, in terms of legal and judicial issues. Abu Umar, and Ibn Sulayman know him guilty in advance, and Ibn Surayj believes that any comment and verdict about Hallaj and his faith are beyond the court's jurisdiction and every other human generally. After a long discussion, Hallaj is brought in. The trial starts. Hallaj does not defend himself, and explains his thoughts only because of Ibn Surayj's insist. However, on the contrary, Abu Umar, and Ibn Sulayman know Hallaj, pagan and recognize him as the trigger of people's uprisings against the government. At this time, an emissary arrives at the court carrying a letter. In that letter, Hallaj has been pardoned despite the issue that he encouraged people to riot. The court believes that this pardon is subject to the Sultan's right and continues trialing around God's right. Therefore Ibn Suraj and those two judges start arguing and he abdicates the judgement. At the end, the court calls on Shibli and questions him about Hallaj and his thoughts. Although Shibli does not decide to reply the questions, he is forced to speak at the end, and confirms what Hallaj believes vaguely, but he does not defend him. Then the judges ask people who were out to come in and ask them about Hallaj. People know his pagan. Then, people are asked to issue a verdict for Hallaj, they all say: murder. Therefore, the judges blame people for his murder and they accept and finally Abu Umar orders to kill him.

2.3.1. Studying the Work

The context of this play is correct according to the sequence of taking place the events in terms of historical literature left, but fake characters and some events are added to the story, which do not have any historical basis. The dramatist has described the scenes and has observed the temporal issues, very well. This play, is written based on the modern style with a look at the Aristotelian classic way. Characterization has done correctly dramatically in this play. The story starts intelligently with the mediator of a preacher, a merchant, and a farmer as the three unaware and ignorant men of the issue and Hallaj's position. Three people who start talking about a man who is executed to know the truth. By choosing the three characters that are identified and introduced through their jobs, from three different social classes, he indicates the psychology of the characteristic of people in facing with Hallaj's issue after his death. The Hallaj's image in this play is different from his original historical image. As we know, two readings are presented from Hallaj's character. One reading that believes Hallaj, was a man with divine claims whether or not people accept him, and the second reading identifies him as a political character from Omani, whose divine claims have covered his political activities. In this play, Hallaj's image was a combination of the both readings, and it caused personality conflict for him. On one hand, Hallaj is a divine character who talks about politics inside him:

Do I speak with my friends and tell them that they are the governors of the nation's heart, and the nation reformation depends on his reformation. If you achieve a position, do not forget to drink the wine of power in the cup of justice. May be the statesmen are angry with me because I paid attention to my people who are all on the way of the hereafter.

The Hallaj's image in this play does not depict a mystic, who is related to God, but it depicts a confused, weakened, and relative oriented man. It is not clear that how such a picture of the man who believes that it is not allowed to fight with anybody, because everyone has been committed a sin, is compatible with the revolutionary figure of Hallaj, which is presented before in this play. When he says with relativism:

Who are the oppressed ones? Where are the cruel ones?
And then explains his relativism as the following:
Has any of the oppressed ones, oppressed his neighbor, child, servant, or bondwoman? Have any of them oppressed God?
At the end, he confesses that:
I shed tears because of inability. I sigh deeply because of bewilderment in thoughts and misdirection in notion
Of course, it was not so far from mind, due to the first Hallaj's doubt:
O' Shibli, don't fill my soul full of tears.

This play can be regarded as a clever effort, which of course has some mistakes especially in facing with the real historical events and the characterizations as well. The story starts with the narration of three passers-by, which stops in front of Hallaj's corpse, and the narration refers to the returning the past of the story of his arrest, trial, and Hallaj's execution, correctly. The general theme of the work is political-social, and the mystical and Hallaj's special claims have been considered less. Even, the character of

Hallaj, is mostly a revolutionary figure rather than a mystical one, that although does not express explicitly and does not accept, the main goal is rebelling against the available government, and overthrowing his time oppressors. The government knows the Hallaj's story political, the significant historical point, in this work is the exculpation of the government from Hallaj's death and attributing him to the judges and the jurisprudence of that time. When at the end of the play, despite of the arrival of the minister the Caliphate's verdict about the Hallaj's exculpation, the judge talks about the God's right, and then through the support of people, issue his murder verdict. The theme of the story is highly dark and disappointing. Except Hallaj, the other characters are sinful, who either do not understand God and justice, or they do not do anything practically. All the characters-even Ibn Suraj- engages in their daily routine lives, which's the only concern, is to provide those ans their families. All of them suffer from self-delusion, and other-delusion. All of them are uninformed, unaware, and foolish, of course there are few people, if any, like Shibli, who are not like them, and do not dare to call for stability for God, for the tyrants' oppressions, and destroy the tyranny and oppression. In this world full of hypocrisy and deception, Hallaj appears lonely, like a myth, suffers, is charged, and executed. Therefore, a Jesus-like image is pictured from Hallaj, which follows the way of union with God, and stands against his opponents, and keeps silence against everything people are doing with him, and smile satisfactorily.

4.1. The Second Play

1.4.1. The Title: the Esecution of Hossein Ibn Mansur Hallaj

The dramatist: Siavash Tahmoores

The Story Plan: the story starts with the regretful cry of people, who did not support Hallaj when he was about to be executed, and now they are regretful. The story starts with returning past, and the conversation among Hossein, Ibrahim Ibn Fatik, and Shibli, talks about the events before the trial. In this conversation, Hossein and Shibli, talks about Hallaj's claims, and Ebrahim informs Hallaj about the government suspicion to him. In the next scene, we see Hallaj with two prisoners and guards who are talking about Hallaj's claims, and Hossein influences on both the prisoners, and it causes one of the prisoners to prefer the prison to escape, and the other one, through being affected by Hallaj, after being released from the prison, when Hossein is taken to the gallows, go to help with some other people, who face with the suppression of the patrolmen. The next scene is the court, where the trial starts in the presence of Abu Umar, Ibn Sulayman, and Ibn Surayj, who were talking together about Hallaj's words and claims before his arrival to the court, do not know exactly what to do with him. Finally Hallaj is sentenced to death.

2.4.1. Studying the Work

First, it should be mentioned that this play is the free adoption of the play "Hallaj's Threnode," some parts of the original text have been eliminated and some parts have been added, and some dialogues have been changed. Analyzing the text of the play, with the historical documentations indicate that in this historical play, some parts of the historical facts have been distorted. The issue that shows some people's regret after Hallaj's death is not mentioned in any of the historical sources after him, as well as the references to the regret of such a character as Shibli, when he says: "I'm Shibli, your murderer, your murderer." And then the other say together, who is Hallaj's murderer. The words that are quoted by Hallaj, are sometimes based on the historical texts and sometimes based on the personal interpretation of the dramatist, which does not have any compatibility with the real Hallaj's opinions, and Sufi's interpreters. The main theme of this play, is completely political, even more than the "Hallaj's Threnode." Therefore, there is no place left for the Hallaj's monotheistic claims, which are his main words. The dramatist, due to lack of understanding Hallaj's words and thoughts and the main nature of the threnode, which has a humanist approach, has presented a new and humanist interpretation of the Hallaj's story. For an example: Hossein says: the sunrise and the sunset are the same for the lover and selfless martyr. To live, to die, and to be killed are the same for me. I left my existence to love. I go on my carol on the altar of love and perception. Then the dramatist, use the second prisoner to present his modern interpretations of Hallaj's words, and talks in a way, that the Shakespeare characters are not even able to say such things. Why do you suppress any scientific and human thought under the accusation of the heterodox? What do you want from him and human thoughts? Here the dramatist did not understand that Hallaj's thoughts are not related at all to the science to be called scientific thoughts, and they are not related to the human. Because, if Hallaj's thoughts are humanistic, the issue that he is mystic goes under the question, and therefore the Hallaj's character does not have special specifications to be separated from other people. This work should be considered as a less successful effort to picture a humanistic-political picture of Hallaj that tries to dim the mystical figure of Hallaj, following the original context of the "threnode," and instead it tries to present a revolutionary picture of Hallaj, which is not the main focus of the historical contexts at all, and

then introduces this picture as something, which has been current in time forever.

5.1. The Third Play

1.5.1. The Title: and said you see today … and you see tomorrow … and the day after tomorrow

The Dramatist: Nima Dehqani

The Story Plan: this story starts with the narration of Hallaj's wife, woman 1, who narrates the story of Hallaj's arrest for her imaginary child. During the play, she talks with different historical characters, including Ibn Fatik, Ibn Ata, Shibli, Sahl, Hamed Vazir, Ghazi Kalan, and other secondary characters and the people. Furthermore, another woman, woman 2, as the woman 1 conscience, talks with Hallaj's wife occasionally, and shouts at her, to know Hallaj's position and does not let his final fate be anything except execution, because he would not be persistent.

2.5.1. Study of the Work:

The narration of this play, as the writer has written, is imaginary and therefore, one cannot claim any historical value for it. In his interpretation of Hallaj's mysticism, the writer is not faithful to the Hallaj's main ideas. The context is highly full of Humanism, feminism and Iranian nationalism approaches. On the page 17, when the woman 1, Hallaj's wife, describes the father for her child, says: "his eyes were full of questions like these two small Galaxies. Now, it should be asked that Hallaj, who has been the God in the belief of mystics and the writer of course, or at least he has been travelled in the highest stages of monotheism, how was full of questions? Can God be full of questions on the religious monotheism issues according to the definitions that are attributed Hallaj to Islam? And if we believe that it is true and he is full of questions, one should ask that what these questions have been, and where and in what historical quotations they have been stated? And if it is stated that it was Hallaj's wife about him, it can be asked that when his wife describes him in this way, how it can be expected that the others describe him better than this? On page 37, the writer uses the woman 2 to refer to the other Hallajs, who did not become Hallaj because of attachment to this world. There were other Hallajs, who said "I'm the truth, but they were dependent on the ground and they were not executed, although I'm sure they were innocent. Now, it is not clear that who has cried "I'm the truth? Could they dependent on the ground? On pages 38 and 40, there is a reference to Babak Khorramdin that shows the writer's nationalist thoughts. On the page 38, the writer quotes from the woman 2, and says: "or nobody cut off Hallaj's hand, It was Babak Khorramdin, who made his face red with his blood so that it does not look pale. This story will be written on Hallaj, He will not be set on fire. Moreover he writes on the page 40: Mansur, or Babak. The writer ties Hallaj to an Iranian citizen without regarding him as a Muslim mystic and presents an image which is under his consideration.

Woman 1, is the Hallaj's wife, tries hard to exculpate his husband from all the accusations with a humanistic-feminist approach and the only thing the wife does not consider is the accuracy of his husband's words, which are observable in all his work. For example, on the page 49, the writer refers to the Hallaj's witchcraft, according to the historical contexts; Hallaj learned the witchcraft. However, the wife claims that Hallaj's wizard and strange affairs are not jugglery, to entertain his friends. Or as another example, on page 47, he talks about some accusations about Hallaj. He is the student of heterodox school, and he is confederate with them to overthrow this religion, but the wife does not accept anything. On the pages 56, and 57, the wife calls herself Sudabeh without any special reason, and talks about the story of Siavash and Sudabeh, which is another witness to the nationalist approach of the writer. In addition to the issue that, there is no similarity between the story of Siavash and Hallaj, there are many differences between these two stories. The wife's figure in the play has an antithetical character. In the "fifth section of Basra beggars" on page 43, she says to the woman 2, "do you think I missed a flirting?"…"no."

When the writer, allots one complete part under the title of "the seventh, the trial, the flirting" talks about the wife's imaginary flirting with Hallaj in the form of a dialogue and in the form of a practical flirting with Hallaj's mask, and has presented a pornographic image of the relationship of a monotheistic mystic. During the work, as he has mentioned in the introduction, he has tried to study the story of Hossein Ibn Mansur Hallaj from the perspective of a female mentality, and states her female thoughts and notions. Therefore, it is called a feminist work.

Generally, this play has written weakly historically and technically, and therefore, the image presented from Hallaj, and the other related characters such as his wife, who has the main role in this work, are the imaginary and non-mystical, which have happened due to the special reading of the dramatist from the event and the application of the modern format of the drama.

6.1. The Fourth Play:

1.6.1. Title: Mansur Halaj's meeting

The writer: anonymous

The Story Plan: The story starts with the Hallaj's sentence "I'm the Truth" and the reply of a character named "Moteshare." He rejects such a claim, and Hallaj states his claim in the reply, and in order to kill

him, Moteshare travels to Mullah Rumi. Then the Mullah orders to bring Hallaj to kill him. Mansur accepts death satisfactorily, and then Moteshare asks the Mullah to ask a question from Hallaj about his religion. Then Mansur introduces his religion, not Islam, but the "religion of truth," and therefore, the Mullah issues his death sentence in the form of execution.

Therefore, after the discussions that takes place between Mansur, Mullah, and Moteshare, finally Mansur is executed. But after his death, Mansur's blood form on the ground in the form of "I'm the truth" and the Mullah understands that he has made a big mistake. Therefore, he collects his blood, pours it in a bottle, and takes with him to his house, and tell his family that it is the poison and no one should even touch it. The Mullah has a blind, deaf, and mad daughter who is not cured. On the day of Eid, when all the family members go out of the house, the daughter is left alone at home. The daughter gets angry and tries to commit suicide; therefore, she picks up the bottle of poison and drinks it, and she is healed at the moment. At the same time, the Mullah's wife arrives and when she sees her daughter, gets surprised, and when she tells Mullah about this event, Mullah gets astonished and says that God does not forgive us, who killed him in the Doomsday. In furtherance, the daughter tells his mother that she is pregnant. When the mother tells the father that their daughter is pregnant, the Mullah orders to hide this issue and to keep it as a secret. The child is born and her child is nobody, except "Shams Tabrizi." The daughter's parents know the story of this birth similar to the story of Jesus, and surprise at the formal beauty of this baby. Shams starts talking with his grandfather, Mullah, about the internal knowledge (Elm-e-Haal), and says to the Mullah Rumi, to leave the external knowledge and seek the divine science. Mullah asks Shams to tell him the difference: then Shams takes a book and throws it into the water, and brings it dried out of the water. This event causes Mullah to be interested in him, and he asks Shams to tell him more about this special kind of science. Shams gives some amount of money to Mullah, and asks him to buy some wine from a Jewish wine sale. Mullah goes and buys some wine from the Jewish person. When people see this scene attacks Mullah and during the fight, the wine bottles are broken, Shams arrives and change the wine to *Golab* (the rose water) in the bottle, with a miracle, and the Moteshareh (versed in law man) confirms Shams's words this during a trial. Then Shams and Mullah Rumi, go to a restaurant, and tells the cook that they were beggars and hungry, and asked the cook to give some food to them, when the cook does not give them any food, in front of their eyes, Shams orders the dead and cooked chickens to fly and they start flying. It makes people pay attention to them, and they rush toward them, so that they are about to die under their feet. This time, Shams, starts urinating in the public to distance people. People call them insane and leave them alone. Finally, Mullah asks Shams to help him during his mystical journey, and Shams teaches him the recitation of "Ya Ali," which believes that is a great recitation. Mullah replies that this recitation will lead him nowhere, and Shams replies that it is due to lack of knowing the fact of Ali, because you, Mullah, has not even known Shams, so how do you want to know Ali?

2.6.1. Studying the Work

Narrating this play, is not correct at all historically, because the real way of events and the chronological order of the causal relationships have disassembled, and the writer sewed some parts of the history deliberately, which do not have any logical and real relationship. At the beginning, it seems necessary to know that the text of "Manosur Hallaj's meeting" is not regarded as mourning at all, contrary to the notions of the reagents of the play; however, it should be regarded as a type of religious play, because, mourning is undoubtedly for the condolence and mourning ceremonies, but this text cannot be regarded as "Tragedy" in terms of the literary type, because in tragedy, the hero dies at the end, and does not succeed, but in this work, death has a meaning except its tragic meaning and it is the beginning of the hero's new life. In this article, Hallaj's characteristic, is presented in the form of two men. The first man is Hallaj himself, and the second man is Shams Tabrizi- the second Hallaj, who is in fact Hallaj after his first bodily death. The story starts with the Mansur's dialogue, who is explaining his famous sentence "I'm the Truth." He believes that it is an unconscious mood, of which he is also unaware.

Who is this hidden, in my body and soul
Who is talking with my tongue?

Who is this one, who is telling the secrets away with my lips?

Look for the owner of this sound (Mason Herbert W. 1995). Then, when he is faced with the harsh criticism of the Moteshare, starts discussing about the two different kinds of knowledge (divine, and discussion):

You studied the external knowledge
You didn't study the internal knowledge, you've left it
The formal world, is destroyed by it
The moral world remains eternal.

It is the same thing that thereafter, Halaj's characteristic in the body of Shams Tabrizi, refers to it:

What you have said, that external knowledge
Go and study, internal knowledge for some moments.

In furtherance, when the discussion continues, and Mullah Rumi enters the discussion as well, he expresses his idea which is based on the internal knowledge (not the external one) as the following:

My religion is the truth; truth is the name of me
Whatever except the truth is disgrace of me?

Then, he does not discuss anymore, and accepts his execution sentence easily:

Whoever said the truth, like Mansur should be executed? To be executed is the fate of the man of God.

At the time of his death, he said his last word as the following:

The truth does not destroy, it is eternal
There is no god, except God.

Therefore, the first face of Hallaj destroys in this play, formally, and then he reappears in the form of Shams Tabrizi (the second Hallaj) after a while. Here, the writer, has revealed his belief in the advent, the Hallaj's opponents have accused him of advent as well. The advent, whose factor is the remaining of the deceased blood and of course it is a new form of the advent, which is unprecedented among the ancient believers of the transmogrification such as Hindus, and other people, and even the apparently Muslim sects such as Khattabieh, and Bayanieh.

When Shams is born, the character of Hallaj, survives in the form of this character, and from the beginning, Shams retells Hallaj's words and repeats his claims. It starts from the Shams's first dialogue.

The truth light should be revealed
I'm the there is no god except the God
One is proud of his glory
The one is proud of his perfection
The other one is proud of beauty
The beneficent is proud of property
I'm the there's no god, except God.

Then, the secondary Hallaj, as it is written in some history books, took the Mullah's books and threw them in the water. Then he brought them out of water without being drenched, and in this way, he shows the difference between the external and internal knowledge, which were first mentioned by Hallaj, practically.

Then Shams characteristic, asks Mullah to go and buy a bottle of wine from a Jewish, to teach him the way of the mystical journey. First Mullah does not accept, but Shams overturns the external, the formal knowledge or the Sharia;

I'll invert whatever you've named knowledge and encourages him to do this job. He tells him that this is the first step to understand the internal knowledge and pass the external knowledge.

The interesting point is that, it seems that the writer, has been apparently Shia Imami, because he has depicted all the characters including Hallaj, Shams Tabrizi, and the Mullah Rumi, as Shia Imami. When the Mullah is going to teach his students, he teaches Sharh Lameh, a book in Shiite jurisprudence.

O' students open your books
I will teach Sharh Lameh.

At the end of the story, Shams Tabrizi, knows the story of recitation of Ya Ali as the fundamental principle of the mystical journey.

My recitation has been always Ya Ali
In all the moods, from the great secrets
This Ali is clear in all my affairs
I've passed this water.

Therefore, the Shia tendencies of the writer are attributed to Shams Tabrizi, which is in fact the Hallaj's soul after his death. It means that Hallaj is introduced both as Shia, and none of these three characters have been Shia, based on the historical documentations, and did not have any tendency to Shia.

At the end, it can be stated that "the Mansur Hallaj's Meeting" is a mythical work, because the characters are imaginary under real names of Shams Tabrizi, Mullah Rumi, Mansur Hallaj, and its events are imaginary and abnormal. Mansur Hallaj, who was murdered two hundred and ninety years ago before the Rumi's birth, is murdered based on the verdict of Mullah Rumi, Rumi. The Mullah Rumi's daughter drinks the deceased's blood which is in a bottle, and gets pregnant, and gives birth to Shams Tabrizi, who was born twenty-two years before his father! And Shams makes the dead and cooked chickens fly! These are not real and he has depicted his social and cultural notions in it. In other words, according to the German Article, "Barch," "the myth is the expression of truth of invisible phenomena in the languages of visible phenomena." The anonymous writer of this play has expressed the available attitudes in his national culture in the fields of ways to know the facts; the ability of human's sense in this recognition, and social-economical values of his society that are real but are hard to be seen, in the language of some phenomena that did not happen, but are able to be seen and touched.

2. Conclusion

According to the mystical and historical contexts, Hallaj has been a divine mystic, who claimed his union with God, and for this reason, and his other claims which were the result of union with God, was sentenced to death by the Islamic scholars and with the support of the people, and he was executed in 309 AH (922 AD).The Persian and non-

Persian poets and scholars have tried a lot to depict his life and thoughts, the honeymoon of which have been remained in different forms such as the sonnet, ode, and quatrain. However, in the field of dramatic literature, no work has been done in this field in the form of the screenplay, and since it is not common in the cinema around the world to publish the screenplay before recording the movie, no work has been achieved in the form of the screenplay about Hallaj. In the form of play, the effort to depict Hallaj does not have a long age, and the only ancient work in this field is the "Mansur Hallaj's Meeting" in the form of a religious play in the form of verse. This work, has presented the image of reviving Hallaj in the Shams Tabrizi's body, imaginatively, which is a distorted figure of the historical Hallaj. Yet, after this work, one can refer to the "Hallaj's Threnode" written by Arab Salah Abd Al-Sabour, in which the Hallaj's figure is depicted as a political revolutionary man, and a non-mystical reading has been presented from him. The next effort is "Hossein Ibn Mansur Hallaj's execution" by Siavash Tahmures, which is based on a selection-free adoption, of the Hallaj's Threnode and some extra changes in the original text. The final text achieved, has depicted the Hallaj's figure completely political with a mystical figure, which has a great difference with the real Hallaj.

The last effort, named "….and said you see today and…you see tomorrow and ….the day after tomorrow" by Nima Dehqani is the most recent work about Hallaj, which narrates Hallaj's life from his language, and is highly weak both in terms of playwriting techniques, and content and historical themes. At the end, it should be mentioned that all the efforts done have not been successful about the Hallaj's illustration in literature.

Among the most weaknesses of these works, one can refer to the incompatibility of the plays with a mystical approach to the Hallaj's life and his relative attention to the social and political dimensions of the character of this great mystic, and since these dramatic factors do not place in a coherent structure, sometimes suffer from surface look and sometimes from slogan-sickness.

Acknowledgements:

Authors are grateful to the South Teheran Branch, Islamic Azad University, Tehran for financial support to carry out this work.

Corresponding Author:
Mohammad Najjari, Kamel Ahmad Nezhad
South Teheran Branch, Islamic Azad University,
Tehran, Iran
Email: MNajjari75@yahoo.com

References

1. Malekpour, J. 2004. *The Iranian drama*. London: Frank Cass.
2. Mason Herbert W. 1995.Al-Hallaj.. Taylor & Francis Ltd.
3. Massignon Louis.1983. "Perspective Transhistorique sur la vie de Hallaj, " in: *Parole donnée*. Paris: Seuil, p. 73-97.
4. MOHAMMAD IKRAM CHAGHATAI, 2008, HUSSAIN BIN MANSOOR HALLAJ, ISBN No: 9693521684.
5. Muḥammad ibn Isḥāq Ibn al-Nadīm.1929. Fihrist. al-Maktabah al-Tijārīyah al-Kubrá, - 542 pages.
6. Sabar Afiaqe .2005. Hussain Bin Mansoor Hallaj, Takhleeqat Publishers.
7. Van Cleef, Jabez L. (2008). *The Tawasin Of Mansur Al-Hallaj, In Verse: A Mystical Treatise On Knowing God, & Invitation To The Dance*. CreateSpace.

8/25/2012

Development Center Network Strategic Plan Tehran University of Applied Science and Technology

Ensieh Zahedi

FacultyTechnical and Vocational University, Theran, Iran
ensiehzahedi@yahoo.com

Abstract: Corporate experts and planners consider strategic plan as one of the most effective organizational management approaches. Strategic planning and strategic management help organizations to face rapid changes in today's flowing, complicated, and changing world. Strategic plan provides a model for identifying and solving critical problems that an organization faces. A strategic model identifies organizational strengths and weaknesses; takes advantage of opportunities and situations; and provides guidelines to overcome weaknesses and threats that may endanger an organization. Strategic planning is an effective initiative to meet the challenges of a competitive and changing world.

[Ensieh Zahedi. **Development Center Network Strategic Plan Tehran University of Applied Science and Technology**. *Life Sci J* 2012;9(3):2234-2245] (ISSN:1097-8135). http://www.lifesciencesite.com. 321

Keywords: Strategic plan,Corporate,effective,organizational,challenge,competive

A strategic plan can help organizations to:

1) think strategically;
2) develop effective strategies;
3) identify priorities and make current decisions based on the possible future outcomes;
4) determine the future direction and build a logical framework for decision making;
5) employ maximum insight and intelligence;
6) solve main organizational problems;
7) improve organizational performance;
8) address change properly;
9) form expert and specialized work groups.
10) After separation from Education Ministry and joining Higher Education Ministry, University of Applied Science and Technology in compliance with Article 21 of 5th National Development Plan Regulations has undertaken the task of supporting and facilitating knowledge based projects and commercialization of innovative and evolutionary technologies proposed by its own professors and students. University Development Centers established with this objective shall be instrumental in new technological developments. The establishment of Development Centers in 31 Provinces with more than 1500 incubators for University of Applied Science and Technology shall require a complete strategic plan prepared by considering vision, outlook, mission, and value statement of University.

What Is Strategic Planning

Strategic planning is the art and science of development, implementation, and evaluations of decisions which enable an organization to achieve its long-term objectives. Strategic planning looks into the internal and external environments to devise strategies. It evaluates corporate strengths and witnesses in order to provide a framework for evaluation and supervision of external opportunities and threats.

Strategic planning is a continued and organized endeavor to develop and establish a framework that defines the purpose of an organization, what it will do, and what it will accomplish. Strategic planning provides a platform for communication and cooperation to direct the stakeholders' diverse interests and values toward the main organizational objectives. This platform promotes and encourages systematic decision making for successful implementation of the strategic plan.

Strategic planning requires:

1) Organizational leaders who believe in strategic planning and are willing to support it because they have accepted the fact that it is necessary and trust what it can provide;
2) Employees who support the strategic plan and are committed to its implementation;
3) Consensus among main decision makers for continued discussions about what strategic planning is and what is expected from it;
4) A logical framework for implementation of the strategic plan;
5) A plan to form a decision making or consulting committee to supervise the work in progress;
6) A plan to establish a competent group for information collection, meeting arrangements, and drafting the strategic plan;
7) Identification of what needs to be done to address opportunities and threats;
8) Preparation of an action plan which is politically acceptable, is technically possible, and is morally responsible;

9) Attraction of external support and assistance during work progress;
10) Constant focus on strategic thinking and actions, and not getting overwhelmed by implementation process; and
11) Training programs on the strategic direction, objectives, and process to encourage employee and stakeholder participation as a critical factor for success of the strategic plan.

Strategic Planning Glossary

Vision:	A clear perspective of organizational ideals
Mission:	A statement of organizational philosophy and the nature of its business; A mission statement includes organizational objectives, responsibilities, characteristics, and values.
Values:	A set of principles that an organization adheres to
Strategy:	A path for achieving corporate mission and/or objectives
Strategic Plan:	A collection of principles, procedures, and tools that help organizational leaders and managers to control and adapt to a changing environment.
Strategic Planning:	A process for evaluating the present organizational standing, determining its future direction, deciding on objectives, developing strategy, formulating actions to implement strategy, evaluating the outcome, and assessing the effectiveness of strategy implementation
Stakeholders:	A group of internal and external individuals who are associated with an organizational, affect its operations, and contribute to its achieving the set objectives, and, in return, receive positive or negative consequences of its activities
Strengths (S):	A collection of corporate capabilities and internal resources that support the achievement of organization objectives
Weaknesses (W):	A combination of internal limitations and shortcomings that prevent an organization from achieving its objectives
Opportunities (O):	A set of external environmental factors whose identification and utilization will help an organization to strengthen its abilities in achieving its objectives
Threats (T):	A set of external factors that prevent an organization from achieving its objectives
SO Strategies:	Strategies devised based on organizational strengths in order to take advantage of opportunities in an attempt to pursue organizational objectives
ST Strategies:	Strategies that control threats or transform them into opportunities
WO Strategies:	Strategies that take advantage of opportunities to address shortcomings
WT Strategies:	Strategies that organizations select for survival or for addressing weaknesses and threats
Development Centers:	A center established by an academic institution with the support and cooperation from Ministry of Higher Education to facilitate research and development activities which contribute to the advancement of science and/or creation of wealth
Development Center Network:	A group of development centers in different geographical locations with given responsibilities and/or assignments that remain in close contact with each other in order to, physically or virtually. share resources, information, opportunities, and the like

Values

1) Attention to overall plans (especially the twenty-year outlook) and the national needs specified in the central plan;
2) Commitment to scientific methods and avoiding personal, group, and political considerations in research activities;
3) Respect for individuals as the main asset;
4) Optimum utilization of time and resources in research activities;
5) Cooperation, coordination, and mutual support of Center employees in achieving objectives; and

6) National and international interaction plus continued communication with outside environment.

Outlook

Continued and sustainable technology development and commercialization of research outcomes for the advancement of human benefits with emphasis on proper values and morality

Mission

Tehran University of Applied Science and Technology has set the following missions for its plan for a Development Center Network in compliance with the national science and technology guidelines:

1) Advancement of scientific, research, and management capabilities for further development;
2) Analysis of business environment in respect to technological products and publication of the results; and
3) Support targeted communication with industries and operations units for commercialization of knowledge-based projects.

Mission Statement

Research Deputy of Tehran University of Applied Science and Technology shall undertake the
following responsibilities assigned based on the plan decided for the University and taken from the twenty-year outlook set for Islamic Republic of Iran.

- Practical and developmental research related to technical and professional trainings; and
- Human resource training and development for Research Department aimed at increasing employee capabilities.

Overall Objectives

1) Create a platform for commercialization of research outcomes;
2) Create entrepreneurial opportunities by supporting innovation and creativity among young researchers;
3) Support local economy by providing technological advancement;
4) Facilitate the development and growth of small and mid-sized knowledge and technology oriented business units in different technological fields;
5) create an environment that offers proper technology-related job opportunities to attract university graduates and entrepreneurial minded individuals; and
6) Produce and develop marketable products and technical processes.

Responsibilities

1) Provide financial support to active unites in Development Center;
2) Obtain legal support to facilitate rapid growth of active unites in Development Center;
3) Provide the required services and counseling to active unites to help them produce marketable products from innovative ideas and commercialization of those products;
4) Supervise the growth of active unites and provide continuous analysis of their productions with the objective to increase Development Center efficiency;
5) Supervise activities of technological units to help them realize their idea-orientation philosophy; and
6) Establish Primary Development Department, if required.

Stakeholders' Benefits

A. University

1) Recognition
2) Income from middle and final development phases (in addition to early phase) for wealth accumulation;
3) Support for students who are active in entrepreneurial fields;
4) An entrepreneurial environment for students and faculty; and
5) Effective organization and utilization of University resources.

B. Entrepreneurs

1) Facilitate commercialization of new technologies through establishment of and support for the new companies;
2) Provide academic technological supports, even in development and growth phases;
3) Use past University experience in establishing new companies;
4) Use University reputation for product commercialization and market positioning;
5) Reduce cost of establishing new companies through utilization of Development Center facilities;
6) Use University relationships with large state and private entities;
7) Obtain institutional financial resources for capital increase;
8) Facilitate rapid production of sample products; and
9) Reduce commercial, managerial, and financial risks.

C. Society

1) Establish strong interactions among university, industry, and market;
2) Develop practical knowledge base and facilitate its transfer;
3) Develop and promote technology;

4) Help local economic development by establishing new companies and creating new activities;
5) Create employment opportunities;
6) Promote and encourage risky investment in the general public; and
7) Increase social welfare.

Environmental Factors

A. Threats

1) Low awareness and knowledge of policy makers and mangers about the value of making policies for science and technology;
2) Low cooperation with media for presentation and communication of research results;
3) Lack of trust on the part of policy makers for scientific activities and the result of research;
4) Wasting available resources for operations expenses and inability to complete research assignments;
5) Work duplication and parallel projects;
6) Restriction in utilizing human and financial resources available in government sector;
7) Lack of policy stability due to changes of management in government organizations;
8) Official interests for short-term research projects;
9) Lack of attention to national needs when defining research projects;
10) Distributed decision making centers for science and technology policies; and
11) Continuous improvements of international standards in science and technology fields.

B. Opportunities

1) Existence of different centers (Development Centers and Parks) active in science and technology fields;
2) Policy makers' interested in science and technology issues;
3) Direct access and interaction with science and technology parks;
4) Interests of external organizations for cooperation and possible modeling;
5) Entrepreneurial training programs in universities across the country;
6) Access to sufficient knowledge and experience for commercialization of technologies;
7) Emergence of new technologies which require further study and policy making;
8) Leader's serious interest and sensitivity to science and technology issues; and
9) Interest for national advancement, especially in the training and research activities of Ministry of Science, Research, and Technology.

Internal Factors

A. Strengths

1) Interested individuals in research and entrepreneurship who are creative and have good ideas;
2) Offering entrepreneurship training courses as required and specialization courses in all university fields of study and in different degree programs;
3) Availability of higher education in all provinces with regional and province administrations;
4) Work diversification in the existing educational branches of Ministry of Science, Research, and Technology;
5) Employment quota and financial aid for faculty;
6) Availability of funds for primarily research;
7) Availability of faculty members of the related universities and committed expert individuals across the country for part-time engagement in research and teaching programs;
8) Availability of a huge number of young technicians and work force in Country compared to what universities can offer;
9) Ongoing expansion of basic and practical research in certain fields of science and technology;
10) Availability of scientific specialization across Country in form of 34 specialized committees covering the fields approved by Ministry of Science, Research, and Technology;
11) Decades of educational activities in technical and professional higher education plus support offered by former directors of technical and professional education in Iran; and
12) Cooperation of university directors and training institutions with the directors of science and technology parks and/or university development centers.

B. Weaknesses

1) Lack of a framework for coordinated interaction with stakeholders;
2) Shortcomings of research support services;
3) Shortage of sufficient and suitable researchers. Mismatch of Center employee capabilities with their responsibilities;
4) Inefficiency of operations and support activities;
5) Lack of publicity about University of Applied Science and Technology units at main universities. Lack of contact with outside entities that make science and technology policies;

6) Negligence in presenting the results of activities. Lack of sufficient assurance for applying research outcome;
7) Shortcomings in control and evaluations
8) Shortness of the time it takes to be accepted and approved by Ministry of Science, Research, and Technology. Non-existence of a proper organizational research structure in academic institutions;
9) Insufficient ICT infrastructure together with dispersion of research and technological activities in academic institutions;
10) Absence of a comprehensive and integrated information-operations system in science and technology;
11) Lack of compliance with standards established for design and implementation of systems used for information generation and communication;
12) Insufficient promotion of entrepreneurial culture and education among policy makers, decision makers, technology producers, and technology users;
13) Lack of belief in utilization of the young work force and talents in policy making, planning, and decision making in science and technology;
14) Insufficient utilization of the private sector capacities;
15) Insufficient financial resources together with the failure to allocate funding for research and technology on timely basis.

Strength - Opportunity (SO) Strategies

1) Establish and support cooperation with the development centers established by other universities and scientific associations;
2) Support cooperation with universities that offer entrepreneurial training programs and encourage student participation in multidisciplinary research projects with cooperation from several universities;
3) Support national development programs across country with programs that include all higher education fields of study approved by Ministry of Science, Research, and Technology;
4) Create new fields of study for emerging new technologies and attract experts in these fields;
5) Expand the development center network with the help of involved individuals based on entrepreneurial and commercialization potential of the existing projects;
6) Interact with Developmental Centers and science/technology parks in different activities of existing projects as designer, technician, and/or operator; and
7) Form partnership with development funds to take advantage of the investment opportunities.

Strengths (S)	**Opportunities (O)**
Creative individuals with ideas who are interested in research and entrepreneurship; Course offering in entrepreneurship as specialization course in all university fields of study at different degree levels; Availability of higher education in all provinces with regional (10 regions) and province administrations; Work diversification in the existing educational branches of Ministry of Science, Research, and Technology; Employment quota and financial aid for faculty; Availability of primarily research funding; Availability of faculty members of the related universities and committed expert individuals across the country for part-time engagement in research and teaching programs; Availability of a huge number of young technicians and work force in Country compared to what universities can offer; Ongoing expansion of basic and practical research in certain fields of science and technology; Availability of scientific specialization across	Existence of different centers (Development Centers and Parks) active in science and technology fields; Policy makers' interested in science and technology issues; Direct access and interaction with science and technology parks; Interests in external organizations for cooperation and possible modeling; Entrepreneurial training programs in universities across the country; Access to sufficient knowledge and experience for commercialization of technologies; Emergence of new technologies which requires further study and policy making; Leader's serious interest and sensitivity to science and technology issues; and Interest for national advancement, especially in the training and research activities of Ministry of Science, Research, and Technology.

Strengths (S)	Opportunities (O)
Country in form of 34 specialized committees covering the fields approved by Ministry of Science, Research, and Technology; Decades of educational activities in technical and professional higher education plus support offered by former directors of technical and professional education in Iran; and Cooperation of university directors and training institutions with directors of science and technology parks and/or university development centers.	

S	Strength - Opportunity (SO) Strategies	O
S1	1) Establish and support cooperation with the development centers established by other universities and scientific associations;	O8
S2	2) Support cooperation with universities that offer entrepreneurial training programs and encourage student participation in multidisciplinary research projects with cooperation from several universities;	O5
S3	3) Support national development programs across country with programs that include all higher education fields of study approved by Ministry of Science, Research, and Technology;	O9
S5	4) Create new fields of study for emerging new technologies and attract experts in these fields;	O7
S2	5) Expand the development center network with the help of involved individuals based on entrepreneurial and commercialization potential of the existing projects;	O1
S8	6) Interact with Developmental Centers and science/technology parks in different activities of existing projects as designer, technician, and/or operator; and	O1
S6	7) Form partnership with development funds to take advantage of the investment opportunities.	O4

Strength - Threat (ST) Strategies

1- Quantitative and qualitative increase of research;
2- Research activities at national level;
3- Increased interaction between development center directors and policy makers to introduce policy makers with the services these centers provide;
4- Increased interaction between development center directors and other research centers to encourage participation in regional projects;
5- Emphasis on short-term and subject-oriented research projects based on national scientific and technological needs;
6- Management over development center activities through a centralized network;
7- Devised new activities by combining entrepreneurial plan, project, and apprenticeship for optimum utilization of available resources.

Strengths (S)	Threats (T)
1) Creative individuals with ideas who are interested in research and entrepreneurship; 2) Course offering in entrepreneurship as specialization course in all university fields of study at different degree levels; 3) Availability of higher education in all provinces with	1) Low awareness and knowledge of policy makers and mangers about the value of making policies for science and technology; 2) Low cooperation with media for presentation and communication of research results; 3) Lack of trust on parts of policy makers for scientific activities and the result of research;

Strengths (S)	Threats (T)
regional (10 regions) and province administrations; 4) Work diversification in the existing educational branches of Ministry of Science, Research, and Technology; 5) Employment quota and financial aid for faculty; 6) Availability of primarily research funding; 7) Availability of faculty members of the related universities and committed expert individuals across the country for part-time engagement in research and teaching programs; 8) Availability of a huge number of young technicians and work force in Country compared to what universities can offer; 9) Ongoing expansion of basic and practical research in certain fields of science and technology; 10) Availability of scientific specialization across Country in form of 34 specialized committees covering the fields approved by Ministry of Science, Research, and Technology; 11) Decades of educational activities in technical and professional higher education plus support offered by former directors of technical and professional education in Iran; and 12) Cooperation of university directors and training institutions with directors of science and technology parks and/or university development centers.	4) Wastage of available resources for operations expenses and inability to complete research assignments; 5) Work duplication and parallel projects; 6) Restriction in utilizing human and financial resources available in government sector; 7) Lack of policy stability due to change of management in government organizations; 8) Official interests for short-term research projects; 9) Lack of attention to national needs when defining research projects; 10) Distributed decision making centers for science and technology policies; and 11) Continuous improvements of international standards in science and technology fields.

S	Strength - Threat (ST) Strategies	T
S1	1) Quantitative and qualitative increase of research;	**T3**
S2	2) Research activities at national level;	**T3**
S3	3) Increased interaction between development center directors and policy makers to introduce policy makers with the services these centers provide;	**T3**
S10	4) Increased interaction between development center directors and other research centers to encourage participation in regional projects;	**T11**
S12	5) Emphasis on short-term and subject-oriented research projects based on national scientific and technological needs;	**T8**
S3	6) Management over development center activities through a centralized network;	**T5**
S6	7) Devised new activities by combining entrepreneurial plan, project, and apprenticeship for an optimum utilization of available resources.	**T6**

Weakness - Opportunity (WO) Strategies

1- Establish a network of specialized and interested individuals in science and technology policies;
2- Employ competent individuals for research projects at the development centers;
3- Establish a communication network with stakeholders;

4- Make structural changes in organization to increase the productivity of center activities (i.e. design systems for communication between work groups, and between work groups and management to facilitate information exchange, assignment of responsibilities, etc.);
5- Improve operational and administrative system (including finance, contracts, secretariat, etc.);
6- Improve evaluation and classification systems for research projects;
7- Improve employee and faculty evaluation systems;
8- Improve support services for research projects;
9- Improve incentive systems for faculty.

Weaknesses (W)	Opportunities (O)
1) Lack of a framework for coordinated interaction with stakeholders; 2) Shortcomings of research support services; 3) Shortage of sufficient and suitable researchers. Mismatch of Center employee capabilities with their responsibilities; 4) Inefficiency of operational and support activities; 5) Lack of publicity for University of Applied Science and Technology units in the main universities; and low contact with outside entities that make science and technology policies; 6) Negligence in presenting the results of activities; and lack of sufficient assurance for applying research outcome; 7) Shortcomings in control and evaluations; 8) Shortness of the time that takes to be accepted and approved by Ministry of Science, Research, and Technology; and non-existence of a proper organizational research structure in academic institutions; 9) Insufficient ICT infrastructure together with dispersion of research and technological activities in academic institutions; 10) Absence of a comprehensive and integrated information-operations system in science and technology; 11) Lack of compliance to standards established for design and implementation of systems used for information generation and communication; 12) Insufficient promotion of entrepreneurial culture and education among policy makers, decision makers, technology producers, and technology users; 13) Lack of belief in utilization of the young work force and talents in policy making, planning, and decision making in science and technology.	1) Existence of different centers (Development Centers and Parks) active in science and technology fields; 2) Policy makers' interested in science and technology issues; 3) Direct access and interaction with science and technology parks; 4) Interests in external organizations for cooperation and possible modeling; 5) Entrepreneurial training programs in universities across the country; 6) Access to sufficient knowledge and experience for commercialization of technologies; 7) Emergence of new technologies which requires further study and policy making; 8) Leader's serious interest and sensitivity to science and technology issues; and 9) Interest for national advancement, especially in the training and research activities of Ministry of Science

W	Weakness - Opportunity (WO) Strategies	O
W6	1) Establish a network of specialized and interested individuals in science and technology policies;	**O1**
W6	2) Employ competent individuals for research projects at development centers;	**O5**
W1	3) Establish communication network with stakeholders;	**O4**
W7	4) Make structural changes in organization to increase the productivity of center activities (i.e. design systems for communication between work groups, and between work groups and management to	**O4**

	facilitate information exchange, assignment of responsibilities, etc.);	**O4**
W7	5) Improve operational and administrative system (including finance, contracts, secretariat, etc.);	**O4**
W8	6) Improve evaluation and classification systems for research projects;	**O4**
W8	7) Improve employee and faculty evaluation systems;	**O4**
W4	8) Improve support services for research projects;	**O4**
W4	9) Improve incentive systems for faculty.	

Weakness - Threat (WT) Strategies

1- Non-existence of a link between research projects in the development center and similar projects in other centers;
2- Non-acceptance of operational activities and reduction in existing operational activities.

Weaknesses (W)	**Threats (T)**
1) Lack of a framework for coordinated interaction with stakeholders; 2) Shortcomings of research support services; 3) Shortage of sufficient and suitable researchers; and mismatch of Center employee capabilities with their responsibilities; 4) Inefficiency of operational and support activities; 5) Lack of publicity for University of Applied Science and Technology units in the main universities; and low contact with outside entities that make science and technology policies; 6) Negligence in presenting the results of activities; and lack of sufficient assurance for applying research outcome; 7) Shortcomings in control and evaluations; 8) Shortness of the time that takes to be accepted and approved by Ministry of Science, Research, and Technology; and non-existence of a proper organizational research structure in academic institutions; 9) Insufficient ICT infrastructure together with dispersion of research and technological activities in academic institutions; 10) Absence of a comprehensive and integrated information-operations system in science and technology; 11) Lack of compliance to standards established for design and implementation of systems used for information generation and communication; 12) Insufficient promotion of entrepreneurial culture and education among policy makers, decision makers, technology producers, and technology users; 13) Lack of belief in utilization of the young work force and talents in policy making, planning, and decision making in science and technology.	1) Low awareness and knowledge of policy makers and mangers about the value of making policies for science and technology; 2) Low cooperation with media for presentation and communication of research results; 3) Lack of trust on parts of policy makers for scientific activities and the result of research; 4) Wastage of available resources for operations expenses and inability to complete research assignments; 5) Work duplication and parallel projects; 6) Restriction in utilizing human and financial resources available in government sector; 7) Lack of policy stability due to change of management in government organizations; 8) Official interests for short-term research projects; 9) Lack of attention to national needs when defining research projects; 10) Distributed decision making centers for science and technology policies; and 11) Continuous improvements of international standards in science and technology fields.

W	**Weakness - Threat (WT) Strategies**	**T**

W1	1) Non-existence of a link between research projects in the development center and similar projects in other centers;	**T5**
W4	2) Non-acceptance of operational activities and reduction in existing operational activities.	**T4**

University Development Center Network Policies and Strategies

Based on analysis of strength, weaknesses, opportunities, and treats the proposed policies and strategies are provided as follows:

No	Over Policies for University Development Center Network	Strategies	Programs
1	Research and Technology Arrangement and Development	1) Reinforce the required infrastructure for research and technological development;	- Integrated planning, positioning, and development for the development center - Link development centers in different levels - Make structural changes in organization to increase the productivity of center activities (i.e. design systems for communication between working groups, and between working groups and management for information exchange, assignment of responsibilities, etc.);
		2) Improve and strengthen resources;	- Provide the required funding; - Establish scientific, research, and technology networks; - Support research, entrepreneurial centers and development center network; - Develop specialized, committed, and competent personnel as required by the development center;
		3) Improve evaluation and monitoring systems of development center network;	- Design and implement performance evaluation and monitoring system for the development center;
		4) Promote and internalize research and entrepreneurship culture; and	- Publicize and distribute the development center reports;
		5) Support and develop development centers	- Implement product quality assurance programs for the development center; - Utilize state and private sectors potentials for investment and implementation of projects; - Establish or organize technological units in all development centers.
2	Identification and fulfillment of commitments set for the development center of Tehran University of Applied Science and Technology as part of the overall objectives for the growth and expansion of research and technology among universities	1) Support and develop infrastructure to expand development centers according to the national development programs	- Planning and positioning of national development center network in compliance with national preparation program.
		2) Enforce positioning and classification system for scientific groups in academic, research, and technology institutions; and	- Provide opportunities for participation of development center network in positioning and classification of academic, research, technology, and scientific institutions and/or groups

No	Over Policies for University Development Center Network	Strategies	Programs
		3) Increase interaction between academic development center network with policy making and technology planning center of the related Ministry	Engage the development center network in programming of policy making center and technology planning of the relevant ministry
3	Identification and fulfillment of commitments set for the development center of University of Applied Science and Technology in compliance with national development and preparation programs	1) Improvement and development of production standards;	Review and implement production standards
		2) Expansion of the development center network according to national preparation program; and	Design and position national development center network according to national preparation program
		3) Organize and support the development center technological activities	Extend technological units activities with the participation of state and private sectors
4	Identification and fulfillment of commitments set for the development center network according to national development objectives at regional and international levels	1) Interactions development with international institutions and organizations related to the development center network	Subscribe to "fundamental principles of official activity" advocated by International Trade Organization for technology production Conduct joint activities between development center network and the related international organizations Provide complete information about activities conducted by development center network to international organizations and institutions Create an information database about relevant international organizations and institutions
5	Participation of private sector in University development center network activities	1) Create a platform for growth, development, and participation of private sector (scientific associations, research centers, investment and knowledge-based companies) in University development center network activities	Utilize private consulting, scientific, and technologic services for development center network activities Utilize private sector services in research projects and implement technologic projects conforming to development center network policies

Reference Documents

Analysis of reference documents is critical in order to make strategic planning and policies for a Development Center Network for University of Applied Science and Technology.

Statistical population for drawing strategic plan for University Development Center Network included Civil Laws; National Outlook Document; National Overall Policies; Leader's guidelines; Cultural Revolution Council approvals; 5th Development Program Regulations; Regulations Pertaining to Objectives, Responsibilities, and Organization of Ministry of Science, Research, and Technology, Higher Education Statement for the Next Century; and Statement of International Science Conference for 21st Century.

Additional reference documents reviewed for this proposal included Science, Research, and Technology Minister's plan; National Provisional Document for Attraction Criteria, Departmental Strategic Plans (National Plan for the Scientific Development System, National Plan for the Technological Development System, Technological Prioritization Plan, Research and Technology Department Documents, Strategic Plan for the Technological Development System, Strategic Plan for the National Scientific Development System, National Document for Higher Education Development in 5th National Development Plan, and Document for Research and Technology Development in 5th National Development Plan).

Policies

The following policies are proposed based on the review and analysis of the reference documents pertaining to science, research, and technology:

1) Organization and development of Research and Technology;
2) Identification and fulfillment of commitments to be made for University Development Center Network pertaining to objectives set for research and technology development in regional universities;
3) Identification and fulfillment of commitments to be made for University Development Center Network in compliance with the objectives of national development and preparation program;
4) Identification and fulfillment of commitments to be made for University Development Center Network in compliance with national development objectives for region and world; and
5) Encouragement of private sector participation in University Development Center Network activities.

Proposed SWOT Strategies

1) Reinforce the required infrastructure for research and technological development;
2) Improve and increase resources;
3) Improve evaluation and monitoring systems for Development Center Network;
4) Promote and internalize research and entrepreneurship culture;
5) Support and develop Development Centers;
6) Support and develop infrastructures to help for expansion of Development Centers according to the national preparation plan ;
7) Support and develop positioning and classification systems for academic, research, and technology institutions and scientific groups;
8) Support interaction of University Development Center Network with the Center for Technological Policy and Planning in the related Ministry;
9) Support and develop production standard;
10) Expand University Development Center Network in conforming to National Preparation Plan;
11) Support and organize technology related activities for University Development Centers;
12) Develop interactions with international organizations and institutions related to University Development Center Network;
13) Develop a platform for growth, development, and participation of private sector (scientific associations, research centers, investment and knowledge-based companies) in University Development Center Network activities;

Corresponding Author:
Ensieh Zahedi
Faculty, University of Applied
Science and Technology, Theran, Iran
Mobile:+989123224553
ensiehzahedi@yahoo.com

Reference

- Ministry of Science, Research, and Technology Strategic Plan
- Higher Education Research and Planning Institutions Strategic Plan.

8/26/2012

Enhancement of probiotic bioactivity by some prebiotics to produce bio-fermented milk

Amnah A. H. Rayes

Biology Department - Faculty of Applied Science, Umm Al-Qura University Kingdom of Saudi Arabia
ahlel7aei@gmail.com; rayes1025@hotmail.com

Abstract: Fermented milk Samples were prepared by adding 3% (w/v) of honey I, II or Inulin to cow's milk, and 2% starter fermented milk. The culture consisted of *Lactobacillus delbreuckii* subspp *bulgaricus* and *Streptococcu thermophilus* 1:1 plus 5% *(Bifidobacterium bifidum* (*B. bifidum) or 2% Lactobacillus rhamnosus* or2 % *Lactobacillus reuteri).* Lactic acid bacterial count, acetaldehyde, acidity as lactic acid values and organoleptic evaluation when fresh and during storage were determined. Counts of LAB and probiotic strains reached their maximum on the 5th days of storage in different samples. Honey II had highest effect on the growth and viability of probiotic strains. All fermented milk samples with prebiotic substances had a high scores compared to controls. All treatments with *B. bifidum* had higher organoleptic scores. Non-significant differences between effects of honey I, II or inulin on organoleptic scores.
[Amnah A. H. Rayes. **Enhancement of probiotic bioactivity by some prebiotics to produce bio-fermented milk**. *Life Sci J* 2012;9(3):2246-2253] (ISSN:1097-8135). http://www.lifesciencesite.com. 322

Key words: Function food, Probiotic, prebiotic, honey, inulin.

1-Introduction

Probiotics are technically defined as live microbial food ingredients that have a beneficial effect on human health. Some of the important beneficial effects are antimicrobial activity, immune system modulation, antimutagenic activity, colonization resistance activity, maintenance of micro-ecology of bowel, stimulation of *Bifidobacteria,* deactivation of carcinogens etc. Commercially available probiotic strains belong to genera *Lactobacilli*, *Bifidobacterium, Streptococcus, Bacillus, Bacteriodes, Pediococcus, Leuconostoc, Propionibacteruim* **(Douglas & Sanders, 2008; Meile, et al., 2008; and Tharmaraj, et al., 2004),** *Saccharomyces cerevisia* and *Aspergillus oryzae* **(Verma & Singh,1995)**

Dairy products are the most common carrier that have been used as probiotic food products **(Lourens-Hattingh and Viljoen, 2001; TianHong and XiangChen, 2004).**

Some Lactobacillus spp. and som *Bifidobacterium spp*. are considered sensitive in dairy products, but this sensitivity was different in different strains (**Nighswonger *et al.*, 1996; Gilliland *et al.*, 2002)**. However, it has found that Bifidobacteria have been reported to show weak growth in milk and require an anaerobic environment and the addition of bifidogenic factors (as prebiotic) to achieve the desired levels of growth **(Kailasapathy and Chin, 2000; Lourens-Hattingh and Viljoen, 2001; Matto *et al.*, 2006b; Donkor *et al.*, 2007).**

Prebiotics are nondigestible food ingredients that beneficially affect the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in colon that can improve the host health **(Nimess, 1999).**

When prebiotics are used in combination with probiotics or live bacteria, the resultant has synergistic effects, referred to as "synbiotic". This is because in addition to the action of probiotics that promote the growth of existing strains of beneficial bacteria in the colon, prebiotics such as inulin and oligofructose also act to improve the survival, implantation and growth of newly added probiotics strains.

Inulin is a mixture of polymers consisting mainly of fructose unit; its partial enzymatic hydrolysis yields oligofructose (**Amiri et al., 2010**). A lot of scientific studies *in vivo* have shown that FOS and Inulin have bifidogenic effect on host; When consumed at a dose of 5g/day for oligofructose and ≤ 8 g/day for inulin, they significantly modify the composition of the intestinal (faecal) flora, selectively increasing the numbers of Bifidobacteria and reducing the harmful bacteria (**Gibson and Wang, 1994b; Reddy *et al.* 1997; Roberfroid *et al.* 1998; Rao. 1999; Tuohy *et al.* 2000; Menne *et al.* 2000, Mehanna, et al., 2003a)**

As a prebiotic, honey contains carbohydrates called oligosaccharides, which may improve gastrointestinal health by stimulating the growth of good bacteria in the colon. Honey has been shown to enhance growth, activity of *Bifidobacteria* in fermented dairy food **(Mehanna et al., 2003b; Sanze *et al*, 2005)**

The consumption of probiotic bacteria within food products is the most popular way to re-establish the gastrointestinal microflora balance. (**Adhikari *et al.*, 2003).**

The aim of this research is enhancement of probiotic bioactivity by some prebiotics to produce bio-fermented milk; this is because in addition to the

action of probiotics that promote the growth of existing strains of beneficial bacteria in the colon, also it acts to improve the survival, implantation and growth of newly added probiotics strains. Thus this study showed which one of prebiotic substances when added to milk maintains a viable, large population during refrigerated storage, not less than 10^6 in order to meet the requirement of a "probiotic" food (**Rybka and Kailasapathy, 1995; Dave and Shah, 1997; Lourens-Hattingh and Viljoen, 2001; Adhikari *et al.*, 2003)**

2. Materials And Methods

Bacterial strains:

Streptococcus thermophilus, Lactobacillus delbreuckii subsp. Bulgaricus and *Bifidobacterium bifidum* were obtained from Chr. Hansen's Lab., Denmark. Strain of *Lactobacillus reuteri, B-14171and Lactobacillus rhamnosus B-445* were provided by Northein Regienal Research Lab., Illinois, USA, (NRRL).

Prebiotics:

Inulin: was obtained from Canada market. Chemical composition of it was 91(±2.0) %

Honey: Two kinds from row Honey were obtained from Kingdom of Saudi Arabian markets**.**

Milk: Fresh whole cow's milk was obtained from Kingdom of Saudi Arabian markets**.**

Expermintal procedure

Preparation of fermented milk with different additives:

Samples were prepared by adding 3 percent (w/v) of honey I, II or Inulin to cow's milk as described by **Mehanna (2003a,b).** A control of cow's milk without any additives was also prepared. All samples were heated to 85° C for 30 min., cooled to 42° C and each sample was divided into three portions. The first portion was inoculated with 2% starter fermented milk + 5% *Bifidobacterium bifidum*, the second portion was inoculated with 2% starter fermented milk + 2% *Lactobacillus reuteri,* where as the third one was inoculated with 2% starter yogurt + 2% *Lactobacillus rhamnosus*. The inoculated milk samples were incubated at 42° C for 3 hours. The samples were stored at refrigerator temperature (5° C), three replicate were made from each treatment.

Analytical procedures:

Growth of strains in batch cultures:

Hundred ml of sterilized respective media for growth of each strains were prepared in Erlenmeyer flasks (250 ml in volume). The flasks were inoculated with 1 ml standerd inoculum of respective strain and shaked (rotary shaker incubator with 160 rpm for 24 hrs. at 37° C). Samples (5 ml) were taken from the growing cultures periodically under aseptic condition to determine the bacterial growth rate by measuring the O.D. at 650 nm using a UV-VIS spectrophotometer (model 8452, Hewlett-Packard).

Growth rate and generation time were calculated from exponential phase using the following equation according to **Shin et al., (2000).**

$\mu = L n x – L n x o / t – t o$

$d t = Ln2 / \mu$

Where : h = growth rate (hr-1)

xo = growth density at zero time

x = growth density after time

dt = generation time (hr)

Microbiological Analysis

Bifidobacterium bifidum was determined according to **Blanchette et al. (1996)** using modified MRS agar (Oxoid) supplemented with 0.05% L. cysteine-HCL (Merck, Germany). Plates were incubated at 37°C for 48 h. under anaerobic conditions (BBL Gas Pak, Becton Dickinson, Cockeysville MA, USA).

3.3.4. *Lactobacillus rhamnosus* was counted on LC agar (**Ramakanth and Nagendera, 1998).** Plates were incubated anaerobically at 27°e for 72- 96h.

Lactobacillus reuteri was enumerated on MRS-arabinose agar. MRS basal medium was prepared without dextrose, and 10 ml of membrane-filtered sterile solution of 10%L-arabinose was added per 90 ml of basal medium (10% final concentration) just before pouring the agar medium. Plates were incubated anaerobically at 37°e for 48 h.

Coliforms were enumerated according to **Harrigan and McCance (1996)** using Violet Red Bile agar medium. The plates were incubated at 37°C for 24 h.

Moulds and yeasts were determined according to Standard Methods for Examination of Dairy Products **(APHA, 1994).**

Chemical analysis:

All fermented milk samples were examined for titratable acidity (T.A%) according to International Dairy Federation **IDF (1991),** acetaldehyde content was determined as described by Lees and Jago (1969).

Sensory Evaluation

Fermented milk samples were organoleptically scored when fresh and throughout the storage period by 25 volunteer panelists according to the International Dairy Federation IDF(1997) as follow: acceptability, flavour, appearance and texture.

3. Results and Dissection

Fig (1) (A, B, C) show the effect of prebiotics on specific growth of all probiotic strains. This effect was dependent on the strains and kind of prebiotic in the growth medium.

All prebiotics substances were effective in enhancing growth rate of all probiotic strains without significant differences between them compared with control.

Table (1) shows the doubling time of each probiotic strain in the presence of prebiotics substances. Doubling time was used as a measure of

the efficacy of prebiotic substance in modulating growth rate. Growth promotion of probiotic strains by prebiotics were dependent on kind of prebiotic as evidenced by decreased doubling time with all prebiotics substances. The data indicated that for all probiotic strains provided the shortest doubling times compared with control. We can notice that honey II had the highest effect on the doubling time for all strains.

These results are in line with those found by **Dubey & Mistry (1998) and Mehanna et. al. (2003a,b)** .who found that generation times were affected by honey and inulin.

These results are consistent with previous reports on the ability of FOS (fractoligosaccharied) – honey contain FOS and other oligosaccharides beside another sweeteners - to stimulate the proliferation of Bifidobacteria relative to other intestinal microflora in vitro culture models simulating the colon **(Gibson and Wang 1994a).**

Activity of *B. bifidum La. rhamnosus, and Lac. reuteri* greatly enhanced when these organisms were grown in the presence of honey or inulin especially with honey II as evidenced by acetaldehyde and acidity (as lactic acid) production (Fig. 2) this result agree with **Amiri et al., 2010**. The effect of acetaldehyde production was more pronounced. Also, we noticed that the acetaldehyde was higher in the strains of probiotic *B. bifidum*. These results agree with **Baranowska (2006), Salama (2002), Rasic & Kurmann (1978) and (Abo-Donia et al., (1992**). They reported that, adding of *bifidobacterium* to lactic ferment starter highly activated the production of the acetaldehyde. This may be due to threonine which present in honey (**Janiszewska et al., 2012)**. Threonine had enhancement effect to the production of acetaldehyde (**Baranowska, 2006).**

Table (1) Effect of prebiotics on doubling time of probiotic bacteria

Species	Doubling time (min)			
	0	3% honey I	3% honey II	Inulin
B. bifidum	289	154	132	143
La. rhamnosus	264	169	159	164
Lac. reuteri,	245	201	185	195

Doubling time (dt) = Ln 2/μ (specific growth rate); μ = Ln x_2-Ln x_1/ t_2-t_1.
Doubling time (dt) = Ln 2/μ (specific growth rate); μ = Ln x2-Ln x1/ t2-t1.

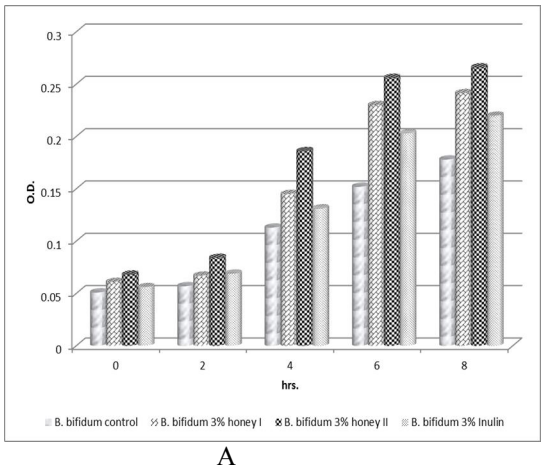
Data presented in Fig (3) shows that the acidity values were gradually increased along the storage period in fermented milk made without or with honey or inulin of different types of probiotic strains. One the other hand, fermented milk made with *B. bifidum* was higher in acidity values as compared with other strains.

The behavior of *Bifidobacterium bifidum* during manufacturing and refrigerated storage period of fermented milk made without or with honey I, II or inulin as shown in Fig. (4). It could be observed that the numbers of *B. bifidum* were increased in all treatments reached maximum in fermented milk made with honey II, honey I and inulin after 5 days of storage respectively. This could be due to the fact that during the manufacture process bacterial starter increase in number and continue to multiply for about five days, whilst lactose is available. From data given in Fig (4) we can noticed that the decrease in population of *B. bifidum* in fermented milk with prebiotics substances was lower than that fermented milk made without prebiotics after 10 days of refrigerated storage period. This may be due to the effect of honey as prebiotic or as stimulate the growth of *B. bifidum*. These results agree with **(Chick et al., 2001 and Mehanna et al., 2003b),** reported that the honey has variety of oligosaccharides with low DP (degrees of polymerization) it may be the favored substrate as Bifidobacteria support (bifidogenic factor).

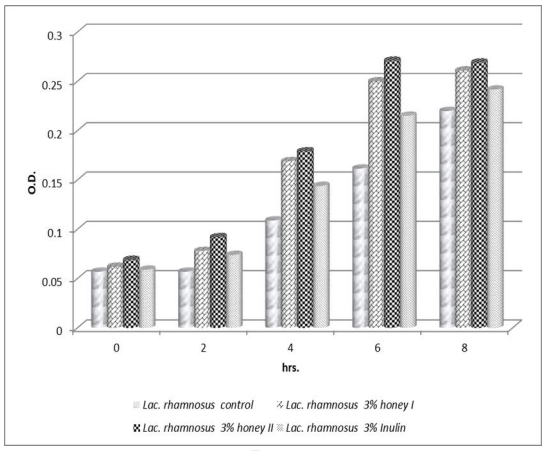
The data given in Fig (5) indicated that the viability of *La. rhamnosus* and *Lac. reuteri* increased in numbers till 5 days of refrigerated storage then dramatically decreased after 10 days of storage period in fermented milk without prebiotics, while slightly decrease in numbers was observed in *La. rhamnosus* at the end of refrigerated storage period in fermented milk made with 3% honey I, II or inulin. Also, these results could be due to the effect of honey or inulin as a prebiotic which stimulates the growth of *La. rhamnosus* and *Lac. reuteri.*

Data present in Fig (7) showed that fermented milk with *B. bifidum* and 3% honey II had highest acceptability scored followed by fermented milk with *B. bifidum* and 3% honey I, or fermented milk with *B. bifidum* and 3% inulin respectively. All samples which contain probiotic bacteria and prebiotics had non-significant effect between acceptability scored but had significant effect between them and control.

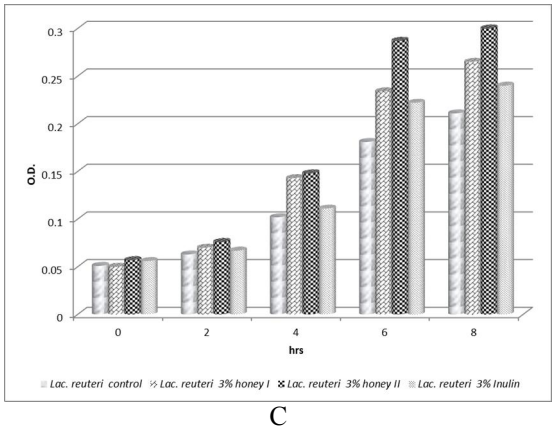
Mould & yeasts and coliform bacteria were also examined in all treatments and were not detected until the end of storage period. This could be attributed to an inhibition effect of probiotic strains against yeasts & moulds and coliform bacteria.



A



B



C

Fig (1): effect of prebiotic substences on specific growth rat of *Bifidobacterium bifidum (A); Lactobacillus rhamnosus (B) and Lactobacillus reuteri (C)*

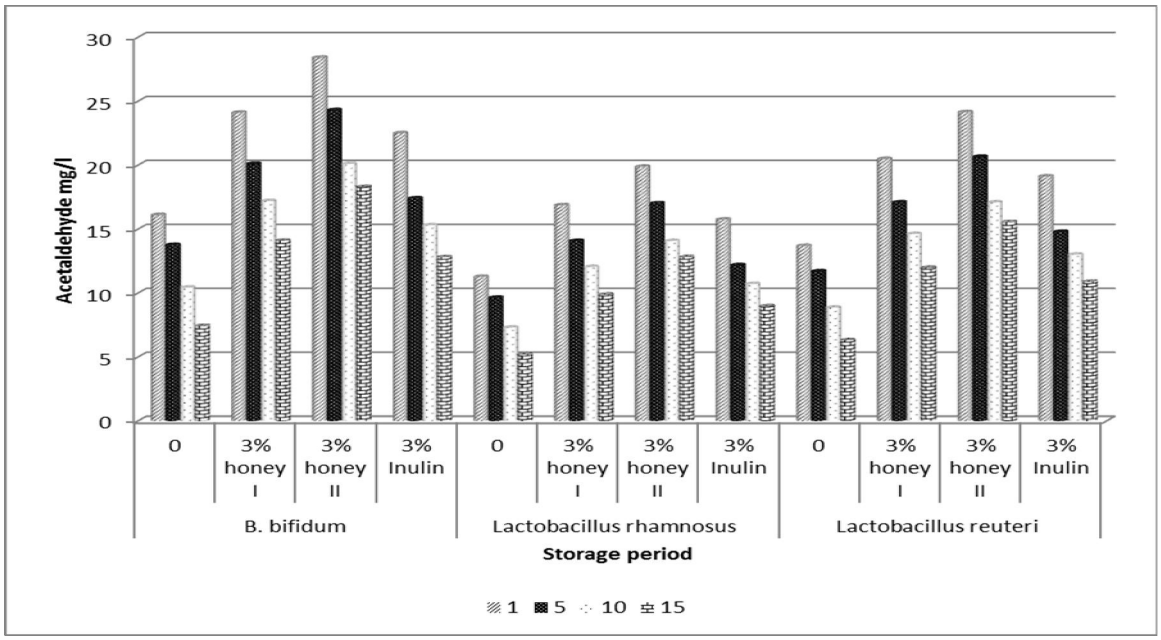


Fig (2): Effect of probiotic strains and prebiotics on the productionof acetaldehyde during storage period.

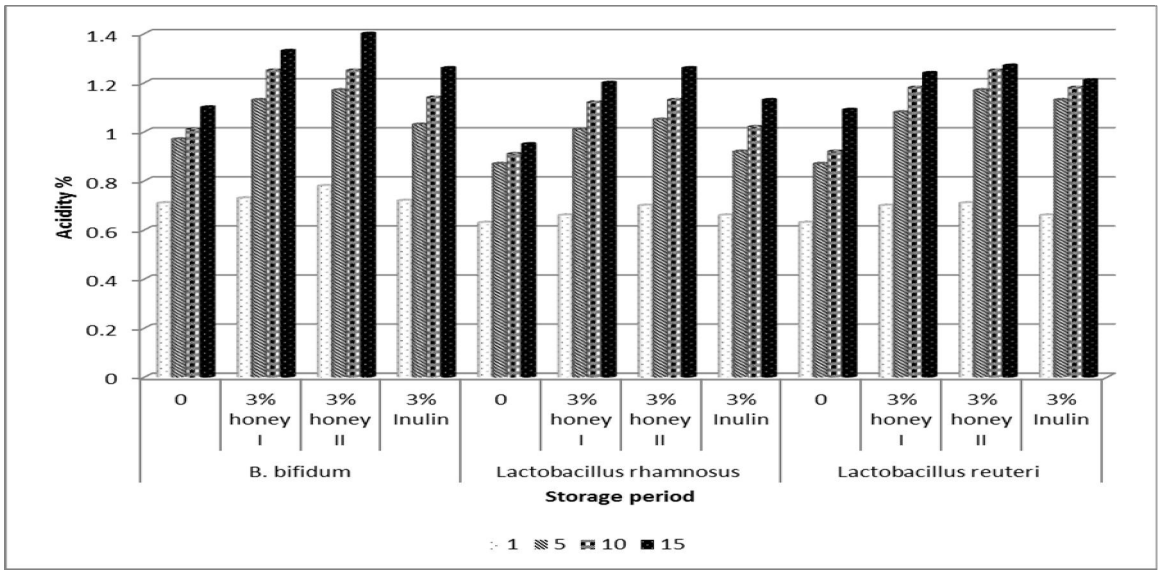


Fig (3): effect of probiotic strains and prebiotics on the production of acidity during storage period.

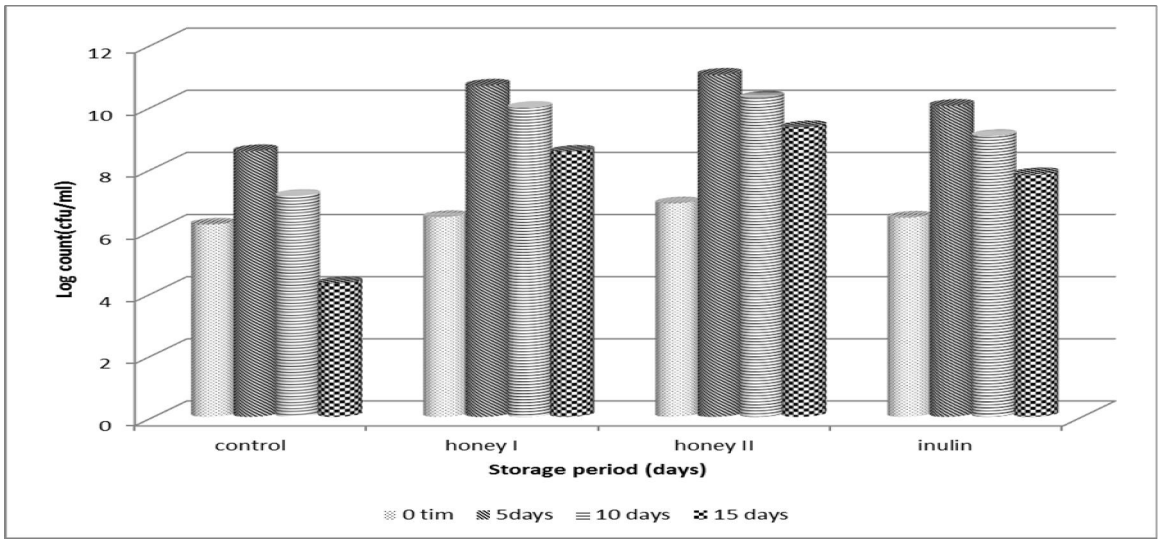


Fig (4): Log count of *B.bifidum* in fermented milk during storage period

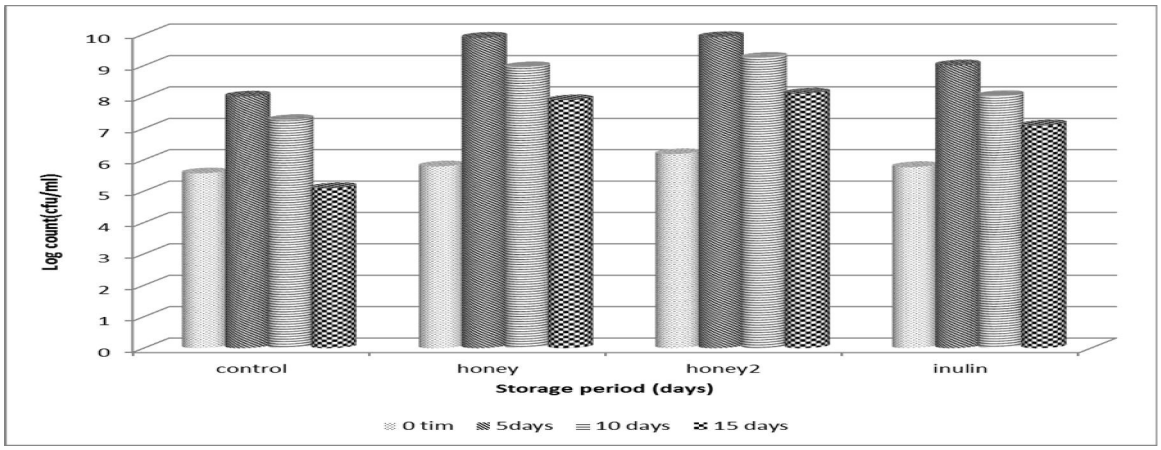


Fig (5): Log count of *Lac. reuteri* in fermented milk during storage period

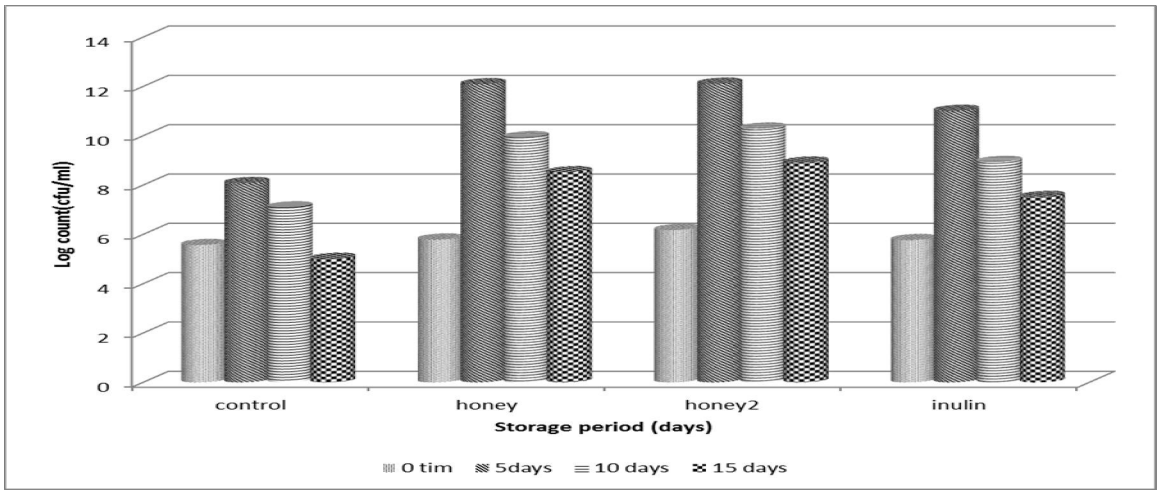


Fig (6): Log count of *Lac. rhamnosus in* fermented milk during storage period

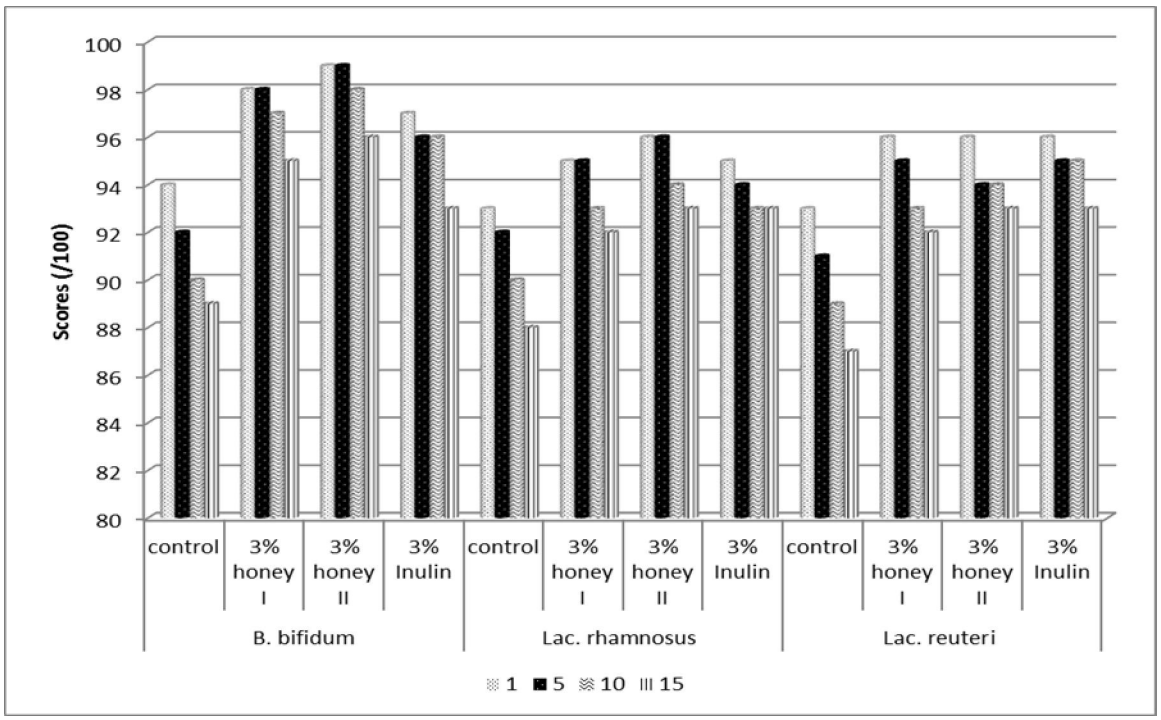


Fig (7): Organoleptic scores of fermented milk manufactured with prebiotics and different of probiotic strains during storage at refrigerator temperature.

4. Conclusions

From all these results, it can be concluded that the probiotic bacteria were enhanced by adding honey or inulin as a healing agent, but honey was more effect than inulin. These results can help us to prove that the consumption of probiotic bacteria and prebiotics within food products is the most popular way to re-establish the gastrointestinal microflora balance.

References

1. Abou-Donia, S.A.; Attia I.A.; Khattab, A.A. and El-Khadragy, S.M.C. (1992) Characteristics of Labneh manufactured using different lactic starter cultures. Egypt. J. Food Sci., 20:1.
2. Adhikari, K., Mustapha, A., and Grun, I.U. (2003). Survival and Metabolic Activity of Microencapsulated Bifidobacterium longum in Stirred Yogurt. Journal of Food Science;68: 275-280.

3. American Public Health Association (APHA) (1994). Standard methods of the examination of dairy products. 16th Ed., Washington, USA.
4. Amiri, Z. R.; Khandelwal, P. and Aruna, B. R. (2010). Development of acidophilus milk via selected probiotics & prebiotics using artificial neural network. Advances in Bioscience and Biotechnology, 1: 224-231
5. Baranowska, M. (2006). Intensification of the synthesis of flavour compounds in yogurt by milkenrichment with their precursors. Polish Journal of Food and Nutrition Sciences, 15/56, SI 1: 5–11
6. **Blanchette, L.; D. Roy; G. Belanger and S.F. Gauthier** (1996). Production of Cottage cheese using dressitg fermented by Bifidobacteria J. Dairy Sci. 79:8-15
7. **Chich, H.S. Shih and Z. Ustunol** (2001): Growth and acid production by lactic acid bacteria and Bifidobacteria grown in skim milk containing honey. J. Food Sci 66 (3): 478 – 481.
8. Dave, R. I., and Shah, N. P. (1997). Viability of yogurt and probiotic bacteria in yogurts made from commercial starter cultures. International Dairy Journal; 7: 31–41.
9. Donkor, O.N., Nilmini, S.L.I., Stolic, P., Vasiljevic, T. and Shah N.P. (2007). Survival and activity of selected probiotic organisms in set-type yogurt during cold storage. International Dairy Journal; 17: 657–665.
10. Douglas, L.C. and Sanders, M.E. (2008) Probiotics and prebiotics in dietetics practice. Journal of the American Dietetic Association, 108(3), 510-521.
11. **Dubey UK, Mistry VV**.(1998).Effect of bifidogenic factors on growth characteristics of bifidobacteria in infant formula. J.Dairy Sci.,79:1156-1163.
12. Gibson, G.R. and Wang, X. (1994a) ―Bifidogenic properties of different types of fructooligosaccharides‖. Food Microbiology; 11: 491-498.
13. **Gibson. G.R. and Wang X**. (1994b) Enhancement of bifidobacteria from human gut contents by oligofructose using continuous culture. FEMS Microbiol. Lett.; 118: 121-
14. Gilliland, S.E., Reilly, S.S., Kim, G.B. AND Kim, H.S. (2002). Viability During Storage of Selected Probiotic Lactobacilli and Bifidobacteria in a Yogurt-like Product. Journal of Food Science; 67: 3091-3095.
15. **Hamann,, W.T. and E.H. Marth** (1984). Survival of Streptococcus thermophilus and Lactobacillus bulgaricus in commercial and experimental yogurt. *J. Food Prot., 47: 781-781.*
16. Harrigan, W.F. and McCance, M.E. (1996). Laboratory Methods in Microbiology. Academic Press, London & New York, 292-293.
17. International Dairy Federation (IDF), (1997). Recommended method for sensory evaluation of fermented milk ·products. -International Dairy Federation 99C Part II.
18. **International Dairy Federation IDF** (1991). Yoghurt: Determination of titratable acidity potentiometric method . IDF:150
19. Janiszewska K.; Aniołowska M.and Nowakowski P., (2012). Free Amino Acids Content of Honeys from Poland Pol. J. Food Nutr. Sci., 62, (2): 85-89
20. Kailasapathy, K. and Chin, J. (2000). Survival and therapeutic potential of probiotic organisms with reference to Lactobacillus acidophilus and Bifidobacterium spp. Immunology and Cell Biology; 78: 80-88..
21. Lourens-Hattingh, A. and Viljoen, B.C. (2001). Yogurt as probiotic carrier food. International Dairy Journ al; 11: 1-17.
22. Matto, J. Alakomi, H.L., Vaari, A., Virkajarvi, I., and Saarela, M. (2006b). Influence of processing conditions on Bifidobacterium animalis subsp. lactis functionality with a special focus on acid tolerance and factors affecting it. International Dairy Journal; 16: 1029–1037.
23. **Mehanna Nayra Sh.; B.A. Effat; N.M.A. Dabiza; N.F. Tawfic and O.M. Sharaf** (2002). Incorporation and viability of some probiotic bacteria in functional dairy foods II- Hard cheese.
24. Mehanna, N.Sh.; Ibrahim, G.A. and Gad EI-Rab, D.A. (2003a). The influence of inulin addition on the quality of functional fermented milk. Minufiya J. Agric. Res., 28 (3): 887-906
25. Mehanna, N.Sh.; Salem, M.M.E., Zaky, W.M. and El- Khalek, A.B.A. (2003b) Viability of probiotic bacteria in functional fermented milk. Annals of Agricultural Science, 48, 691-702.
26. Meile, L., Blay, G.L. and Thierry, A. (2008) Safety assessment of dairy microorganisms: Propionibacterium and Bifidobacterium. International Journal of Food Microbiology, 126(3), 316-320.
27. Menne E., Guggenbühl N., and Roberfroid M. B. (2000), ―Fn-type chicory inulin hydrolysate has a prebiotic effect in humans―, Journal of Nutrition; 130: 1197-1199.
28. Nighswonger, B. D., Brashears, M. M. and Gilliland, S. E. (1996). Viability of L. acidophilus and Lactobacillus casei in fermented milk products during refrigerated storage. Journal of Dairy Science; 79: 212-219.

29. Nimess. K. R. (1999). Inulin and oligofructose. What arethey? Journal of Nutrition, 129(7), 1402-1406.
30. Ramakanth, R.R. and Nagendra, P.S. (1998). Selective enumeration of Lactobacillus casei from yogurts and fermented milk drinks. Biotechnology. Techniques, 12, No. 11:819-822.
31. Rao, A.V. (1999), ―Effect of consuming low levels of oligofructose on the composition of the intestinal flora.‖ Research report prepared for ORAFTI.
32. **Rasic, J.L. and Kurmann, J.A.** (1978): Yogurt: Scientific Grounds, Technology, Manufacture and preparations. Vol. I. Technology Dairy Publishing House, Copenhagen, Denmark. 446 PP.
33. Reddy, B.S., Hamid, R., Rao, C.V. (1997), "Effect of dietary oligofructose and inulin on colonic preneoplastic aberrant crypt foci inhibition." Carcinogenesis; 18: 1371-1374.
34. Roberfroid, M.B., Van Loo, J., and Gibson, G.R. (1998). The bifidogenic nature of chicory inulin and its hydrolysis products. Journal of Nutrition; 128: 11–9.
35. Rybka, S. and Kailasapathy, K. (1995). The survival of culture bacteria in fresh and freeze-dried AB yogurts. The Australian Journal of Dairy Technology; 50: 51-57.
36. **Salama, M. M (2002)** Production of therapeutic and diabetic stirred yogurt-like fermented milk products Egyptian J. of Dairy Sci.; -30:177-190.
37. Sanze, M.L., Polemis, N., Morales, V., Corzo, N., Dvakoularakou, A.and Gibson, G.R. (2005) In vitro investigation of potential prebiotic activity of honey oligosaccharides. Journal of Agricultural and Food Chemistry, 11(3), 2914-2921.
38. **Shin**, **H.S.; J.H. Lee; J.J. Pestka and Z. ustunol** (2000). Growth and viability of commercial Bifidobacterium spp. In skim milk containing oligosaccharides and Inulin. J. of Food Sci. 65 (5): 884. 886.
39. Tharmaraj, N., Nagendra, P. and Shah, N.P. (2004) Survival of Lactobacillus acidophilus, Lactobacillus paracasei subsp. paracasei, Lactobacillus rhamnosus, Bifidobacterium animalis and Propionibacterium in cheesebased dips and the suitability of dips as effective carriers of probiotic bacteria. International Dairy Journal, 14(12), 1055-1066.
40. TianHong, B. and XiangChen, M. (2004). Prebiotic and Probiotic cultured dairy products. China Dairy Industry; 32: 32-34.
41. Tuohy, K., Finlay, R., Wynne, A., Gibson, G. (2000), ―An in Vivo Study on the fermentation of HPInulin: gut bacteria enumerated using Fluorescent In Situ Hybridisation (FISH) – Confidential report to ORAFTI.
42. Verma, S.V.S. and Singh, R. (1995) Probiotic and their role in broiler chicken production: An overview. Journal of Animal Science, 10, 359-363.

8/8/2012

Bilirubin Clearance in Temporarily Hyperbilirubinemic Rats Treated With Aqueous Extract of *Sida rhombifolia*

Faizah Mohd. Faizul, Habsah Abdul Kadir, Saad Tayyab

Biomolecular Research Group, Biochemistry Programme, Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia
saadtayyab2004@yahoo.com

Abstract: Bilirubin (BR)-clearing activity of *Sida rhombifolia* (SR) aqueous extract was assessed in temporarily hyperbilirubinemic rats. BR level of these rats was reduced to normal upon oral administration of SR aqueous extract for three consecutive days. Although both doses (50 and 500 mg/kg body weight) produced significant reduction in the BR level from 2.37 ± 0.30 and 2.15 ± 0.04 mg/dL to 0.89 ± 0.08 and 0.50 ± 0.20 mg/dL respectively, higher dose required only two days to reduce the BR level to normal. These results showed the potential of SR aqueous extract towards developing new drugs for hyperbilirubinemic subjects.
[Faizul FM, Kadir HA, Tayyab S. **Bilirubin Clearance in Temporarily Hyperbilirubinemic Rats Treated With Aqueous Extract of *Sida rhombifolia*.** *Life Sci J* 2012;9(3):2254-2256] (ISSN:1097-8135). http://www/lifesciencesite.com. 323

Keywords: Bilirubin clearance; hyperbilirubinemia; *Sida rhombifolia*

1. Introduction

Bilirubin (BR), an endogenous toxic degradation product of heme catabolism in mammals, is carried to the liver by albumin for further metabolism and detoxification (Karp, 1979; Vanstapel et al., 1993). About 3-4 mg of BR per kg of body weight is produced every day in a healthy adult. Hyperbilirubinemia develops if the BR concentration in blood exceeds 1mg/dL while a BR concentration ≥ 2.5 mg /dL causes jaundice / kernicterus in adults / infants (Hauser et al., 1986; Gourley, 1997; Jansen and Bittar, 2004). Phototherapy and exchange transfusion are possible treatment strategies under mild and acute conditions, respectively. Epidemiological studies revealed that the administration of phototherapy in the newborn is not optimal; nor is it used when it should be, and sometimes used inappropriately (Atkinson et al., 2003).

Medicinal plants offer an alternative approach to treat various infections and diseases. *Sida rhombifolia* (SR), locally known as arrowleaf sida or ibu sida is a traditional plant used to cure or treat several ailments including pulmonary tuberculosis and rheumatism. Various parts of the plant are used as demulcent, emollient, diuretic, febrifuge and to treat skin diseases, rheumatism, leucorrhoea and swelling (Rao and Mishra, 1997; Poonam and Singh, 2009). The whole plant, its roots and aerial parts and their extracts have shown significant hepatoprotective, oedema suppressant and anti-arthritic activities (Rao and Mishra, 1997; Gupta et al., 2009). Antioxidant potential of SR has been proven with high free radical scavenging activity, reducing power and superoxide scavenging activity and the plant has been suggested as a potential source of natural antioxidants (Dhalwal et al., 2007). The antibacterial activity of SR against both Gram-positive and Gram-negative test organisms has also been demonstrated (Islam et al., 2003). Although SR is known to be effective in treating jaundice, but lacks any experimental proof. Therefore, we studied BR clearing activity of SR aqueous extract in temporarily hyperbilirubinemic rats.

2. Materials and Methods

Materials

Phenylhydrazine (PHZ), bilirubin (BR), sulfanilic acid, sodium nitrite and caffeine were purchased from Sigma-Aldrich Inc., USA. Sodium benzoate was the product of B.D.H. England. Fresh leaves of *Sida rhombifolia* (SR) were supplied by the local supplier and authenticated by a plant taxonomist. Sprague Dawley adult rats weighing 150–200 g were purchased from the Animal Research Centre and maintained by the staff of the Animal Centre Laboratory, Faculty of Medicine, University of Malaya.

Preparation of SR aqueous extract

Fresh SR leaves were dried under shade for 3 days and then grinded into powder form. About 500 g grinded dried leaves were treated with 2 L water at 70–90ºC for 8 h and filtered using a muslin cloth. Aqueous extract was obtained from the filtrate through rotary evaporation. A fixed amount of aqueous extract was dissolved in 0.15M sodium chloride to prepare different doses of SR aqueous extract.

Development of hyperbilirubinemia in rats

Hyperbilirubinemic condition was

developed in rats using PHZ treatment following the method described by Cekic *et al.* (2003) after slight modification. For the preparation of stock PHZ solution, 100 mg of PHZ was dissolved in 10 mL of 0.01 M sodium phosphate buffer, pH 7.4 containing 0.138 M NaCl. A single dose of 100 µL of stock PHZ solution (5 mg/kg body weight) was given intraperitoneally to each rat for five consecutive days. Total serum BR concentration was determined by the method of Fog (1958) both before (1st day) and after PHZ treatment (5th–8th days). Hyperbilirubinemic condition was confirmed by the measurement of BR in rat sera after 5 doses of PHZ treatment.

SR aqueous extract treatment of hyperbilirubinemic rats

Hyperbilirubinemic rats received SR aqueous extract in a single dose through oral route everyday starting from the 5th day (6 h after the last injection of PHZ) till 8th day. Two groups of rats (n = 6) received 50 mg (lower dose) and 500 mg (higher dose) of SR aqueous extract respectively per kg body weight. The third group served as control without receiving any dose of SR aqueous extract. Blood was collected from the tail of the rats on the 1st (normal) day, 5th day (6 h after PHZ treatment) and the following days after aqueous extract administration.

Statistical analysis

Different values in each group of rats were subjected to the calculation of mean value and standard deviation. Student's t-test was used to calculate the p-value and a p-value <0.05 was taken as statistically significant.

3. Results and Discussion

The concentration of BR (mg/dL) in control group rats is shown in Figure 1. Treatment of these rats with PHZ for five days resulted in the development of hyperbilirubinemia as BR concentration increased from 0.23 ± 0.10 to 2.49 ± 0.04 mg/dL on the 5th day upon PHZ treatment. Hyperbilirubinemic condition persisted for the next three days though the serum BR level was reduced to 1.44 ± 0.08 mg/dL.

BR level in hyperbilirubinemic rats, receiving a dose of SR aqueous extract (50 mg/kg body weight) is shown in Figure 2A. The BR concentration increased from 0.180 ± 0.07 (normal) to 2.37 ± 0.30 mg/dL after five days of PHZ treatment. Treatment of these rats with SR aqueous extract reduced the BR concentration to 0.89 ± 0.08mg/dL on the 3rd day of treatment. The decrease (62%) of BR level was highly significant (p = 0.001) compared to hyperbilirubinemic condition and was sufficient to bring down the BR level back to the normal range (< 1 mg/dL).

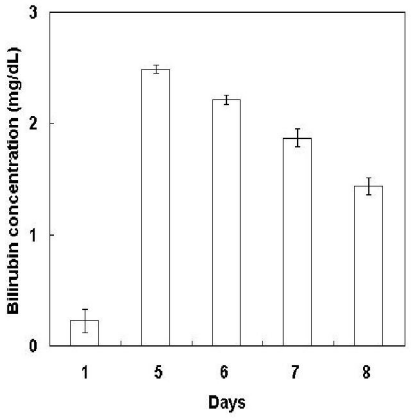


Figure 1. BR level in the sera of control group of PHZ-treated rats over a period of eight days both before and after PHZ treatment. Each value of the bar represents the mean ± S.D. of six different measurements

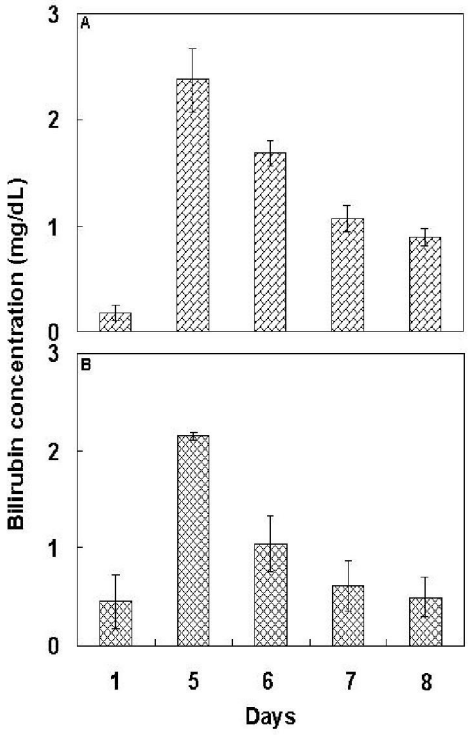


Figure 2. BR level in the sera of two groups of PHZ-treated rats over a period of eight days both before and after receiving different doses of SR aqueous extract such as 50 mg/kg body weight (A) and 500 mg/kg body weight (B). Each value of the bar represents the mean ± S.D. of six different measurements

The effect of a higher dose of SR aqueous extract (500 mg/kg body weight) treatment on the serum BR concentration of hyperbilirubinemic rats is shown in Figure 2B. The three days treatment significantly reduced the serum BR level of hyperbilirubinemic rats from 2.15 ± 0.04 to 0.50 ± 0.20 mg/dL ($p = 0.0001$). The higher dose (500 mg/kg body weight) was more effective in reducing the BR concentration compared to the smaller dose (50 mg/kg body weight) as it took only two days to lower down the BR level back to the normal value, from 2.15 ± 0.04 mg/dL to 1.05 ± 0.29 mg/dL and 0.61 ± 0.26 mg/dL with the first and second dose, respectively.

These results suggested the BR clearing activity of SR aqueous extract in hyperbilirubinemic rats and opened the way to develop future drug using SR aqueous extract for the treatment of hyperbilirubinemic/ jaundiced conditions.

Acknowledgements

This project was funded by the University of Malaya R.U. Grant (SF100-2007A) sanctioned to S.T. We also thank Dr. Norhaniza Aminudin for her help in animal studies. Technical assistance from the staff of Animal Centre Laboratory, Faculty of Medicine, University of Malaya is also acknowledged.

Corresponding Author:
Prof. Saad Tayyab
Biomolecular Research Group
Biochemistry Programme
Institute of Biological Sciences
Faculty of Science
University of Malaya
50603 Kuala Lumpur, Malaysia
E-mail: saadtayyab2004@yahoo.com

References

1. Atkinson LR, Escobar GJ, Takayama JI, Newman TB. Phototherapy use in jaundiced newborns in a large managed care organization: Do clinicians adhere to the guideline? Pediatrics 2003; 111: e555-61.
2. Cekic D, Bellarosa C, Garcia-Mediavilla MV, Rigato, I, Pascolo L, Ostrow, JD, Tiribelli C. Upregulation in the expression of multidrug resistance protein *Mrp1* mRNA and protein by increased bilirubin production in rat. Biochemical and Biophysical Research Communications 2003; 311: 891-6.
3. Dhalwal K, Deshpande YS, Purohit AP. Evaluation of *in vitro* antioxidant activity of *Sida rhombifolia* (L.) ssp. retusa (L.). Journal of Medicinal Food 2007; 10: 683-8.
4. Fog J. Determination of bilirubin in serum as alkaline azobilirubin. Scandinavian Journal of Clinical and Laboratory Investigation 1958; 10: 241-5.
5. Gourley GR. Bilirubin metabolism and kernicterus. Advances in Paediatrics 1997; 44: 173-229.
6. Gupta SR, Nirmal SA, Patil RY, Asane GS. Anti-arthritic activity of various extracts of *Sida rhombifolia* aerial parts. Natural Product Research 2009; 23: 689-95.
7. Hauser SC, Ziurys JC, Gollan JL. Regulation of bilirubin glucuronide synthesis in primates (*Macaca fascicularis*) liver: Kinetic analysis of microsomal bilirubin uridine diphosphate glucuronyltransferase. Gastroenterology 1986; 91: 287-96.
8. Islam ME, Hague ME, Mosaddik MA. Cytotoxicity and antibacterial activity of *Sida rhombifolia* (Malvaceae) grown in Bangladesh. Phytotherapy Research 2003; 17: 973-5.
9. Jansen PLM, Bittar EE. Bilirubin metabolism. In: Bittar EE, ed. Liver in biology and disease. Principles of medical biology 15. Elsevier B.V. Amsterdam, Netherlands. 2004: 257-89.
10. Karp WB. Biochemical alterations in neonatal hyperbilirubinemia and bilirubin encephalopathy. A review. Pediatrics 1979; 64: 361-8.
11. Poonam K, Singh GS. Ethnobotanical study of medicinal plants used by the Taungya community in Terai Arc Landscape, India. Journal of Ethnopharmacology 2009; 123: 167-76.
12. Rao KS, Mishra SH. Anti-inflammatory and hepatoprotective activities of *Sida rhombifolia* Linn. Indian Journal of Pharmacology 1997; 29: 110-6.
13. Vanstapel F, Blankaert N, Tavaloni N, Berk PD. Hepatic transport and bile secretion: Physiology and pathophysiology, Tavoloni N, Berk PD eds. Raven Press, New York, USA. 1993: 447-8.

8/30/2012

A New Approach for Biological Complex Adaptive System Modeling and Simulation

Touraj Banirostam[1*], Mehdi N. Fesharaki[2]
1 and 2, Department of Computer Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
*** Corresponding author**: Touraj Banirostam; Email: t.banirostam@srbiau.ac.ir

Abstract: By considering definitions of complex adaptive systems, the fundamental features of them are determined. Furthermore, Capra Cognitive Framework for better understanding of living systems is introduced and described. Based on the Santiago Theory of Cognition, Capra Cognitive Framework and Complex Adaptive System features, a model for Biological Complex Adaptive System is proposed and explained. The proposed model includes the main characteristics of Complex Adaptive System like adaptation, Learning and Evolution. Furthermore, for simulating the model by computer, the functionality of Biological Immune System as a Biological Complex Adaptive System is considered and based on; an agent for simulating the Biological Immune System is modeled and designed. The behavior generation of the agents and decision making of them, is presented. By simulating the Biological Immune System based on proposed model the effect of some characteristics in robustness of the system is illustrated.

*[Touraj Banirostam, Mehdi N. Fesharaki. **A New Approach for Biological Complex Adaptive System Modeling and Simulation.** Life Sci J* 2012;9(3):2257-2263] (ISSN:1097-8135). http://www.lifesciencesite.com. 324
Keywords: Agent, Biological Immune System, Capra Cognitive Farmworker, Complex Adaptive System, Living System.

1. Introduction

Complex Adaptive Systems (CAS) refers to a field of natural, biological and artificial systems that defy reductionist (top-down) investigation. In a general manner, such systems are composed of adaptive agents with ability of interactions in complex non-linear dynamics [1]. Emergent [2] is one of the basic results of the interactions between agents and it is an important aspect of CAS [3].CAS is concerned with:1- comparing natural and artificial examples of CAS to distil general properties and processes and 2- investigate computer simulations of simplified models of natural systems. By modeling and simulation of CAS, proposing a conceptual model for computational system will be accessible [1].

As John H. Holland Saied, CASs are systems that have a large numbers of components (agents) that interact and adapt or learn. He believes CAS share four major features: 1- Parallelism, 2- Conditional action, 3- Modularity and, 4- Adaptation and evolution. The agents in a CAS change over time. These changes are usually adaptations that improve performance, rather than random variations [4].

By considering CAS it is evidence that understanding behavior of agents in CAS have not been enough to achieve a precise comprehension about it, rather the effect of components and agents on each other should be traced [5]. Time and emergence [6] have been considered as effective parameters in CAS. Time brings the birth, growth, changes, death and destruction of the system and emergence which has caused the ultimate behavior to be the result of all system agents' behaviors [7].

Social living systems like biological immune system, ant colony, and honey bee colony would be considered as a Biological Complex Adaptive System (BCAS) including complex elements with complex interactions. A cell as a fundamental component of living system would be considered as a basic living system. In a cell membrane and chemical metabolism are vital characteristics [8]. In metabolism process, chemical network of processes could be observed and, by exact consideration on BCAS this would be perceived that a network could be noticed as a common pattern for all living systems [9]. For better understanding of BCAS it is necessary consider biological system by CAS approaches.

In the following Section Capra Cognitive Framework (CCF) will be described, then related work will be considered. A through description basic characteristic of BIS and its modeling including a model for antibody behavior, modeling of BIS as a BCAS and behavior generation of agents in BIS, will be explained. In section V the result of BIS simulation based on proposed BCAS model will be illustrated. Conclusions will end the paper.

2. Capra Cognitive Framework (CCF)

Living systems interact with the environmental by Structural changes. Structural changes results in changing later behaviors of the living system. It would be considered as Learning in living system [10]. The Structure of a living system would change while it interacts with its environment and finds the ability of Evolution as time goes on. Through the interactions living system keeps its former Structural changes and

applies the changes of new Structures on future behaviors [11].

Considering mentioned issues and due to the Santiago Theory of Cognition [12 and 13], Structural changes of a system form the rules of cognition [9]. Every living system is autonomous in reaction of environment acts and gives the appropriate reaction among all reactions which have been learned in its Structure [14].

Capra Cognitive Framework (CCF) has been represented for understanding the biological and cognitive phenomena. CCF considers living systems through three viewpoints; Pattern, Structure and Process. The Pattern valuates the relations between living agents of a system. In this viewpoint the Pattern of a living organization is mentioned which determines the main characteristic of the system. Physical embodiment of an agent or organization is Structure. Structure has an evolutionary process and gets more complete as time goes on. The Process point of view emerges the first two viewpoints together [15]. Figure 1 illustrates the Capra Cognitive Framework for a single living creature.

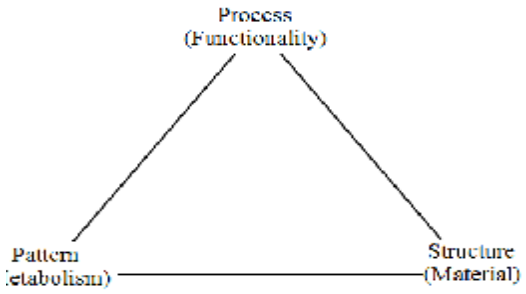


Figure 1. Capra Cognitive Framework (CCF)

In a living system like BIS each component could be mentioned as an element of a CAS: a cell as a Structure (material), cells' metabolism as the Pattern (form), and the chemical interaction among them (their functionality) as the Process. The Pattern and Process are not material and have been emerged from material actions and reactions. To generalize life to the social dominant, the Meaning viewpoint has been added to the three previous points of view. Therefore social phenomena could be evaluated from four viewpoints of Pattern, Structure, Process and Meaning [15].

In order to make the Capra Cognitive Framework (CCF) to be adapted to the existed context in CAS, Network (the relations between the components) would be used for the Pattern and Agent will be mentioned as the Structure. Therefore in CCF, Network would be the selected flow of connections. Structure or Agents are information resources and services. The Process includes every agent's decision making methods. The Process is a function of Structure and Network which means that all affairs in the Process dimension would be affected by the Network and Agents of system. Figure 2 illustrates Adapted Capra Cognitive Framework (ACCF) for CAS.

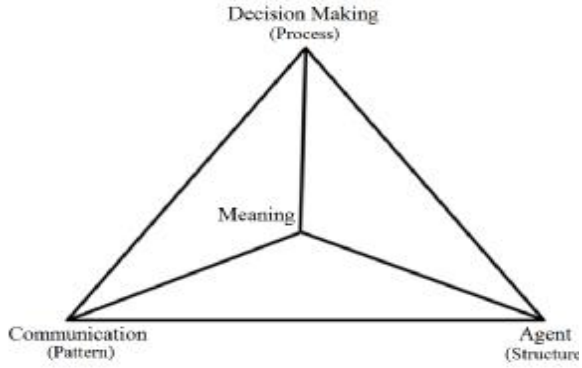


Figure 2. Adapted Capra Cognitive Framework (ACCF) for a CAS

Meaning dimension, as the fourth dimension is a concept that results in convergence and robustness of a biological system. It determines the main system objectives. Also the group of each data and its sources and objectives will be mentioned and clarified in this dimension.

3. Related Work

The field of Complex Adaptive Systems (CAS) was founded at the Santa Fe Institute (SFI) in about 1987 [16].Many methods have considered complexity, complex systems and CAS. Anderson provides an insightful summary of eight popular theories and methods of thinking about complexity, which highlights the diversity of such approaches [17]. However, a clear definition of a CAS has been not presented, but sets of principles and properties in different researches presented different definition of CAS [18]. John H. Holland conceptualized an "adaptive plan", which was the progressive modification of structures by means of suitable operators [19]. He would like to find out how computers could be programmed so that problem solving capabilities are built. In the 1992, he provided ECHO [20]. It was a summary of CAS with a computational example [1].

Furthermore, Waldrop provided a detailed review of the science of complexity [21]. Gell-Mann [22] also produced a seminal work on complexity theory including many detailed illustrative examples. Arthur presented a definition of complex systems as studied in economics with six properties [23]. K. Dooley provided a definition that in it, agents are the base elements of the system and they adapt in response to

interactions [24]. S. A. Levin considered some of the mathematical challenges of CAS. He notifies the limited predictability of results from simulation to the natural systems [25]. J. Jost explained the environment of a CAS is more complex than the CAS itself and that CAS depends on regularities in its environment [26].

Base on the mentioned points, BIS is a CAS includes complex components with complex interactions, distributed throughout our body, with ability of adaptation, learning, evolution, emergence that defense against antigens [9].There are several methodologies for modeling BIS based on an analytical approach [27], Cellular Automata [28] and some others based on Multi Agent System [29]. Differential equations systems based on analytical approach set up to represent some part of BIS [27].

Complex generalized Cellular Automata is simulations based on the global consequences of local communications of members of a population and have been proposed as models of BIS [30]. IMMSIM is a cellular automata base simulation to simulate clonotypic cell types and their communication with other cells. Pappalardo et al. [31] explicitly implement the cellular and humoral immune responses in a set of rules relating to the communication of cellular entities.

SIMISYS is a model and simulates some aspects of the human immune system based on the computational framework of cellular automata. SIMISYS 0.3 model and simulate the innate and adaptive components of the human immune system [32]. Bandini et al. modeled BIS by Situated Cellular Agents (SCA). They introduced the SCA model [33] and exploited to represent their model [34].

Furthermore, some researchers tried to model and simulate BIS for increasing robustness of computer systems. For example, Jabbour and Menasce presented a security policies framework. The security policies consist of several layers in a way that significantly increases the difficulty of attacking the system [29].Y. Ishida proposed the self-identification mechanism based on the value sharing among agents. He has suggested the computer network requires “population thinking” and provided a platform for testing the evolutional system including the immunity-based systems [35].

Dasgupta et al. [36] proposed an immunity-based IDS framework for a multi-agent architecture. The proposed system followed the multi-level detection feature of the immune system [37]. They used ART-2 neural network for detecting anomalies of all monitoring levels and fuzzy logic was proposed to combine four different levels of warnings into a final threat warning [38].

Chandrasekaran adopted Bio-Inspired approach for making the network to automatically detect and tolerate the previously unseen normal behavior [39]. De Paula et al. proposed ADENOIDS [40], an intrusion detection system based on immune system. They have introduced different components taken from BIS.

4. Immune System Modeling

Based on the Santiago Theory of Cognition every living system is a cognition system. In the other word, Living is equal with cognition and living systems are cognition systems. On the other hand, regarding the CAS definitions, a system with adaptation, learning, emergence and evolution ability with the interaction between elements is a CAS. Therefore, can be claimed living system like BIS is a cognitive CAS or Biological CAS (BCAS).

BIS can be able to recognize self/non-self and has some characteristics like adaptation, learning, emergence, evolution and communication. For modeling BIS, its elements, structure and function should be studied carefully. BIS is consisting of different antibodies (self elements) which resist antigens (non-self elements).

4.1. Behavior Modeling of Antibody

Each antibody has two different receptors; Paratope uses for antigens recognition and Idiotope uses for communicate between antibodies. Furthermore the part of antigens that recognized by antibodies called Epitope [41]. Figure 3 shows the different parts of an antibody. Antibody memorizes some antigens' structure and can only confront with them, in the other words; these antigens are known for the antibody [42].

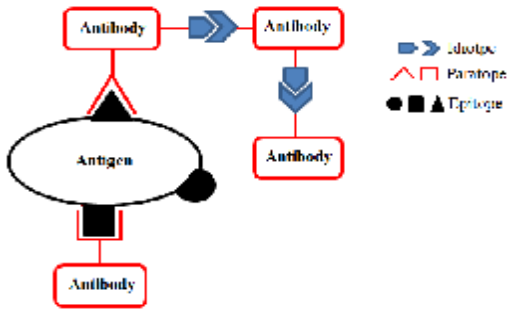


Figure3. Different parts on an antibody

Antibodies monitor the environment and determine self and non-self elements by Paratopes. If the element was non-self, its structure would be checked by the antibody’s memory. If it was matched, the antibody would be able to confront that antigen. Otherwise, antibody tries to adapt its Paratope with antigen's Epitope.If the antibody could have the ability to confront; it would migrate to the lymph nodes, and if it was not able, would keep on moving in the environment [43]. On the other hand, in first step

every antibody monitors its environment and tries to get data by Paratope and Idiotope. In the second step antibody analyze the data and recognize self and non-self. Furthermore, in this step it considers its memory for recognizing the kind of non-self antigens. In third step, it plans to confront with antigen. The reaction of antibody in this step depends on its memory. If it recognizes the kind of antigen, it migrates to lymph's node and autopoiesis [9]; else it moves in environment and communicates with other antibodies. The model of antibody's behavior is illustrated in figure 4. More details about BIS behavior are presented in [41-44].

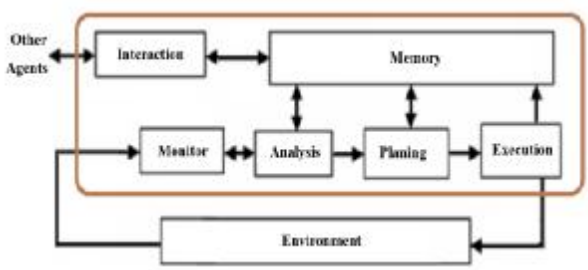


Figure4. Proposed Model for Behavior of an Antibody

For BIS modeling, agent with four processes would be designed. Every agent (antibody) as shown in figure 4 obeys a behavior generation circle with four states. In Monitor state, an agent observe the environment; in Analyse state, recognize self and non-self; in Planning state, generate a suitable behavior and in Execute state, execute the behavior in environment.

4.2. Modeling of BIS as a BCAS

Based on Capra Cognitive Framework and the Santiago Theory of Cognition, by Structural changes a living system would react to the actions of their environment. It would be happen through the two forms of self-renovation and structural changes. In the first one, the organizational structure of the living creature has been kept and it could be assumed as Adaptation. In the second one, new communicational structures have been generated which could cause further changes in creature's behavior and this process has to be called Learning. Through the time Learning could direct the living creature to Evolution.

Awareness about the environment is a necessary for elements in biological adaptive systems (BAS).Without the Awareness, BAS would not be able to make an appropriate adaptation in order to the Meaning. Furthermore, the Meaning provides suitable purpose for action and reaction of living system. When a BAS considered as a social system, Shared Awareness as one of the other major parameters is appeared. The Shared Awareness has been generated from sharing the Awareness of an organization or a system's elements. In basic BCAS like ant colony and BIS, Shared Awareness is caused of chemical interactions such as pheromone and enzymes. But in more advanced social-systems like mammals societies, it happens through conversation and information transmission. Regarding to the mentioned issues and using the CCF, a cognitive model in three tiers could be proposed for an agent in the social dominant as what has been illustrated in figure 5. This model proposes a Meta Model for Biological System Modeling (MMBSM).

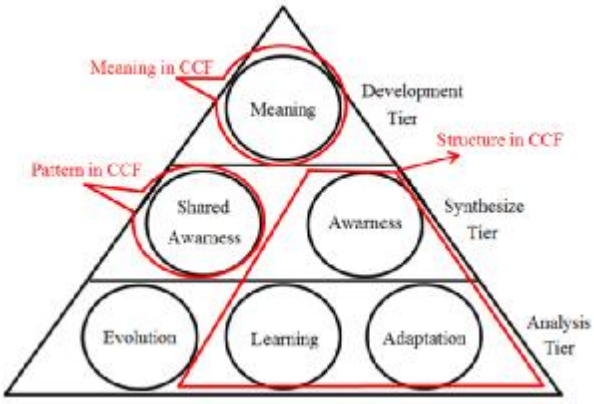


Figure5. The Approach of MMBSM.

The Awareness, adaptation and learning in the MMBSM could be considered equivalent to the Structure dimension in CCF and Shared Awareness has been the consequence of the existence of Pattern and communicational network in CCF. The Meaning dimension has been equivalent in the MMBSM and CCF. The Meaning could determine the amount of threshold for all contexts and depends on the environmental conditions it could be changed for any of contexts. The Process has been considered as an independent dimension in the CCF and MMBSM. The Process is the consequent of the Structure and the Pattern and result of it is behavior generation. The comparing of the MMBSM and CCF is shown in figure 5. More details about the MMBSM have been presented in [45]. By comparing the MMBSM and CAS definitions [1-5, 17 and 18], it is evidence the proposed model contain many concepts of CAS.

4.3. Agent Definition and Antibody Behavior Flowchart

For simulation the proposed model, presenting a precise algorithm or formalism is necessary. By considering BIS, it could be found that it is a BCAS consist of heterogeneous, autonomous and mobile elements. Agent as an independent and mobile entity can be used for simulation of BIS [9]. For simulating BIS by computer, a Multi Agent System (MAS) would be a suitable option. Relation (1) defines MAS for

simulating BIS by MMBSM based on ACCF and CAS.

$$< Space, Agent, Object > \quad (1)$$

Where *Space* is a single layered environment where agents are situated, act autonomously and interact; *Agent* is including antibody and antigen agents and *object* is some defined object in the space.
Antibodies and antigens are implemented by reaction agent. As describe in Eqs. (2) and (3), two different agent use for proposed modeling simulation.

$$Agent_{self} \equiv antibody \quad (2)$$
$$Agent_{nonself} \equiv antigen \quad (3)$$

Every self and non-self agent defines by Eqs. (4) and (5).

$$Agent_{self} \equiv \delta\,(Aw, Id, Po, Mo,\ En, Me) \quad (3)$$
$$Agent_{nonself} \equiv \delta\,(Aw, Id, Po, Mo, En) \quad (4)$$

Where *En* is the energy of each agent and adjusted by user at the initializing time. When the energy of agent finish, the agent is killed; *Mo* is an agent movement, *Po* is an agent coordinates; *Id* is every agent identification code; *Aw* indicate the information of agent about the other agents, who are located in same *Po*, and *Me* in antibody agent shows the memory of an antibody. δ is a function defines an agent according mentioned characteristics.
Behavior generation of antibody agent obey figure 6. The presented flowchart is adapted by behavior generation in figure 4.
Important definitions used in simulation are defined below:

1- Memory of antibody is randomly initialized.
2- Agent movement is based on Random Walk [2].
3- Neighborhood; Two agents are neighborhood with each other if they have a same location.
4- Adaptation; when Paratope of an antibody has a little difference with Epitope of an antigen, the Paratope of antibody can change and adapt with the Epitope. This process named adaptation. For applying this process in the simulation, minimum Hamming distance (mHd) [46] is used. By changing mHd amount in initializing time, user can adjust the different ability of adaptation for antibodies.
5- Learning; the adaptation causes a change in antibody's memory. If the changing would be saved in memory of antibody, the process named learning.
6- Communication is data transferring between two antibodies. For communication, the position of antibody agents (*Po*) would be same.
7- Robustness Time: since agents can reproduce themselves robustness time would be defined the time antibodies kill all antigens and vice versa.

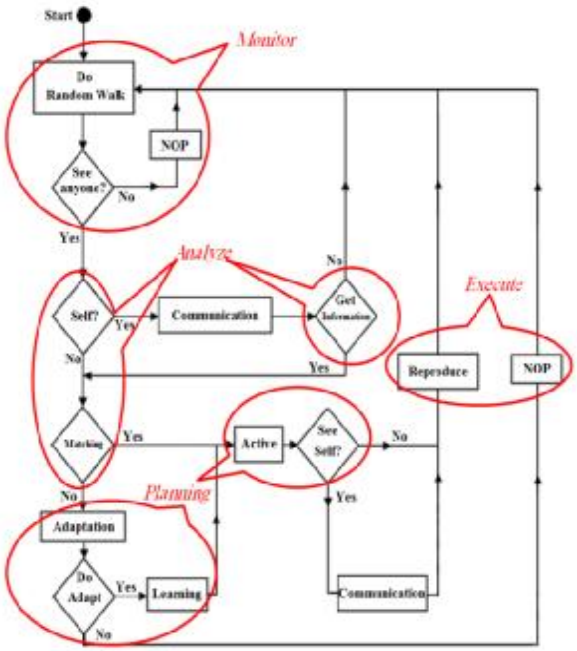


Figure 6. Behavior generation of an antibody agent [47]

5. Results of Simulation

For simulating BIS, Netlogo environment has been used, and agents have been categorized in self and non-self. All antibodies obey flowchart of figure 6 for behavior generation. Antibodies have same codes and recognize each other, but antigens have different random codes and identify antibodies. Each antibody agent has a memory of antigens' code with random data.
For considering the effect of adaptation, learning and communication in robustness of BIS, effect of mentioned parameters in robustness of BIS is considered by 100 running. By considering the results in figure 7, it is evidence; by increasing adaptation the robustness time is increased. In figure 7, Y axis shows the average of robustness time for 100 running and, X axis shows the ability of adaptation, learning and communication.
Also, the results of the running show, learning is another effective characteristic increases robustness of the system. Furthermore, results show in same situation antibodies with communication is more robust than without it.

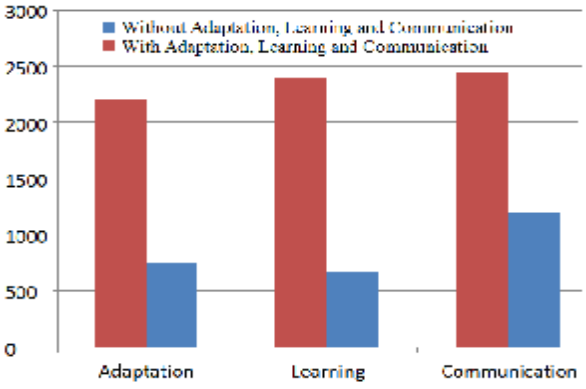


Figure 7. Effect of adaptation, learning and communication

6. Conclusions

Complex Adaptive Systems were described and their features introduced. Also, Capra Cognitive Framework was explained and based on it the characteristics of living systems were detailed. Regarding the CCF and the Santiago Theory of Cognition every living system was cognition system.

Biological Immune System and Ant Colony as a Biological Complex Adaptive System (BCAS) have complex component with complex interaction. By introducing BCAS, it was described by CAS definitions and CCF. Furthermore, a Meta Model for Biological System Modeling was proposed and adapted with CCF and CAS definitions. For simulating a BCAS in a computer, an agent was introduced and the behavior model of the agent for BIS modeling and simulation was presented. By simulating BIS as a BCAS the effect of some characteristics in robustness of system was illustrated.

References

1- Brownlee J, "Complex Adaptive Systems", CIS Technical Report 070302A, March 2007.
2- Bar-Yam, Y., "Dynamics of Complex Systems", Addison-Wesley, 1997.
3- Holland J. H., "Emergence: From Chaos to Order", Redwood City, California, USA: Addison-Wesley, 1998.
4- Holland J. H., "Studying Complex Adaptive Systems", Springer, Jrl Syst Sci & Complexity (2006) 19: 1–8.
5- Miller, J. H. and Page, S. E., "Complex Adaptive Systems: An Introduction to Computational Models of Social Life", Princeton University Press, 2007.
6- Smith, M. J., and Witty, S., "Emergent Behavior: Theory and Experimentation Using the MANA Model", Journal of Applied Mathematics and Decision Sciences Volume 2006, pp. 1–13., May 2006.
7- Kitto, K., "Modeling and Generating Complex Emergent Behaviour", Ph.D. thesis, School of Chemistry, Physics and Earth Sciences, The Flinders University of South Australia, Jun., 2006.
8- Margulis, L., "Serial endosymbiotic theory (SET) and composite individuality Transition from bacterial to eukaryotic genomes", Microbiology Today, Vol. 31, pp. 172-147.
9- Banirostam, T. and Fesharaki, M. N., "Immune System Simulation with Biological Agent Based on Capra Cognitive Framework", UKSim 2011(IEEE), Cambridge, UK, pp.122-127.
10- Capra, F., "The Hidden Connections: Integrating the Biological, Cognitive, and Social Dimensions of Life into A Science of Sustainability", Doubleday, 2002.
11- Kenny,V., "Distinguishing Ernst von Glasersfeld's "Radical Constructivism" from Humberto Maturana's "Radical Realism"", Constructivist Foundations Interdisciplinary Journal Vol. 2, Numbers 2-3, pp.58-64, 2007.
12- Mingers, J., "The cognitive theories of Maturana and Varela", Systemic Practice and Action Research, Volume 4, Number 4, pp. 319-338, 1991.
13- Capra,F., "The Santiago Theory of Cognition. The immune system: our second brain", http:// www.combusem.com/ CAPRA4. HTM.
14- Capra, F., "The Web of life: A New Scientific Understanding of Living Systems", Doubleday, 1996.
15- Anderson P. W., "The Eight fold Way to the Theory of Complexity", Addison- Wesley, 1994, pp. 7-16.
16- Gell-Mann, M., "What is Complexity?" Complexity 1/1, 1995, pp. 16-19.
17- Capra, F., "The Hidden Connections: Integrating the Biological, Cognitive, and Social Dimensions of Life into A Science of Sustainability", Doubleday, 2002.
18- Anderson, Ph. W., "The Eight fold Way to the Theory of Complexity - A Prologue. In: Complexity: metaphors, models, and reality", USA: Addison-Wesley, 1994.pp. 7-16.
19- Holland, J. H., "Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control, and Artificial Intelligence", USA: MIT Press, 1975
20- Holland, J. H., " Hidden Order: How Adaptation Builds Complexity", USA: Addison Wesley Publishing Company, 1995.
21- Waldrop, M. M., "Complexity: The Emerging Science at the Edge of Order and Chaos", USA: Simon & Schuster, 1992.
22- Gell-Mann, M., "The Quark and the Jaguar: Adventures in the Simple and the Complex", Owl Books, 1995.
23- Arthur, W. B., "Introduction: Process and Emergence in the Economy", USA: Addison-Wesley Pub. Co, 1997.pp. 1-04.
24- Dooley, K., "Complex adaptive systems: A nominal definition The Chaos Network", vol. 8, pp. 2-3, 1996.
25- Levin, S. A., "Complex adaptive systems: Exploring the known, the unknown and the unknowable", American Mathematical Society, vol. 40, pp. 3-19, 2003.

26- Jost, J., "External and internal complexity of complex adaptive systems Theory in biosciences", vol. 123, pp. 69-88, 2004.
27- Tauber, A. I., "The Immune System and Its Ecology," Philosophy of Science 75, April 2008, pp. 224–245.
28- Beigy, H., and Meybodi, M. R., "Asynchronous Cellular Learning Automata", Journal of International Federation of Automatic Control, Vol. 44, No. 5, May. 2008, pp. 1350-1357.
29- Jabbour G., and Menasce, D. A., "Policy-Based Enforcement of Database Security Configuration through Autonomic Capabilities", Fourth International Conference on Autonomic and Autonomous Systems, 2008, (ICAS 2008).
30- Beigy, H. and Meybodi, M. R., "Open Synchronous Cellular Learning Automata", Advances in Complex Systems, Vol. 10, No. 4, Dec. 2007, pp. 527-556.
31- Pappalardo, F.,Lollini, P.L., Castiglione F., and Motta, S., "Modeling and simulation of cancer immune prevention vaccine", Bioinformatics 21, 2005, pp. 2891–2897.
32- Kalita, J., Chandrashekar, K., Deshmukh, A., Hans,R., Selvam,P. and Newell, M. K., "Computational Modeling and Simulation of the Immune System", International Journal of Bioinformatics Research and Applications, Volume 2, No. 1, 2006. pp. 63-88
33- Bandini, S., Manzoni, S. and Vizzari, G., "Situated Cellular Agents: a Model to Simulate Crowding Dynamics," IEICE Trans., Vol.E85-A, No.1 Jan., 2002.
34- Bandini, S.,Celada, F., Mmanzoni,S. and Vizzari,G., "Modeling the immune system: the case of situated cellular agents," Natural Computing, Vol. 6, Number 1, 2007, pp. 19-32.
35- Ishida, Y., "The Immune System as a Self-Identification Process: a survey and a proposal," Proc. of the ICMAS international workshop on Immunity-Based Systems, pp. 2-12.
36- Dasgupta, D., "Immunity-based intrusion detection systems: A general framework," In Proc. of the 22nd National Information Systems Security Conference (NISSC), October 1999.
37- Dasgupta, D., and Brian, H., "Mobile security agent for network traffic analysis," In Proceeding of DARPA Information Survivability Conference and Exposition II (DISCEX-II), Anaheium, California, June 2001.
38- Kim, J., Bentley, P. J., Aickelin, U., Greensmith, J., Tedesco, G., Twycross, J., "Immune System Approaches to Intrusion Detection - A Review," Natural Computing, 6(4), pp 413-466, 2007, DOI: 10.1007/s11047-006-9026-4.
39- Chandrasekaran, S., Dinesh,C., Murugappan,A.L., "An Artificial Immune Networking Using Intelligent Agents," Proceedings of the World Congress on Engineering 2008 Vol I WCE 2008, July, 2008, London, U.K. ISBN: 978-988 98671-9-5.
40- De Paula, F. S., De Castro, L. N., and De Geus, P. L., "An intrusion detection system using ideas from the immune system," In Proceeding of IEEE Congress on Evolutionary Computation (CEC-2004), pages 1059-1066, Portland, Oregon, USA, June 2004.
41- Forrest, S., and Beauchemin, C., "Computer immunology," Immunological Reviews, Vol. 216, Issue 1, April 2007, pp. 176–197.
42- Funk, G., Barbour, A., Hengartner, H., and Kalinke, U., "Mathematical model of a virus neutralizing immunoglobulin response," Journal of Theoretical Biology, Vol. 195, Issue 1, Nov. 1998, pp. 41-52.
43- Dai, H., Yang, Y. and Li, C., "Immune Network Theory Based Artificial Immune System and Its Application for Pattern Recognition," Journal of Convergence Information Technology, Volume 5, Number 9. Nov. 2010.
44- Eisenbarth, S. C. and Flavell, R. A., "Innate instruction of adaptive immunity revisited: the Inflammasome", EMBO Molecular Medicine, Feb. 2009, pp. 92–98.
45- Banirostam, T. and Fesharaki, M. N., "MMBSM: A Meta Model for Biological System Modeling", International Journal of Computer Science Issues, Vol. 9, Issue 5, 2012, (in press).
46- Hamming, R. W., "Error detection and Error Correcting Codes," The Bell System Technical Journal, Volume 29, No.2, April 1950.
47- Banirostam, T., "Self-Protection Modeling Based on Biological Immune System with Autonomous Computing Approach," Ph.D. Thesis, Computer Department, SRBIAU, Sep, 2011.

10/6/2012

Effect of Egyptian Bread Prepared by Different Types of Flour on Diabetic Rats and Its Glycemic Index in Diabetic Patients

[1]Hany Helmy and [2]Hanaa F. El-Mehiry

[1]Home Economics Dept., Faculty of Specific Education, Zagazig University.Egypt
[2]Home Economics Dept., Faculty of Specific Education, El- Mansoura University. Egypt
Hanyhelmy2007@yahoo.com

Abstract: The blood glucose response to a food is not accurately predicted by the content of available carbohydrate in the food. Also Glycemic index (GI) is a useful index to describe the extent to which certain food can increase the blood glucose in human. The present study was carried out to estimate the effect of Egyptian bread prepared by different types of flour on diabetic rats and it's glycemic index in diabetic patients. Seven different types of bread were examined which prepared by different mixture of flours (wheat, corn and rice). A total of 45 male healthy rats, weighing between (140-150gm) were divided into 9 groups.all rats were subcutaneous injected by alloxan as 150 mg/kg body weight rats to induce hyperglycemic except rats of negative control. The negative control and positive control groups (1 and 2) fed on basal diet without submailintion, all diabetic treated groups (1-9) fed on basal diet containing deferent type of bread as a source of carbohydrates. Then samples were collected to examine serum glucose and lipids profile. In addition the present human study was conducted among 50 diabetic out patients attending Six October Hospital was assessed by measured height, weight, age, body mass index, as well as blood analysis of glucose by One Touch USA. For all patients Blood glucose were estimated as fasting and after 2 hours from eating 50 g carbohydrates of different types of bread, and also blood glucose were estimated as fasting and after 2 hours from eating 50 g of glucose, to calculate glycemic index. The observed results revealed a significant ($p \leq 0.05$) decrease in serum glucose and lipids profile (total lipids, total cholesterol, triglycerides, LDL-c and VLDL-c) and also significant ($p \leq 0.05$) increase in HDL-c were observed for all diabetic groups fed on diets containing different types of bread comparing with diabetic rats fed on basal diet (control positive). The best results were found in group which fed on bread (whole wheat + whole corn + white riceflours 1:1:1), followed by group which fed on bread (whole wheat flour 100%). Moreover, the lowest values of glycaemic index (61 ± 7.00) were showed for bread (whole wheat + whole corn + white riceflour 1:1:1) followed by groups which fed on bread (whole wheat + white riceflour 1:1) and (whole wheat flour 100%) (63 ± 6.00) and (64 ± 7.00) in diabetic II respectively. In conclusion, using of breads had low-GI carbohydrates would be beneficial to patients with type 2 diabetes.
[Hany Helmy and Hanaa F. El-Mehiry. **Effect of Egyptian Bread Prepared by Different Types of Flour on Diabetic Rats and Its Glycemic Index in Diabetic Patients**. *Life Sci J* 2012;9(3):2264-2272] (ISSN:1097-8135). http://www.lifesciencesite.com. 325

Key words: Egyptian bread – Glycemic index – diabetes – corn flour – rice flour – whole wheat – alloxan.

1-Introduction

It is increasingly accepted that the blood glucose response to a food is not accurately predicted by the content of available carbohydrate in the food, as measured in traditional food analysis. At the same time, the need for food values that will complement available carbohydrate values, to enable dietary control of postprandial glycemic responses, has become recognized ***(Seidell, 2000)***. Type 2 diabetes, formerly known as non-insulin-dependent diabetes (NIDDM), accounts for most cases of diabetes mellitus worldwide. It is estimated that in 2000 there were approximately 150 million individuals with the disease and that this number is likely to double by 2025 ***(King, et al., 1998).*** Type 2 diabetes is the fourth or fifth leading cause of death in most developed countries and there is growing evidence that it has reached epidemic proportions in many developing and newly industrialised countries ***(King, et al., 1998)***. The lowest rates of type 2 diabetes are found in rural communities where people retain traditional lifestyles (***Amos, et al., 1997)***.

Accordingly, in 2004 the American Association of Cereal Chemists (AACC) established an ad hoc committee on the definition of glycemic carbohydrates charged with the task of providing "a measurable definition that will enable manufacturers to communicate the glycemic response in grams per serving of food." After lengthy and stimulating discussion, the committee proposed several recommendations and definitions, including, "Glycemic impact is the weight of glucose that would induce a glycemic response equivalent to that induced by a given amount of food"***(Miller-Jones, 2007)***. This is a simple but profound definition. It has important implications for the meaning of terminology surrounding the glycemic potency of foods, for the way glycemic potency is measured, for the

management of data arising from the measurements, and for ways it can be used in controlling postprandial glycemia. Although the AACC definition of glycemic impact is simple, it requires a change in thinking, from food carbohydrates to entire foods, and from static index values to intake-sensitive values, and from unit-free values to nutrient-like values that represent glycemic effects with weight units ***(Monro.2006).***

Studies carried out in people with diabetes shed further light on the possible roles of dietary fiber and GI. Many studies have shown that glycaemic control is improved and the total LDL cholesterol reduced on relatively high carbohydrate, low fat diets including naturally occurring fiber-rich foods compared with relatively low carbohydrate, higher fat diets. A similar benefit has also been shown when comparing diets with similar carbohydrate: fat ratios, but with the experimental diet being appreciably higher in fiber. Feeding supplements of dietary fiber for several weeks has also been shown to lower both post-prandial glycaemia, insulin levels ***(McIntosch and Miller (2001) and Anderson (1986).*** Numerous studies have illustrated beneficial effects of a diet comprising foods with a low GI in type 2 diabetics ***Frost et al.,(1994).*** Furthermore, some studies have found that foods with a high GI increase fasting triacylglycerol concentrations, even when the amount of carbohydrate is kept constant ***Brand-Mille (1994).***

Some studies have a significant results in vitro and different results in vivo, thus this study was carried out to estimate the effect of Egyptian bread prepared by different types of flour on diabetic rats and it's glycemic index in diabetic patients.

2. Materials and Methods:

Grains:

Grains (wheat, corn and rice) used in this research was obtained from local market, Cairo, Egypt.

Alloxan:

Alloxan used was obtained from Hoffman La'roch Company. Alloxan has been used to produce diabetes in experimental animals by destroying the insulin-secreting islet cells of the pancreas. ***Malekinejad, et l.,(2012).***

Preparation of bread:

Type (1): Egyptian commercial bread form local bakeshop.(72% exertion wheat flour 100%)

Type (2): whole wheat flour 100%.

Type (3): whole corn flour 100%.

Type (4): whole wheat flour and whole corn flour by (1:1).

Type (5): whole wheat flour and white rice flour by (1:1).

Type (6): whole corn flour and white rice flour by (1:1).

Type (7): whole corn flour and whole corn flour and white rice (1:1:1).

Grains (wheat, corn and rice) were ground, mix as the previous types, knead by water and baked in oven at 260ºc to 400ºc.

Preparation of diet.

The basal diet consisted of protein (13%), fat (4%), salt mixture (3.5%), vitamin mixture (1%), choline (0.2%), cellulose (5%) and the remainder was starch ***Reevese et al,. (1993).***

Experimental animal design:

A total of 45 male healthy rats, weighing between (140-150gm) were divided into 9 equal groups.all rats were subcutaneous injected by alloxan as 150 mg/kg body weight rats to induce hyperglycemic except rats of negative control. Animal, groups were as follows:

1. Fed on basal diet as a "negative control"
2. Fed on basal diet as a diabetic rats without treated "positive control "
3. Fed on basal diet (diabetic rats) containing type (1) of bread as a source of carbohydrates.
4. Fed on basal diet (diabetic rats) containing type (2) of bread as a source of carbohydrates.
5. Fed on basal diet (diabetic rats) containing type (3) of bread as a source of carbohydrates.
6. Fed on basal diet (diabetic rats) containing type (4) of bread as a source of carbohydrates.
7. Fed on basal diet (diabetic rats) containing type (5) of bread as a source of carbohydrates.
8. Fed on basal diet (diabetic rats) containing type (6) of bread as a source of carbohydrates.
9. Fed on basal diet (diabetic rats) containing type (7) of bread as a source of carbohydrates.

Blood sampling.

At the end of experiment rats were starved for 12 hr, then sacrificed under ether anesthesia. Blood samples were collected from the aortic vein into clean dry centrifuge tubes and were stored at room temperature for 15 minutes, put into a refrigerator for 2 hour, then centrifuged for 10 minutes at 3000 rpm to separate serum. Serum was carefully aspirated and transferred into dry clean Wasser –man tubes by using a Pasteur pipette and kept frozen at (-20c) till analysis, organs (liver, kidney,heart and spleen) were separated to calculate organs to body weight % at the end of the experiment period.

Human study:

Subject: the present study was conducted among 50 diabetic out patients attending Six October Hospital, Dokky, Cairo, Egypt. The sample was randomly selected and divided into two groups as the follows:

Group 1: type I diabetic patients (n = 22 (men 9&women 13)) Insulin Dependent Diabetes Mellitus (IDDM).

Group 2: type II diabetic patients (n= 28(men 12&women 16)) Noninsulin Dependent Diabetes Mellitus (NIDDM). Ages for patients arranged between (40 to 65) years old.

Study Design:

In the present study patients was assessed by measured height, weight, age, body mass index, as well as blood analysis of glucose by One Touch USA. For all patients, Blood glucose were estimated as fasting and after 2hour from eating 50g carbohydrates of different types of bread, and also blood glucose were estimated as fasting and after 2 hour from eating 50 g of glucose to calculate glycemic index.

Glycemic Index:

The following review will provide an overview of the concepts of GI and GL, describe their limitations and discuss their applications for dietary planning and disease prevention.

* Common/popular definitions of GI:

- the rate of digestion and absorption of a carbohydrate-rich food
- blood glucose raising capacity of a carbohydrate-rich food

The operational definition of GI demonstrates the physiological complexity of the measure and illustrates why it is so infrequently used, particularly in the popular press.

* Operational (accurate) definition of GI:

- the incremental area under the blood glucose curve (AUC) after the ingestion of 50 grams of a test food, expressed as a percentage of the AUC of an equal amount of a reference food (generally glucose or white bread) ***Jenkins et al.,(1981)***.

Blood glucose response to 50 g test food (e.g., beans)

GI = -------x 100

Blood glucose response to 50 g reference food (e.g. glucose).

As the definition indicates, the GI of a given food (i.e., the "test" food) is calculated by comparing the glycemic response to a 50 gram portion of the food with that of an equal portion of a reference food and multiplying that ratio by100. The calculated GI values are then categorized as low, medium and high; the numerical value that is representative of these categories depends on the reference food used (i.e., white bread or glucose).

Glycemic Index Categories

Category	Glucose Reference*	White Bread Reference*
Low	< 55	< 60
Medium	55-70	60-85
High	> 70	> 85

* The reference food is arbitrarily assigned a GI of 100. Both glucose and white bread have been used as reference foods. Glucose has a glycemic response that is 40% greater than that of white bread; conversely, white bread has a GI that is 71% of glucose. ***(Jenkins et al., (1981)***.

Anthropometric measurements:

The anthropometric measurements used in this study included weights and heights from which body mass index (BMI) was calculated. ***National Heart Lung and Blood Institute (2012)***

Body Mass Index (BMI):

Body mass index (BMI) as an indicator of obesity, was calculated according to the following formula. ***National Heart Lung and Blood Institute (2012)***:

BMI = weight (kg) / height (m^2)

The grades of obesity utilizing the BMI.

Desirable range BMI (20 < 25)kg / m^2
Grade I obesity BMI (25 < 30) kg / m^2
Grade II obesity BMI (30 < 40) kg / m^2
Grade III obesity BMI ≥ 40 kg / m^2

The analytical methods of blood serum

1-Determination of serum glucose:

Serum glucose was determined according to ***Burrin and price, (1985)***.

2-Determination of total cholesterol

Serum cholesterol was determined according to the enzymatic method described by ***Allain et al.,(1974)***.

3-Determination of triglycerides

The triglycerides in serum were colorimetrically determined according to ***Wahlefeld, (1974).***

4-Determination of high density lipoprotein

(HDL) cholesterol:

The HDL-c was determined according to ***Albers et al.,(1983).***

5-Determination of very low density lipoprotein (VLDL) cholesterol

The concentration of VLDL-c was estimated according to the Fridewald's equation ***Fridewald et al., (1972)***.

VLDL-c = triglycerides / 5

6-Determination of low density lipoprotein (LDL) cholesterol:

According to ***Fridewald et al. (1972),*** low density lipoprotein cholesterol can be calculated as follows:

LDL-c = Total cholesterol – (HDL-c) -(VLDL-c).

Statistical Analysis:

Results were expressed as the mean ± SD. Data were statistically analyzed for variance using one-way analysis of variance (ANOVA) ***Granfeldt et al.,(1995).***

3. Results and Discussions:

As shown in table (1), it could be observed that significant ($p \leq 0.05$) decrease in food intake and body weight gain ratio were showed in diabetic rats fed on basal diet (control positive) compared with healthy rats fed on basal diet (control negative). In addition, significant ($p \leq 0.05$) increase in food intake were showed in diabetic groups (5, 8&9) fed on diet containing type 3(whole corn flour), type 6 (whole corn +white riceflour 1:1) & type7 (whole wheat +whole corn +white rice1:1:1) of bread respectively, while other types of bread had no significant ($p \leq 0.05$) difference in food intake compared with control positive. Moreover, significant ($p \leq 0.05$) increase in body weight gain ratio were found in all diabetic groups fed on diets containing different types of bread comparing with diabetic rats fed on basal diet (control positive). The results may be due to the effect of fiber in cereals and legumes which reduced the risk for chronic diseases, this explanation is in line with the study by ***(Kushi et al. (1999)***. Some of these include micronutrients such as selenium and vitamin E, antioxidants, phytochemicals, isoflavins and lignans. Since many of these factors occur together in cereals it is difficult to determine the precise benefits of each. While the benefits of the 'whole' grains have been demonstrated to reduce risk of CHD in women in the Nurses Health Study ***(Liu et al. (1999)***.

From the data in table (2), it could be observed that significant ($p \leq 0.05$) increase in organs (liver, kidney, heart and spleen) to body weight gain ratio were showed for diabetic rats fed on basal diet (control positive) compared with healthy rats fed on basal diet (control negative). In addition, significant ($p \leq 0.05$) decrease in organs (liver, kidney,heart and spleen) to body weight gain ratio were observed for all diabetic groups fed on diets containing different types of bread comparing with diabetic rats fed on basal diet (control positive).

From the data in table (3), it could be observed that significant ($p \leq 0.05$)increase in serum glucose and lipids profile (total lipids, total cholesterol, triglycerides, LDL-c and VLDL-c) and also significant ($p \leq 0.05$)decrease in HDL-c were showed for diabetic rats fed on basal diet (control positive) compared with healthy rats fed on basal diet (control negative). In addition, significant ($p \leq 0.05$) decrease in serum glucose and lipids profile (total lipids, total cholesterol, triglycerides, LDL-c and VLDL-c) and also significant ($p \leq 0.05$)increase in HDL-c were observed for all diabetic groups fed on diets containing different types of bread comparing with diabetic rats fed on basal diet (control positive). The best results were found in group (9) which fed on diet containing type 7 of bread (whole wheat + whole corn + white riceflours 1:1:1), followed by group (4) which fed on diet containing type 2 of bread (whole wheat flour 100%). The results are agreement with ***Arturo, et al.,.(2004)*** which conclude that a low GI diet with more than 23g fiber per day may help to improve dyslipidemia in individuals with type 2 diabetes. And also there is an important body of evidence in support of a therapeutic potential of a low-GI carbohydrate diet taken during the 3 meals, but not only once at breakfast, in subjects with type 2 diabetes and dyslipidemia***.(Brand et al. (1998), Wolever et al. (1992), Jarvi et al. (1999)and Frost et al. (1999).***

From the data in table (4), it could be observed that significant ($p \leq 0.05$) increase in age were showed for men diabetic II compared with men diabetic I, while non-significant ($p \leq 0.05$) increase in age were showed for women diabetic II compared with women diabetic I. In addition, significant ($p \leq 0.05$) increase in body mass index BMI were observed for men and women of diabetic II compared with men and women diabetic I respectively. The results were agreement with previous studies which concluded that the protective association in the extreme quintiles revealed a risk ratio of 0.64–0.72, after correcting for related variables such as age, BMI, smoking and physical activity. Two of the studies reported that glycaemic load is associated with risk of diabetes. They showed an increased relative the risk of type 2 diabetes of 2.2 in women and 2.1 in men, with a combination of low cereal fiber intake and a high glycaemic load***.(Salmeron et al. (1999)and Salmeron et al. (1999.)***

Fom the data in table (5), it could be observed that lowest values of glycaemic index were showed for type 2 of bread (whole wheat flour 100%)(63 ± 6.00) this result agreement with similler the study by ***David et al., (2012***) showed that cereal fiber in the diet may be a marker for another component of whole grains that imparts health advantages or a healthy lifestyle. Another study showed that 30 gm of whole wheat having GI value equals to 65 and glcaemic load equals to 7.4 while GI of mixed grain bread is 34 and its GL is 4.3 ***Fiona et al., (2008)***. Followed by type 3 (whole corn 100%) (68 ± 9.00) and type 4 (whole wheat + whole corn 1:1) (68 ± 2.00) in diabetic I respectively. While, lowest values of glycaemic index were showed for type 7 of bread (whole wheat + whole corn + white rice flour 1:1:1) (61 ± 7.00) followed by type 5 (whole wheat + white rice flour 1:1)(63 ± 6.00) and type 2 (whole wheat flour 100%)(64 ± 7.00)in diabetic II respectively. Another study by ***Hu et al,. (2012)*** revealed that the higher consumption of white rice is associated with a significantly increased risk of type 2 diabetes, especially in Asian (Chinese and Japanese) populations. While ***Fiona et al., (2008)*** found that white rice has GI equals to 58 and rice flour is 95.

On the other hand, the highest values of glycaemic index were showed for type 6 of bread (whole corn + white rice flour 1:1) (79 ± 2.00) followed by type 7 of bread (whole wheat + whole corn + white rice flour 1:1:1) (76 ± 6.00) in diabetic I, while highest values of glycaemic index were showed for type 6 of bread (76 ± 7.00) followed by type 3 of bread (whole corn flour 100%)(75 ± 5.00) in diabetic II. This result in line with the study which revealed that the corn is a nutrient-rich food classified as a starch on the Diabetes Food Pyramid, along with grains, potatoes, peas and beans. With a glycemic index (GI) of 42, corn is also classified as a low-GI food, meaning that corn raises blood sugar by a relatively small amount. The healthy effects of eating corn may be negated, however, by consuming the wrong type of corn products ***Emilia (2012).***

Table (1): Effect of Egyptian bread prepared by different types of flour on food intake (FI) and body weight gain ratio (BWG%) of diabetic rats

Groups	FI (g/ day)	BWG %
Group (1): Control -	A	A
	17.20± 0.83	20.60± 0.89
Group (2): Control +	Cd	E
	11.80± 1.09	11.40± 1.34
Group (3): Bread 1	d	Bcd
	11.40 ± 1.34	15.40± 0.54
Group (4): Bread 2	D	Cd
	10.80± 1.09	14.0 ± 1.41
Group (5): Bread 3	A	Bc
	16.40± 1.67	16.40± 1.67
Group (6): Bread 4	Bc	Bcd
	13.60± 1.67	16.00± 2.91
Group (7): Bread 5	Bcd	Bcd
	12.20± 0.83	15.80± 2.49
Group (8): Bread 6	B	Cd
	13.80± 1.78	14.00± 1.41
Group (9): Bread 7	A	B
	16.60± 0.89	17.60± 1.67

Values with the same letters indicate no significant different ($p \leq 0.05$) and vice versa

Table (2): Effect of Egyptian bread prepared by different types of flour on organs to body weight gain ratio of diabetic rats

Groups	Liver / B.W. %	Kidney / B.W. %	Heart / B.W. %	Spleen / B.W. %
Group (1): Control -	C	D	D	D
	3.35±0.20	0. 606±0.01	0.350± 0.01	0.396±0.04
Group (2): Control +	A	A	A	A
	4.82±0.35	0.768±0.02	0.464± 0.04	0.510±0.04
Group (3): Bread 1	B	Bc	Bc	Bc
	4.16±0.46	0.656±0.01	0.414±0.02	0.434±0.02
Group (4): Bread 2	B	D	Bc	Cd
	4.10±0.45	0.606±0.01	0.408±0.02	0.426±0.01
Group (5): Bread 3	B	A	C	bc
	4.08±0.16	0.736±0.04	0.406±0.01	0. 438±0.01
Group (6): Bread 4	Bc	Cd	C	cd
	3.82±0.47	0.636±0.01	0.390±0.02	0.414±0.01
Group (7): Bread 5	Bc	B	C	bc
	3.85±0. 47	0.692±0.02	0.400±0.01	0.434±0.02
Group (8): Bread 6	B	Cd	Ab	b
	4.06±0.47	0.636±0.01	0. 448±0.02	0.464±0.02
Group (9): Bread 7	B	Cd	Bc	bc
	4.03±0.64	0.620±0.02	0. 422±0.03	0.442±0.01

Values with the same letters indicate no significant different ($p \leq 0.05$) and vice versa

Table (3): Effect of Egyptian bread prepared by different types of flour on serum glucose, total lipids, total cholesterol, low density lipoprotein, high density lipoprotein, very low density lipoprotein of diabetic rats

Groups	Glucose mg/dl	Total lipids g/l	T.Ch mg/dl	T.G mg/dl	LDL-c mg/dl	HDL-c mg/dl	VLDL-c mg/dl
Group (1): Control -	E	Cd	E	F	E	ab	f
	97.00± 4.58	2.67± 0.33	96.73± 0.83	147.18± 1.58	20.19± 0.46	47.10± 1.14	29.43± 0.31
Group (2): Control +	A	A	A	A	A	e	a
	189.60± 4.93	4.25± 0.52	168.26± 10.96	216.00± 11.40	87.63± 12.26	37.43± 3.53	43.20± 2.28
Group (3): Bread 1	D	Bc	Bc	C	Bc	de	c
	123.00± 7.58	2.91± 0.01	139.40± 13.66	188.30± 2.38	61.56± 13.46	40.20± 0.83	37.64± 0.49
Group (4): Bread 2	F	B	E	D	E	d	d
	89.80± 0.83	2.78± 0.18	104.13± 5.36	172.20± 4.38	28.89± 6.78	40.80± 2.49	34.44± 0.87
Group (5): Bread 3	E	Bc	Cd	D	Cd	cd	d
	100.80± 2.38	2.98± 0.04	133.00± 17.40	176.80± 4.02	54.81± 14.53	42.82± 3.00	35.36± 0.80
Group (6): Bread 4	C	B	B	Bc	B	cd	bc
	134.20± 6.57	3.35± 0.42	149.40± 5.36	192.00± 2.73	69.10± 5.68	41.90± 2.35	38.40± 0.54
Group (7): Bread 5	E	Cd	e	D	E	a	d
	96.00± 3.16	2.75± 0.19	108.12± 7.54	173.95± 3.55	25.51± 8.69	47.85± 1.95	34.76± 0.69
Group (8): Bread 6	Bc	Bc	D	Bc	D	cd	bc
	139.00± 1.73	3.02± 0.13	127.00± 7.58	189.40± 2.51	47.08± 7.97	42.04± 2.74	37.88± 0.50
Group (9): Bread 7	F	D	E	E	E	bc	e
	89.00± 1.87	2.33± 0.38	102.0± 2.73	161.00± 5.47	25.60± 2.60	44.20± 2.388	32.20± 1.09

Values with the same letters indicate no significant different ($p \leq 0.05$) and vice versa
T.Ch. Total cholesterol
T.G. Triglycerides
L.D.L-c Low density lipoprotein cholesterol.
H.D.L-c High density lipoprotein cholesterol.
V.L.D.L-c very low density lipoprotein cholesterol.

Table (4): Anthropometric measurements of Diabetic patients (mean ± SD)

	sex	Number	Age	weight	height	BMI
Diabetic I	men	9	36.00 ± 22.34 b	86.67 ± 30.14 a	168.33 ± 7.64 a	25.57 ± 8.32 c
	Women	13	52.40 ± 13.61 a	72.80 ± 4.38 b	163.00 b ± 5.66	27.52 ± 3.19 b
Diabetic II	men	12	55.88 ± 10.36 a	74.86 ±9.67 b	165.29 ± 5.50 a	27.46 ± 3.64 b
	women	16	57.5 ± 9.29 a	87.50 ± 23.98 a	161.00 ± 4.97 b	31.52 ± 6.95 a

Values with the same letters indicate no significant different ($p \leq 0.05$) and vice versa.

Table (5): Glycemic index of Egyptian bread prepared by different types of flour						
Type of bread	**Diabetic (I)**		**Glycemic Index**	**Diabetic (II)**		**Glycemic Index**
	Number	**Hours**		**Number**	**Hours**	
Type (1)	22.00	2.00	71 ± 6.00 c	28.00	2.00	72 ± 7.00 b
Type (2)	22.00	2.00	63 ± 6.00 d	28.00	2.00	64 ± 7.00 c
Type (3)	22.00	2.00	68 ± 9.00 c	28.00	2.00	75 ± 5.00 a
Type (4)	22.00	2.00	68 ± 2.00 c	28.00	2.00	65 ± 9.00 c
Type (5)	22.00	2.00	69 ± 3.00 c	28.00	2.00	63 ± 6.00 cd
Type (6)	22.00	2.00	79 ± 2.00 a	28.00	2.00	76 ± 7.00 a
Type (7)	22.00	2.00	76 ± 6.00 b	28.00	2.00	61 ±7.00 d
Glycemic index of Glucose = 100						

Values with the same letters indicate no significant different ($p \leq 0.05$) and vice versa.

Conclusion:

The present study concluded that the blood glucose response to a food is not accurately predicted by the content of available carbohydrate in the food but also Glycaemic index (GI) is a useful index to describe the extent to which certain food can increase the blood glucose in human. It's suggested using types of breads had low-GI carbohydrates would be benefit to patients with type 2 diabetes.

Corresponding author
Hany Helmy
Home Economics Dept., Faculty of Specific Education, Zagazig University.Egypt
Hanyhelmy2007@yahoo.com

References:

1. **Albers, N.; Benderson, V. and Warnick, G. (1983):** Enzymatic determination of high density lipoprotein cholesterol: Selected Methods. Clin. Chem., (1983) 10:91-99.
2. **Allain, C.C.; Poon, L.S. and Chan, C.S. (1974):** Enzymatic determination of total serum cholesterol. Clin. Chem, (1974) 20, 470-475.
3. **Amos AF, ; McCarty DJ; and Zimmet P. (1997):** The rising global burden of diabetes and its complications: estimates and projections to the year 2010. Diabetic Medicine 1997; 14: S7–85.
4. **Anderson JW.(1986):** Fiber and health: an overview. American Journal of Gastroenterology 1986;81:892–7.
5. **Arturo Jime´nez-Cruz; Wilfred H. (2004):** Turnbull, Montserrat Bacardi-Gasco´n and Perla Rosales–Garay. A high-fiber, moderate-glycemic-index, Mexican style diet improves dyslipidemia in individuals with type 2 diabetes. Nutrition Research 24 (2004) 19–27.
6. **Bessesen DH. (2001):** The role of carbohydrates in insulin resistance. Journal of Nutrition 2001; 131: 2782S–6S.
7. **Bouchard C.; Tremblay A, Despres JP, Nadeau A, Lupien PJ, Theriault G, Dussault J, Moorjani S, Pinault S, and Fournier G. (1990):** The response to long-term overfeeding in identical twins. New England Journal of Medicine 1990; 322: 1477–82.
8. **Brand JC.; Colagiuri S, Crossman S, Allen A, Roberts DC, and Truswell AS. (1991):** Low-glycemic index foods improve long-term glycemic control in NIDDM. Diabetes Care 1991; 14: 95–101.
9. **Brand-Miller JC. (1994):** The importance of glycemic index in diabetes. American Journal of Clinical Nutrition 1994; 59(Suppl.): 747S–52S.
10. **Bray GA and Popkin BM. (1998):** Dietary fat intake does affect obesity. American Journal of Clinical Nutrition 1998; 68: 1157–73.
11. **Burrin JM.; and Price CP. (1985):** Measurement of blood glucose. Ann Clin Biochem 1985 Jul; 22 (Pt 4):327-42.
12. **David J. A.; Jenkins, MD,Cyril W. C. Kendall, PHD, Livia S. A. Augustin, MSC, Margaret C. Martini, PHD et al., (2012):** Effect of Wheat Bran on Glycemic Control and Risk Factors for Cardiovascular Disease in Type 2 Diabetes. Clinical Nutrition and Risk Factor Modification Center, St. Michael's Hospital, Toronto, Ontario, Canada. Department of Medicine, Division of Endocrinology and Metabolism, St. Michael's Hospital, Toronto, Ontario, Canada.
13. **Department of Health. Dietary Reference Values for Food Energy and Nutrients for the United Kingdom. (1991):** Report of the Panel on Dietary Reference Values of the Committee on Medical Aspects of Food Policy. London: HMSO, 1991.
14. **Emilia Klapp, R.D., B.S. (2012):** Rice Nutritional Values and Facts Diabetics Can Use. 2011. www.TheDiabetesClub.com.
15. **Englyst H.; Kingman S, and Cummings J. (1992):** Classification and measurement of nutritionally important starch fractions. European Journal of Clinical Nutrition 1992; 46: 33S–50S.
16. **FAO/WHO (1998):** Carbohydrates in Human Nutrition. Report of a Joint FAO/WHO Expert Consultation. FAO Food and Nutrition Paper 66. Rome: Food and Agriculture Organization of the United Nations, 1998.

17. **Feskens EJ.; Loeber JG, Kromhout D. (1994):** Diet and physical activity as determinants of hyperinsulinaemia: the Zutphen Elderly Study. American Journal of Epidemiology 1994;140:350–60.
18. **Fiona S.; Atkinson, Kaye Foster-Powell, and Jennie C. (2008):** International tables of glycemic index and glycemic load value: Brand-Miller in the December 2008.
19. **Fontvieille AM.; Rizkalla SW, Penfornis A, Acosta M, Bornet FR, and Slama G. (1992):** The use of low glycaemic index foods improves metabolic control of diabetic patients over five weeks. Diabetic Medicine 1992; 9: 444–50.
20. **Foster-Powell K.; and Miller JB. (1995)**: International tables of glycemic index. Am J Clin Nutr 1995; 62: 871S-890S.
21. **Foster-Powell K; Holt SH, and Brand-Miller JC. (2002):** International table of glycemic index and glycemic load values: 2002. Am J Clin Nutr 2002; 76:5-56.
22. **Fridewald, W.T.; Leve, R.I. and Fredrickson, D.S. (1972):** Estimation of the concentration of low density lipoprotein. Clin. Chem. (1972) 18:499-502.
23. **Frost G.; Leeds A, Dore´ J, et al (1999):** Glycemic index as a determinant of serum HDL-cholesterol concentration. Lancet 353:1045-1048, 1999.
24. **Frost G.; Wilding J, and Beecham J. (1994):** Dietary advice based on the glycemic index improves dietary profile and metabolic control in type 2 diabetic patients. Diabetic Medicine 1994; 11: 340–67.
25. **Granfeldt Y.; Bjo¨rck I, Hagander B.(1991**): On the importance of processing conditions, products thickness and eggs addition, for the glycemic and hormonal responses to pasta—a comparison with white bread made from pasta ingredients. European Journal of Clinical Nutrition 1991; 45: 489.
26. **Granfeldt Y.; Hagander B, and Bjo¨rck I. (1995):**Metabolic responses to starch in oat and wheat products. On the importance of food structure, incomplete gelatinization or presence of viscous fiber. European Journal of Clinical Nutrition 1995; 49: 189–99.
27. **Grundy SM. (1999):** The optimal ratio of fat-to-carbohydrate in the diet. Annual Review of Nutrition 1999; 19: 325–41.
28. **Grundy SM.; and Denke M. (1990):** Dietary influences on serum lipids and lipoproteins. Journal of Lipid Research 1990; 31: 1149–72.
29. **Holm J.; Koellreutter B, and Wursch P. (1992):** Influence of sterilization, drying and oat bran enrichment of pasta on glucose and insulin responses in healthy subjects and on the rate and extent of in vitro starch digestion. European Journal of Clinical Nutrition 1992; 46: 629.
30. **Hu EA. ; Pan A, Malik V, Sun Q. (2012):** White rice consumption and risk of type 2 diabetes: meta-analysis and systematic review. Department of Nutrition, Harvard School of Public Health, Boston, MA 02115, USA.
31. **Jacobs DR.; Meyer KA, Kushi LH, and Folsom AR. (1998):** Whole-grain intake may reduce the risk of ischemic heart disease death in postmenopausal women: the Iowa Women's Health Study. American Journal of Clinical Nutrition 1998; 68: 248–57.
32. **Jarvi A.; Karlstrom B, Granfeldt Y, et al (1999):** Improved glycaemic control and lipid profile and normalized fibrinolytic activity on a low-glycemic index diet in type 2 diabetic patients. Diabetes Care 22:10-18, 1999.
33. **Jenkins DJ., and Jenkins AL.(1985):** Dietary fiber and the glycemic response. Proceedings of the Society for Experimental Biology and Medicine 1985; 180: 422–31.
34. **Jenkins DJ.; Wolever TM, Kalmusky J, et al. (1986):** Low-glycemic index diet in hyperlipidemia: use of traditional starchy foods. American Journal of Clinical Nutrition 1987; 45: 66–71.
35. **Jenkins DJ; Wolever TM, Taylor RH, Barker H, Fielden H, Baldwin JM, Bowling AC, Newman HC, Jenkins AL, and Goff DV. (1981)**: Glycemic index of foods: a physiological basis for carbohydrate exchange. Am J Clin Nutr 1981; 34: 362-366.
36. **Jeppesen J.; Schaaf P, Jones C, Zhou MY, Chen YD, and Reaven GM. (1997):** Effects of low-fat, high-carbohydrate diets on risk factors for ischemic heart disease in postmenopausal women. American Journal of Clinical Nutrition 1997; 65: 1027–33.
37. **King H.; Aubert RE, and Herman WH (1998):** Global burden of diabetes, 1995–2025: prevalence, numerical estimates, and projections. Diabetes Care 1998; 21: 1414–31.
38. **Krauss RM.; Eckel RH, Howard B, et al. (2000):** AHA dietary guidelines revision 2000: a statement for healthcare professionals from the Nutrition Committee of the American Heart Association. Circulation 2000, 2000; 102: 2284–99.
39. **Kushi LH.; Meyer KA, and Jacobs DR. (1999):** Cereals, legumes, and chronic disease risk reduction: evidence from epidemiologic studies. American Journal of Clinical Nutrition 1999;70(Suppl):451S–8S.
40. **Liu S.; Stampfer MJ, Hu FB, Giovannucci E, Rimm E, Manson JE, Hennekens CH, and Willett WC. (1999):** Whole-grain consumption and risk of coronary heart disease: results from the Nurses' Health Study. American Journal of Clinical Nutrition 1999; 70: 412–9.
41. **Lovejoy J.; DiGirolamo M.(1992):** Habitual dietary intake and insulin sensitivity in lean and obese adults. American Journal of Clinical Nutrition 1992; 55: 1174–9.
42. **Malekinejad, H.; Rezabakhsh, A.; Rahmani, F.; Hobbenaghi, R.(2012):** Silymarin regulates the cytochrome P450 3A2 and glutathione peroxides in

the liver of streptozotocin-induced diabetic rats. 2012 words 6466.
43. **Marshall JA., Hamman RF, and Baxter J. (1991):** High-fat, low carbohydrate diet and the aetiology of non-insulin dependent diabetes mellitus: the San Luis Valley Diabetes Study. American Journal of Epidemiology 1991; 134: 590–603.
44. **McIntosch M., and Miller C. A (2001):** diet containing food rich in soluble and insoluble fiber improves glycemic control and reduces hyperlipidemia among patients with type 2 diabetes mellitus. Nutrition Reviews 2001; 59: 52–5.
45. **Mensink RP., and Katan MB.(1992):** Effect of dietary fatty acids on serum lipids and lipoproteins: a meta-analysis of 27 trials. Arteriosclerosis and Thrombosis 1992; 12: 911–9.
46. **Meyer KA., Kushi LH, Jacobs DR, Slavin J, Sellers TA, and Folsom AR. (2000):** Carbohydrates, dietary fiber, and incident type 2 diabetes in older women. American Journal of Clinical Nutrition 2000; 71: 921–30.
47. **Miller-Jones J. (2007):** Glycemic response definitions. Cereal Foods World, 2007;52:54–5.
48. **Monro JA. (2006):** Assessing the glycemic potency of foods and its relevance to industry and the consumer. Intl Rev Food Sci. Tech. 2006; Winter 2005/ 2006:60–5.
49. **National Heart Lung and Blood Institute (2012):** Calculate your Body Mass Index. U.S. Department of Health & Human Services. Saturday, 2012 http://www.nhlbi.nih.gov/index.htm. USA.gov.
50. **National Institute of Diabetes and Digestive and Kidney Diseases. (2001):** Diet and exercise dramatically delay type 2 diabetes. Press release of the National Institute of Diabetes and Digestive and Kidney Diseases. August 8, Accessed November 29, 2001 at http:/www.nih.gov/news/pr/aug2001/niddk-08.htm.
51. **Nestle PJ., Carroll KF, and Havenstein N. (1970):** Plasma triglyceride response to carbohydrates, fats and caloric intake. Metabolism 1970; 19: 1–18.
52. **Parks EJ. and Hellerstein MK.** (2000): Carbohydrate-induced hypertriacylglycerolemia: historical perspective and review of biological mechanisms. American Journal of Nutrition 2000; 71: 412–33.
53. **Rassmussen OW; Thomsen C, Hansen KW, Vesterlund M, Winther E, and Hermansen K. (1993):** Effects on blood pressure, glucose, and lipid levels of a high-monounsaturated fat diet compared with a high-carbohydrate diet in NIDDM subjects. Diabetes Care 1993;16:1565–71.
54. **Reaven GM. (1997):** Do high carbohydrate diets prevent the development or attenuate the manifestations (or both) of syndrome X? A viewpoint strong against. Current Opinion in Lipidology 1997; 8: 23–7.
55. **Reeves, P.G.; Nielsen, F.H. and Fahmy, G.G. (1993):** Purified diets for laboratory rodents: Final report of the American Institute of Nutrition adhoc writing committee on the reformulation of the AIN-76 A Rodent diet. J. Nutrition, (1993) 123:1939-151.
56. **Richards MK.; Paeratakul S, Bray GA, and Popkin BM. (2001):** Current theories regarding the influence of diet and the control of obesity. In: Wilson T, Temple NJ, eds. Nutritional Health: Strategies for Disease Prevention. Totowa, NJ: Human Press Inc., 2001, 135–50.
57. **Salmeron J. ; Ascherio A, Rimm EB, Colditz GA, Spiegelman D, Jenkins DJ, Stampfer MJ, Wing AL, and Willett WC. (1997):** Dietary fiber, glycemic load and risk of NIDDM in men. Diabetes Care 1997; 20: 545–50.
58. **Salmeron J.; Manson JE, Stampfer MJ, Colditz GA, Wing AL, and Willett WC.(1997):** Dietary fiber, glycemic load, and risk of noninsulin-dependent diabetes mellitus in women. Journal of the American Medical Association 1997;277:472–7.
59. **Seidell JC (2000)**: Obesity, insulin resistance and diabetes—a worldwide epidemic. Br J Nutr 2000;38(suppl):S5–8.
60. **Sullivan A. (2000):** Healthy eating: something to chew over? Nursing Standards 2000; 14: 43–6.
61. **Trowell HC. (1973):** Dietary fibre, ischaemic heart disease and diabetes mellitus. Proceeding of the Nutrition Society 1973; 32: 151–7.
62. **Trowell HC. (1975):** Dietary fiber hypothesis of the aetiology of diabetes mellitus. Diabetes 1975; 24: 762–5.
63. **Tsunehara CH.; Leonetti DL, and Fujimoto WY. (1990):** Diet of secondgeneration Japanese-American men with and without non-insulin-dependent diabetes. American Journal of Clinical Nutrition 1990; 52: 731–8.
64. **Tuomilehto J.; Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, and Salminen V, (2001):** Uusitupa M and for the Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. New England Journal of Medicine 2001;344:1343–50.
65. **Wahlefeld, A.W. (1974):** Enzymatic Determination of Triglycerides.Methods of Enzymatic Analysis. (1974) Vol. 5, HU. Bergmeyer, Ed. Academic Press, New York, pp. 1831-1835.
66. **Wolever TMS.; Jenkins DJA, Vuksan V, Jenkins AL, Buckley GC, Wong GS, and Josse RG. (1992):** Beneficial effect of a low glycemic index diet in type 2 diabetes. Diabetic Medicine 1992; 9: 451–8.

8/3/2012

Quality Control of Certain Slimming Herbal Products Present in the Egyptian Market

Mostafa A. Abdel Kawy[1], Eman G. Haggag*[2], Amira A. Abdel Motaal[1] and Nermin A. Eissa[3]

[1]Pharmacognosy Department, Faculty of Pharmacy, Cairo University, Cairo 11562, Egypt
*[2]Pharmacognosy Department, Faculty of Pharmacy, Helwan University, Helwan, Egypt, 11795
[3]Pharmacognosy Department, Faculty of Pharmaceutical Sciences and Pharmaceutical Industries, Future University in Egypt, Cairo, Egypt
wemisr@hotmail.com

Abstract: Two commercial slimming herbal tea products present in the Egyptian market *viz*; Sekem Herbal Tea (commercial herbal tea-**1**) and Royal Regime Tea (commercial herbal tea-**2**) were quality-evaluated compared to two prepared standard mixtures; prepared standard herbal tea-**1**, composed of mixture of herbs of Sekem Herbal Tea (chicory, marjoram, nettle and senna leaves, liquorices roots, celery fruits and calendula flowers) and prepared standard herbal Tea-**2** composed of mixture of herbs of Royal Regime Tea (fennel, senna and chicory). Quality control of both commercial and prepared herbal teas was conducted through microscopical identification of their diagnostic elements, determination of certain heavy metals and pharmacopeial constants and detection of aflatoxins content and total microbial count. Quality control was also conducted through HPLC quantitative estimation of main active constituents of the commercial and prepared standard herbal teas, where results revealed that as for the percentages of sennoside A in commercial herbal tea-**1** and its standard tea were 58.87 and 56.70, respectively, while its percentage in commercial herbal tea-**2** and its standard tea were 59.30 and 55.17, respectively, as for esculetin percentages in commercial herbal tea-**1** and its standard tea were 0.41 and 0.73, respectively, while its percentages in commercial herbal tea-**2** and its standard tea was the same 0.17 and as for scopoletin percentage in commercial herbal tea-**1** and its standard tea were 0.19 and 0.18, respectively, which all within the reported standard limits. Quality control was also conducted through GC/MS of the volatile oil constituents, the percentage yields of volatile oils, which were obtained by hydrodistillation of both commercial tea-**1** and its corresponding standards tea were 1.8 and 2.0 V/W, respectively, while that of commercial tea-**2** and its corresponding standard tea were 2.0 and 2.2 V/W, respectively. GC-MS analysis revealed that the major oil components of both commercial teas and their corresponding prepared standard teas were nearly the same with slight significant different percentages. Lipid profile tests (cholesterol, triglycerides and total lipids) were carried out in induced hypercholesteremic rats and after eight weeks of oral treatment with aqueous extracts of commercial tea**s-1** and **-2** and their standard teas, showing significant reduction in cholesterol, triglycerides and total lipids plasma levels. Sekem herbal tea decreased the glucose levels by 10.7% in normoglycemic rats after 30 minutes of glucose oral administration and by 8.3% in STZ-induced diabetic rats after 30 days treatment; while it's prepared standard tea caused 5.7 and 4.5% reduction, respectively. Royal Regime Tea decreased the glucose levels in normoglycemic and hyperglycemic rats by 3.0 and 6.0% reduction, respectively; while it's prepared standard tea decreased the blood glucose level by 9.6 and 8.3% in normoglycemic and hyperglycemic rats after 30 minutes and 30 days of treatment, respectively.
[Mostafa A. Abdel Kawy, Eman G. Haggag, Amira A. Abdel Motaal and Nermin A. Eissa. **Quality Control of Certain Slimming Herbal Products Present in the Egyptian Market.** *Life Sci J* 2012;9(3):2273-2285] (ISSN:1097-8135). http://www.lifesciencesite.com. 326

Key words: Drug evaluation, senna, liquorice, chicory, nettle, marjoram, celery, calendula**,** fennel**,** hypocholesterermic**,** hypoglycemic and antidiabetic activity.

1. Introduction:

The use of medicinal plants for treating diseases is the oldest existing method that humanity has tried to cope with illness, in high-income countries, the widespread use of phytotherapy declined at the end of the first era of the twentieth century, due to the development and production of synthetic medicine, however during the past few decades, the use of phytotherapy started to increase even in industrial countries, while in low- and –middle -income countries, phytotherapy never stopped being important as the only therapeutic system to which certain people could refer (Crellin *et al*., 1989). It is important that the conditions for the correct and appropriate use of phytotherapeutic methods to follow the criteria of safety, efficacy and quality; safety in the meaning of assuring the presence of the least acceptable limits of aflatoxins, pesticides, toxic heavy metals and micro organisms in the drug, efficacy means that the drug must be efficient in the given dose, while quality means evaluating the identity, purity, content, and other chemical, physical and biological properties of the drug (WHO, 2007). A healthy weight is crucial for a long and healthy life, being obese or overweight

increases the risk of heart attack, high blood cholesterol, high blood pressure and diabetes (Grundy, 2004; Haslam and James, 2005; Caballero, 2007; Shoelson *et al.*, 2007). Drinking certain slimming herbal teas prevents fat absorption, expelling it out of the body with wastes and getting rid of water accumulated in the body, thus leading to weight loss (Dewick, 1999). According to the most recent statistics conducted by the World Health Organization, nearly 70 percent of Egyptian adults are overweight (WHO, 2010). This encouraged the authors to evaluate two commercial slimming herbal tea products that are widely used in Egyptian market *viz*; Sekem Herbal Tea and Royal Regime. Though these commercial herbal teas are used as slimming drugs, some of their individual constituents reported to have other pharmacological activities (Evans, 2002; Gulcin *et al.,* 2004; Mimica-Dukic and Popovic, 2007; Meena *et al.*, 2010), thus it deemed interested to the authors to quality evaluate these herbal tea products comparing them with prepared standard teas as well as to investigate their hypocholestermic and hypoglycemic activity.

2. Materials and Methods

Plant material:

Herbal tea material: commercial preparations used were collected from different batches present in the Egyptian market; samples of batch numbers (HS0305/09, HS0334/09 and HS0335/09) of Sekem herbal tea (slimming) with production dates of (2/09, 6/09 and 7/09, respectively) and samples of batch numbers (06020, 06504 and 06681) with production dates (5/09, 6/09 and 7/09 respectively) of royal regime tea. Standard herbal mixture teas were prepared from herbs collected from the Experimental Farm, Faculty of Pharmacy, Cairo University; as for prepared standard herbal tea-**1** composed of 20 gm *Chicorium intybus* L., 15 gm *Urtica dioica* L., 15 gm *Majorana hortensis* L. and, 10 gm *of Cassis angustifolia* L. leaves, 15 gm *Glycyrhizza glabra* L. roots, 15 gm *Apium graveolens* L. fruits and 10 gm *of Calendula officinalis* L. flowers, as for prepared standard herbal tea-**2** composed of 50 gm *Foeniculum vulgare* L., 30 gm *Cassia angustifolia* L. and 20 gm of *Chicorium intybus* L.

Animals

Adult male albino rats (*Rattus norvegicus*) weighing from 22 – 28 g obtained from the Animal Houses, Faculty of Veterinary Medicine, Alexandria University, Egypt, were used for antihyperlipedemic, hypoglycemic and antidiabetic activity.

Microorganisms:

The bacterial strains*; Bacillus cereus, B. polymexa B. sphaericus, B. subtilus, Micrococcus* spp and *Staphylococcus epidermidis* and the fungi; *Aspergillus candidus; A. niger, A. versicolor, Fusarum equiseti, F. oxysporum; Mucor pusillus* and *Penicillum* spp., were all supplied through Department of Microbiology, Faculty of Pharmacy, Al-Azhar University, Cairo, Egypt, were used for microbial count measurement.

Solvents and chemicals:

Acetonitrile, methanol, phosphoric acid, acetic acid formic acid (analytical and HPLC grade), anhydrous CH_3COONa, $MgSO_4$, and Na_2SO_4 were all supplied through E. Merck, Darmstadt, Germany. Aflatoxins B_1, B_2, G_1 and G_2 were supplied from, the Central Laboratory of Residue Analysis of Pesticides and Heavy Metals at Food, Agriculture Research Center Dokki, Giza, Egypt. Kits for lipid profile test; commercial kits for serum total cholesterol, triglycerides and total lipids were supplied from Diamond Diagnostics Co., Cairo, Egypt.

Authentic reference Materials:

Sennoside A, esculetin and scopoletin, were purchased from Sigma Chemical Co. St. Louis, Mo, USA. The authentic samples for pesticide analysis were supplied through Central Laboratory of Residues Analysis of Pesticides and Heavy Metals from Food – Agriculture Research Center, Giza, Egypt.

LC/MS/MS for determination of pesticide residue:

Agilent Technologies 7890 A, Triplet Quadrupole MS Agilent Technologies 7000 B; column Phenomenex 50 mm column Aqua C-18 with internal diameter: 0.32 mm and film thickness 5 µm, Flow rate; 0.2 ml/min, Mobile phase; Solvent A: H_2O / 0.1 formic acid, Solvent B: acetonitrile / 0.1% formic acid with Mass spectrometer Elecrospray ionization, Multiple Reaction and monitoring (MRM) mode was used according to scheme of pesticide analysis of Chen *et al*. (2011) as follows; fifty grams of each tea sample under investigation was comminuted in a disintegrator for 1 min., 5 g was transferred into 50 ml centrifugal tube having 10 ml H_2O + 10 ml acetonitrile (containing 1% acetic acid), vortexed for 3 minutes, set for 1 h, 5 g anhydrous CH_3COONa + 4 g anhydrous $MgSO_4$ were added, vortexed for 1 min., the tubs were immediately cooled in ice bath for 5 min., centrifuged for 5 minutes at 5000 rpm, samples were then subjected to SPE clean – up [(SPE column was conditioned with 10 ml acetonitrile/ toluene 3:1 (containing 1% acetic acid)], 1 ml of the extract was subjected to CC eluted with 20 ml acetonitrile/toluene 3:1 (containing 1% acetic acid). The effluent was concentrated to 1 ml by evaporating with weak N_2 stream at 40°C the residue was reconstituted in 1ml acetonitrile (1%acetic acid), filtered with 0.2 acetonitrile (1%acetic acid) and with 0.2 µm organic filter and then injected into LC/MS/MS for analysis.

Preparation of the samples for HPLC analysis:

One hundred and fifty grams from each of commercial herbal tea-**1** and **-2**, and their

corresponding prepared standard teas were extracted using Soxhlet apparatus with ethanol till exhaustion, evaporated to dryness under reduced pressure (40°). Seven mg of each residue was dissolved separately in 1 ml of methanol and 10 µl of each prepared solution was subjected to HPLC.

HPLC for quantitative determination of active constituents:

HPLC Agilent 1100 series, Quaternary pump, equipped with a Hypersil 100 RP-18 column (5µm, 250 × 4 mm), flow rate 1.5 ml/min, samples injector (20 ml) and UV photodiode array detector was used for quantitative determination esculetin, scopoletin and sennoside A. Isocratic elution at room temperature using methanol: water 35: 65 V/V (adjusted to pH 3.5 with phosphoric acid) as mobile phase, and UV detection at 320 nm for esculetin. Isocratic elution at room temperature using methanol: water 15: 85 V/V (phosphoric acid was added till pH 2) as a mobile phase and UV detection at 330 nm for scopoletin. Isocratic elution at room temperature using methanol: 2% acetic acid 70:30 V/V as mobile phase and detection at 254 nm for sennoside A. Standard calibration curves were established using different concentrations of authentic esculetin, scopoletin and **s**ennoside A (Hayashi *et al.,* 1980).

GPC/HPLC for quantitative detection of aflatoxins:

Aflatoxins were detected after extraction of the herbal samples with dichloromethane:water (10:1) by clean up gel-permeation chromatography (GPC) using a column packed with Bio-beads S-X3 and dichloromethane : hexane (3:1) as eluent for clean-up of extracts prior to separation and quantification of aflatoxins by HPLC. The eluent fraction containing the aflatoxins is concentrated by evaporation under reduced pressure and the aflatoxins separated by Agilent 1100 HPLC on an ODS reverse phase column (C-18, 4.6 mm × 150 mm, 3.5µm) with fluorescent UV detector (365 nm), isocratic elution at room temperature using deionized water: methanol : acetonitrile (50:40:10) as mobile phase with a flow rate of 0.8 ml/min and injection volume 10 µl (Hetmanski and Scudaamore, 1989).

Preparation of volatile oils:

Volatile oils of herbal teas were prepared by hydrodistillation using Clevenger apparatus (Egyptian Pharmacopeia, 2005). The obtained oils were dried over anhydrous sodium sulfate and stored at -4°C till analyzed by GC/MS.

GC/MS for volatile oils analysis:

Analysis was performed on a Shimadzu GC/MS QP2010 USA, samples were injected into an XTI5 MS column (0.25 µm, 20 m × 0.25 mm), oven temperature: 60-260°C, program rate; 2°C/min., injector port temperature: 250°C, detector; FID/250°C, carrier gas: Helium, flow rate; 6 ml/min., linear velocity: 44.7 cm/sec.

Determination of microbial contaminants:

A total of eighteen samples were tested; nine samples of commercial herbal tea-**1** (three samples of each of the three product batches) and nine samples of commercial herbal tea-**2** (three samples of each of the three product batches). One g of each of each sample was mixed with 9 ml sterile peptone water and then 10 fold serial dilutions were made. Five level-spacing 1 logarithmic unit were investigated by pipetting 1 ml from each level in a plate, 15 ml of nutrient (agar for bacterial count, Sabouraud dextrose agar for fungal count and Mackonky agar for pathogenic coliform count), were added. The contents were allowed to solidified and inverted plates were incubated at 37°C, examined after 2 days for both bacterial and coliform count and after 7 days for fungal count and suitable dilution were counted (Baker and Breach, 1980).

Hypocholesterermic activity:

Thirty male rats were fed with a diet supplied with 1% cholesterol and beef fat for 4 weeks to become hypercholesteremic. The hypercholesteremic rats were then randomly allocated into 5 equal groups; control hypercholesteremic group, second and third groups receiving aqueous extracts of commercial herbal tea-**1** and its prepared standard tea, respectively, fourth and fifth groups receiving aqueous extracts of commercial herbal tea-**2** and its prepared standard tea, respectively. Basal blood samples were taken before treatment by puncturing the inner canthus of the eye under light ether anesthesia and after overnight fasting. Blood from each rat was left to clot, then centrifuged for about 10 minutes at 300 rpm to obtain a clear serum, and stored frozen at -20°C until assayed for total cholesterol, triglycerides and total lipids using specific kits (Saravanan *et al*., 2007).

Hypoglycemic and antidiabetic activity:

Oral glucose tolerance test (OGTT) in hypoglycemic rats

The oral glucose tolerance test was performed on normoglycemic five groups of rats fasted for 15 hrs. The normoglycemic rats were then randomly allocated into 5 equal groups; control group receiving saline, second and third groups receiving aqueous extracts of commercial herbal tea-**1** and its prepared standard tea, respectively, fourth and fifth groups receiving aqueous extracts of commercial herbal tea-**2** and its prepared standard tea, respectively. Thirty minutes later, glucose (1.25 g/kg body weight) was orally administered to each rat. Blood samples were obtained from each rat by sinocular puncture under light ether anesthesia at -30 (half hour before drug administration), 0 time (just before glucose administration, 30, 60, 90, 120 and 150 min. for

determination of glucose according to commercial kits (Waynforth and Flecknell, 1992).

Induction of diabetes

Rats were fasted overnight before inducing diabetes with Strerptozotocin (STZ). The rats were given an intraperitoneal injection of STZ, freshly dissolved in saline at a dose of 65 mg/kg body weight, so as to induce diabetic state with blood glucose levels > 200 mg/ml. At this dose of STZ (120 mg/kg body weight) given, diabetic induction was 90% with a mortality rate of 20%. Blood glucose was monitored after STZ treatment to confirm the diabetic state and the diabetic rats were included in the experiment ten days after STZ treatment. Diabetic rats were divided into five groups; control group diabetic group, second and third groups receiving aqueous extracts of commercial herbal tea-**1** and its prepared standard tea, respectively, fourth and fifth groups receiving aqueous extracts of commercial herbal tea-**2** and its prepared standard tea, respectively. Animals were continued with the administration for 60 days and were used to assess the effect of different treatments on the change of blood glucose at 0, 15, 30 and 60 days (Waynforth and Flecknell, 1992).

Statistical analysis

All the data were presented as mean ± standard deviation. Differences between treated groups were analyzed for statistical significance by Student's test. Differences were regarded significant at $p<0.05$ level of significance. The statistical analyses were performed with the software Graph Pad Prism, version 3 for windows, Graph Pad Software (San Diego, CA, USA).

3. Results and Discussion

The microscopical examination of commercial herbal teas-**1** and -**2** compared to their corresponding prepared standard herbal teas (Herbal tea-**1** and -**2**) and compared to reported data (Jackson and Snowdon, 1990), confirmed the presence of diagnostic elements of their constituents among which are; the branched anastomosing laticeferous vessels with dark contents and the non-glandular multicellular hair of chicory; the unicellular stellate hair, fragments of crystal layers of CaOx clusters, large cystoliths hair containing dense granular masses of $CaCO_3$ and glandular hair with uniseriate stalk and biseriate head of nettle; the non-glandular unicellular warty cuticle hair, crystal sheath (lignified fibers with thick wall, wide lumen and tapering ends surrounded by parenchyma cells containing prisms of Ca Ox crystals) and clusters of CaOx crystals of senna; the bordered pitted large lignified xylem vessels, cork cells of polygonal shape and thick straight anticlinal wall, starch granules (simple, oval and rounded with no striations) and crystal sheath of liquorice; the bulbous papillae with an adherent pollen grain, glandular hair with biseriate ovoid head and biseriate stalk, non-glandular hair conical biseriate multicellular hair, fragments of fibrous layer of anthers of slightly thickened walls associated with small elongated sclerenchyma with slightly thickened walls of large pits and spiny pollen grains of calendula; the nonglandular multicellular uniseriate hair with warty cuticle, glandular capitate hair (one-celled ovoid head and one-celled short stalk), glandular labiaceous hair (eight radiating celled-head and one celled-stalk) of marjoram; the cylindrical long vittae with brown content; lignified fibro–vascular tissue of small thin-walled fibers and vessels with spiral and annular thickening, epicarp cells with narrow tangentially elongated thin walled-cells arranged in groups parallel to one another oriented in one direction (non-parquetry structure) of endocarp of celery; the brown simple (nonbranched) vitti and reticulate parenchyma of fennel. The microscopical examination confirmed the absence of any substitutions or adulteration (Figure 1).

Determination of certain heavy metals and certain pharmacopeial constants

Because metal contaminants cause chronic toxicity problems as; lead causes anorexia, constipation, severe abdominal cramps, peripheral neuritis, encephalopathy, renal dysfunction, anemia, mild jaundice, psychological disorder and olegospermia; cadmium causes renal injury, liver damage, anemia yellow stained teeth and distributes calcium metabolism (osteomalacia; decrease bone density), hypercalcinuria and renal stones (De Smet et al., 1992), thus the level of certain heavy metals such as lead (Pb), cadmium (Cd), mercury (Hg), chromium (Cr) and arsenic (Ar) were determined adopting atomic absorption method (Ghaedi *et al.*, 2008). The results in Table 1 showed that the concentrations of heavy metals in both commercial teas were found to be within maximum tolerable limits (WHO guidelines, 2007).

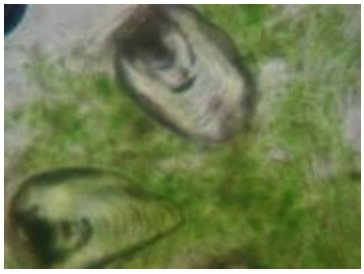
Certain specific parameters and values must be followed during the quantitative and qualitative estimations of any herbal drug either in single or in a mixture form, among which are total ash, acid insoluble ash and water soluble ash. Adopting the guidelines of WHO (2007), for determination of ash constants for both commercial teas and their corresponding prepared standard herbal teas, as well as for each herb constituting the herbal teas separately, results obtained (Table 2) showed that the values of the total ash, acid insoluble ash and water soluble ash were around the recorded values in the published data (British Pharmacopoeia, 1999; Egyptian Pharmacopoeia, 2005), indicating that there is no adulteration or substitution in these plant constituents.

Laticeferous vessels of Chichorium X = 280

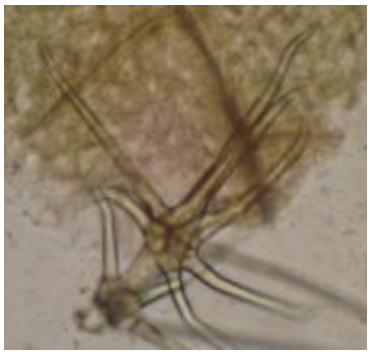
nonglandular hair of Chichorium X = 400

Glandular hair of Nettle X = 340

Fragment of crystal layer of Ca.Ox clusters of Nettle X = 140

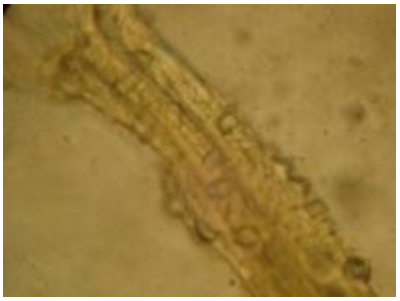


Cystolysith hair of Nettle X = 280



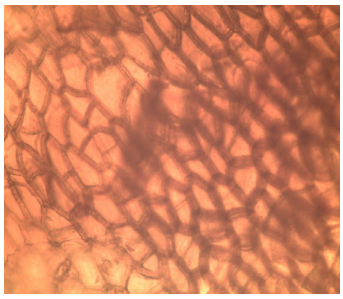
Stellate hair of Nettle X = 140

Warty cuticle hair of Senna X = 140

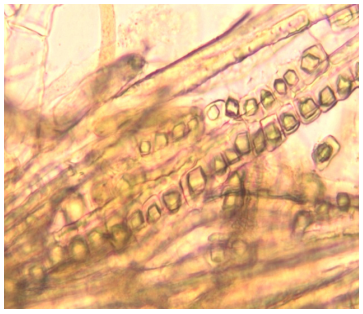


Crystal sheath of Senna X = 250

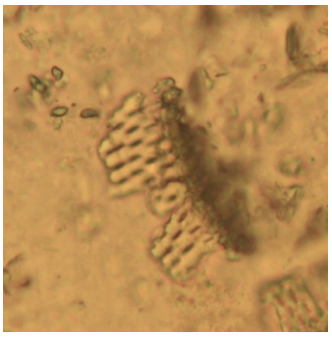
Clusters of Ca.Ox crystals of Senna X = 280



Cork cells of Liquorice X = 250

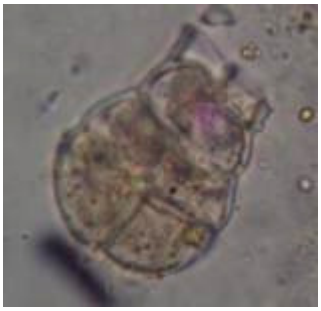


Crystal sheath of Liquorice X = 250



Pitted xylem vessels of Liquorice X = 100

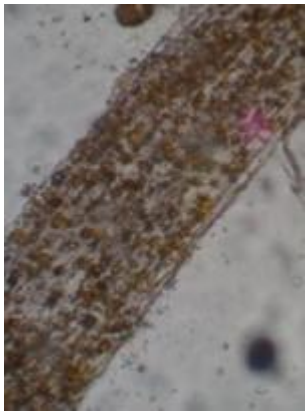
Spiny pollen grains of Calendula X = 420



Glandular hair of Calendula X = 340

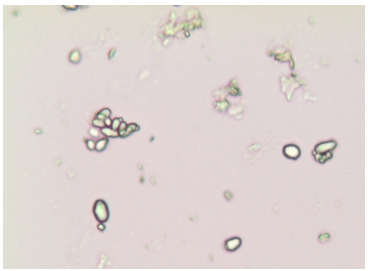
Starch granules of Liquorice X = 100

Fig. (1): Dignostic elements of the different herbal teas



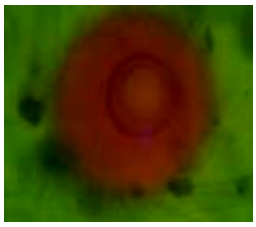
Fibrous layer of anther of Calendula X = 420

Bibrous papillae of Calendula X = 250



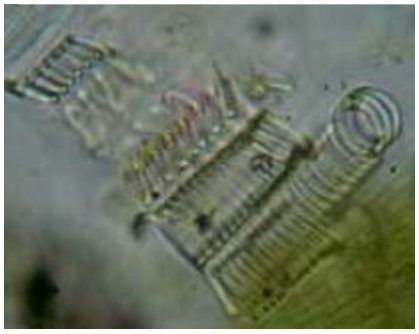
Nonglandular hair of Calendula X = 340

Non-parquetory endocarp of Cellery X = 280

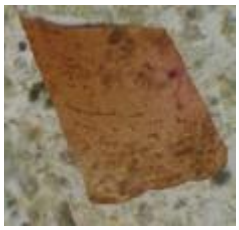


Vittea of Cellery X = 140

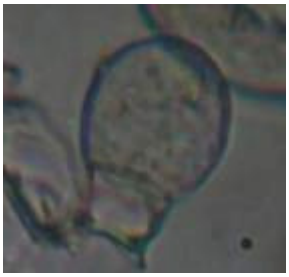
Nonglandular hair with warty cuticle of Majoram X = 140



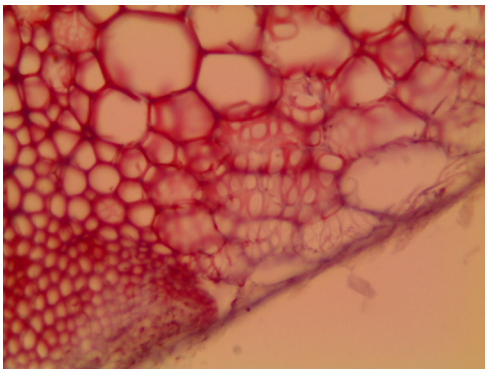
Spiral and annularxylem vessel of Cellery X = 340



Labiaceous hair of Marjoram X = 280



Capitate hair of Majoram X = 340



Reticulate parenchyma of Fennel X = 280

Vittea of Fennel X = 140

(cont.) **Fig. (1):** Dignostic elements of the different herbal teas

However in case of celery, total and acid insoluble ash pointed to 13.91% and 3.07% respectively, which are higher than that reported in B.P. (should be not more than 10% and 2%, respectively), this difference may be attributed to cultivation of the plant in different habitat. Statistically there is no significant difference between the parameters of commercial and their corresponding prepared standard teas confirming that the commercial teas are not adulterated.

Determination of pesticide residue

Pesticides residues detected in samples of commercial herbal tea-1 were propamocarb, metalaxyl and ortho- phenyl phenol (OPP), while malathion, chlorpyrifos profenofos and OPP were detected in commercial herbal tea-2 in concentrations within limits (MRLs database, 2011) (Table 3). Pesticide residues detected are may be found as a result of environmental contamination such as air, soil and water according to guidelines of pesticide residue contamination, (IFOAM EU Group, 2012).

Table (1): Concentration (mg/kg) of heavy metals in commercial herbal teas-**1** and -**2**

Sample	Cr	Cd	Hg	Pb	Ar
Commercial herbal tea-**1** (Sekem herbal tea)	1.10	0.064	0.08	0.17	0.15
Commercial herbal tea-**2** (Royal regime tea)	-	0.032	0.05	0.12	0.04
WHO standard limits	2.00	0.300	0.50	10.00	4.00

Cr, Chromium; Cd, Cadmium; Hg, Mercury; Pb, lead; Ar, Arsenic

Table (2): Pharmacopeial constants of commercial and prepared standard teas together with the individual powdered herbs

Herbal ingredient or Herbal tea	Total ash		Water-soluble ash		Acid-insoluble ash	
	Weight (g)	% W/W	Weight (g)	% W/W	Weight (g)	% W/W
Calendula flower	0.2311	9.75	0.1106	4.67	0.0256	1.12
Celery fruit	0.4613	13.91	0.1105	3.33	0.0862	3.07
Chicory leaf	0.2424	8.46	0.1194	4.17	0.0230	0.92
Fennel fruit	0.1893	8.41	0.0539	2.40	0.0082	0.28
Liquorice root	0.1610	6.4	0.0562	2.23	0.0160	0.61
Marjoram leaf	0.3199	12.4	0.0271	1.05	0.0782	3.17
Nettle leaf	0.7574	27.1	0.1569	5.62	0.0454	1.88
Senna leaf	0.2880	9.36	0.0562	1.83	0.0274	0.99
Commercial herbal tea-1	0.4447	16.47	0.1568	5.81	0.0214	0.85
Standard herbal tea-1	0.4533	16.60	0.1625	6	0.0232	0.93
Commercial herbal tea-2	0.3455	12.08	0.906	3.17	0.0180	0.71
Standard herbal tea-2	0.3426	11.8	0.0859	2.96	0.0180	0.6

Each figure represents mean of three determinations

Table (3): Concentrations of pesticide residues in commercial herbal teas compared to database

Pesticide	**Concentration (mg/kg)**		
	Herbal tea-1	**Herbal tea-2**	**MRLs**
Propamocarb (carbamate fungicide)	0.19	0.00	0.20
Metalaxyl (phenylamide fungicide)	0.03	0.00	0.10
O-Phenyl Phenol (phenolic biocide & fungicide)	0.02	0.02	0.10
Malathion (organophosphate)	0.00	0.06	0.50
Chlorpyrifos (chlorinated organo thiophosphate)	0.00	0.01	0.10
Profenofos (organothiophosphate)	0.00	0.02	0.02

Detection of aflatoxins

Among the large variety of mycotoxins, were aflatoxins, which are considered as the most dangerous. Aflatoxins are mutagenic and they produce hepatocarcinoma even when given in very low doses for laboratory animals. Expired and non-expired samples from both commercial hebal tea-1 and -2 were investigated for detection of B-series aflatoxins (coumarin nucleus fused to a bifuran unit in addition to a pentenone ring) and of G series (six-membered lactone ring) compared to standards B_1, B_2, G_1 and G_2, which achieved separation peaks in less than 5.5 min (Barbas and Dams, 2005), while none of the herbal samples showed any corresponding peaks. Thus no aflatoxins were detected in any of the samples under investigation confirming the safety of these drugs even if had been taken by mistake after their expiry date.

Microbial contaminants:

Results of microbial contents of both commercial herbal tea-1 and -2 as shown in Table 4, revealed that the samples were considerably different, according to WHO (2012) the aerobic bacteria in dried and instant products

should not exceed 10^3 cfu/g, thus the examined samples could be roughly categorized according to their initial bacterial counts into samples of low microbial content showing bacterial counts from 0 - 10^2 cfu/g, which was found in 10 samples representing 55.6 % of the total 18 samples, moderate microbial content showing bacterial counts from 1^2 - 1^3 cfu/g, which was found in 8 samples representing 44.4 % of the total samples and high microbial content of bacterial counts more than 1^3 cfu/g, which was not found in any of the tested samples. The obtained results were within the limits of reported data (Alexander, 1978) stating that the microbial loads in medicinal plants are usually due to contamination with dust from soil which is considered the main habitat of bacteria and fungi. Yeast was detected in two samples only representing 11.1% of the total samples. The high incidence of Bacillus spp. is in agreement with that reported data (Baxter and Holzapfel, 1982), the domination of Aspergillus spp. in all examined samples is in harmony with reported data (El-Zawahry et al., 1991). Coliform, which is a Gram-ve Bacilli was not detected in any of the investigated samples. In conclusion both commercial teas were slightly contaminated with fungi and bacteria that are non pathogenic organisms (Roy and Chourasia, 1990).

Table (4): Microbial contents of different batches of commercial herbal tea-**1** and -**2**

Herbal tea/ batch No.	Sample No.	Count (cfu/gm)	Bacterial species	Count (cfu/gm)	Mould species
Herbal tea-1 HS0305/09	1	1.0×10	*B. polymexa*	0	-
	2	1.0×10	*Micrococcus* spp.	1.0×10	*M. pusillus*
	3	1.0×10	*Micrococcus* spp.	0	-
Herbal tea-1 HS0334/09	4	2.0×10	*B. subtilus*	0	-
	5	0	-	1.0×10^2	*F. oxysporum*
	6	0	-	0	-
Herbal tea-1 HS0335/09	7	1.0×10^3	*S. epidermidis*	0	-
	8	0	-	2.0×10^2	*A. candidus*
	9	3.0×10	*B. subtilus*	0	-
Herbal tea-2 06020	10	2.0×10	*B. subtilus*	0	-
	11	2.0×10	*B. subtilus*	1.0×10	*A. niger*
	12	4.0×10	*S. epidermidis*	0	-
Herbal tea-2 06504	13	1.0×10	*B. sphaericus*	0	-
	14	1.0×10	*S. epidermidis*	0	-
	15	1.0×10	*B. subtilus*	0	-
Herbal tea-2 06681	16	1.0×10^2	*B. subtilus*	1.0×10	*A. versicolor*
	17	1.0×10	*S. epidermidis*	0	-
	18	3.0×10	*B. cereus*	1.0×10^3	*F. equiseti*

A., Aspergillus; B., Bacillus; F, Fusarium; S., Staphylococcus

Analysis of volatile oils

The percentage yields of each oil components of both commercial herbal teas and their corresponding prepared standard herbal teas were presented in Table 5, the percentage yields were determined according to the Egyptian pharmacopoeia (2005) and oil components were identified by comparing their mass spectra with the published data (Adams, 2004). The percentage yield of volatile oil of commercial herbal tea-1 and its prepared standard were 1.8 and 2 % V/W respectively. Comparing oil constituents of commercial herbal tea-1 and 2 with their corresponding prepared standard herbal tea-1 and -2, it was found that the major oil components were nearly the same but with different percentages. Difference in the volatile oil composition to some extent is governed by climatic and drying conditions as well as the production process (Halim et al., 1990; Okoh et al., 2008; Verma et al., 2010; Bishr et al., 2012).

HPLC analysis of active constituents:

HPLC was carried out for quantitative estimation of the main active constituents of the plant components which do not contain volatile oil in commercial herbal teas-1 and -2 and their corresponding prepared standards. Sennoside A, esculetin, and scopoletin were used for standardization of senna, chicory and nettle, respectively. HPLC chromatograms of commercial herbal tea-1 and -2 as well as their corresponding prepared standard teas were compared to HPLC chromatograms of the authentic standards sennoside A and esculetin for their equivalent retention time peaks, while scopoletin was only determined for commercial herbal tea -1 and its corresponding prepared herbal tea -1 (Table 6). Results showed that the concentrations of the measured active constituents calculated from the standard curves of sennoside A of senna, esculetin of chicory and scopoletin of nettle (Figs 2, 3 and 4, respectively) were within the reported limits (British Pharmacopeia, 1990), showing no significant differences, confirming that the herbs used in the commercial teas are not exhausted.

Table (5): The major oil components present in both commercial herbal teas and their prepared standard herbal teas identified by GC/MS

Retention time/min	Base peak m/z	Oil component	Percentage in Herbal tea-1	Percentage in prepared standard Herbal tea-1	Percentage in Herbal tea-2	Percentage in prepared standard Herbal tea-2
7.22	93.00	α - Terpinene	1.19	3.29	-	-
7.70	68.00	Limonene	48.23	2.17	2.72	1.92
8.81	93.00	γ - Terpinene	1.80	5.64	-	-
10.07	93.00	Terpinolene	0.33	1.70	-	-
10.20	81.00	Fenchone	-	-	2.68	1.84
14.64	71.00	Terpin -4-ol	6.85	23.87	-	-
15.44	59.00	α - Terpineol	0.88	7.75	-	-
15.79	148.00	Methyl chavicol	0.56	9.05	65.06	59.04
20.34	135.00	Carvacrol	0.82	25.04	-	-
21.10	148.00	E- anethole	-	-	28.29	31.89
27.99	41.00	Z- Caryophyllene	0.89	1.13	-	-
31.92	41.00	Aromadendrene	2.71	0.79	-	-

Table (6): HPLC analysis of both commercial herbal teas and prepared standard herbal teas

Retention time/min	Active constituent	Percentage in Herbal tea-1	Percentage in prepared standard Herbal tea-1	Percentage in Herbal tea-2	Percentage in prepared standard Herbal tea-2
1.15	Sennoside A	58.87	56.70	59.30	55.17
5.28	Esculetin	0.41	0.73	0.17	0.17
27. 10	Scopoletin	0.19	0.18	-	-

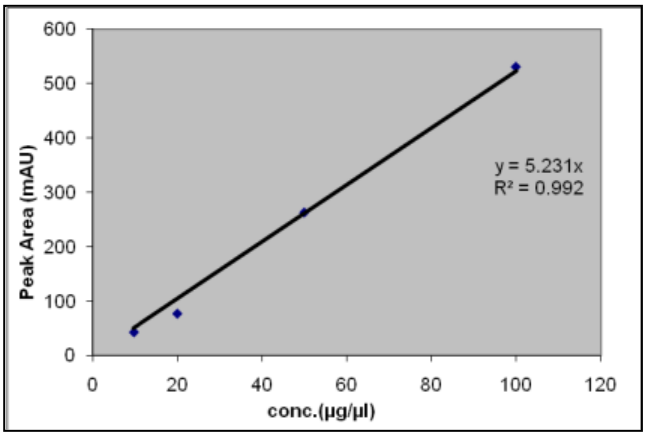


Fig. (2): Standard curve of sennoside A

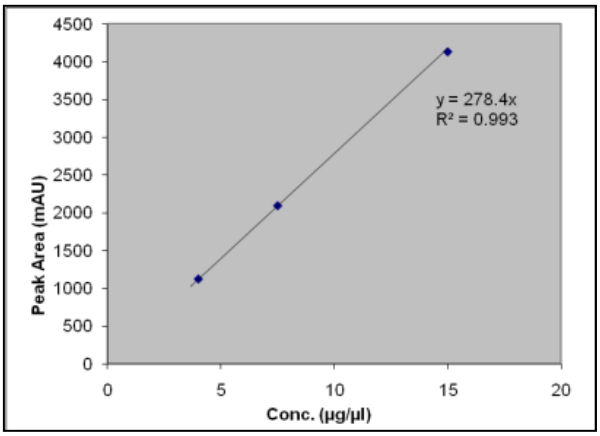


Fig. (3): Standard curve of Esculetin

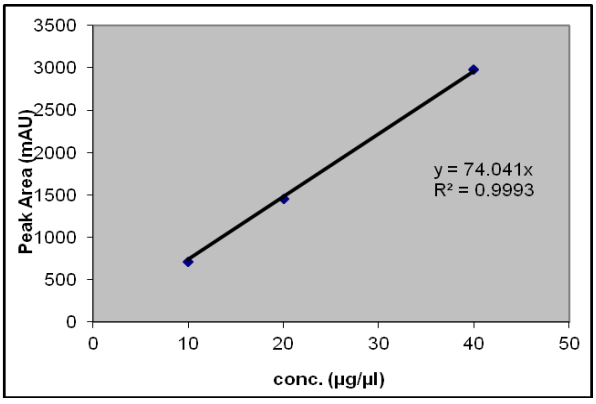


Fig. (4): Standard curve of Scopletin

Biological activity

Hypocholesterermic activity

Results of hypolipidemic activity of both commercial and standard herbal teas-1 and -2 in experimentally induced hypercholesteremic rats (Saravanan *et al.,* 2006) showed that administration of both commercial and standard herbal tea-1 (400 mg/kg) and commercial and standard herbal tea-2 (360 mg/kg) for 8 weeks had significantly reduced total cholesterol, triglycerides and total lipids (Tables 7, 8 and 9). The prepared standard teas showed slightly more effect on lipid profile tests in hypercholesteremic rats than commercial teas. Standard herbal tea-1 showed more decrease in cholesterol and triglyceride levels 16.36% and 5.91%, respectively than the commercial tea after 8 weeks.

While the commercial herbal tea-1 showed more decrease in total lipids by 8.14% than the standard tea after 8 weeks. Standard herbal tea-2 showed more decrease in cholesterol, triglycerides and total lipids by 4.24%, 3.97% and 6.29%, respectively than the commercial tea after 8 weeks.

Hypoglycemic and antidiabetic activity:

The effect of commercial herbal teas-1 and -2 their corresponding prepared standard teas on fasting glucose levels in normoglycemic rats (Table 10) showed no statistical difference in the initial basal glycemic levels between the studied groups. The plasma glucose levels gradually decreased after one hour of oral administration of the aqueous extracts of the herbal formulations. The commercial herbal tea-1 decreased the blood glucose by 10.7% level from 30 to 60 minutes after glucose administration, while the prepared standard herbal tea-1 decreased the level by 5.74%. The commercial herbal tea-2 decreased the blood glucose level by 3.01% while the prepared standard herbal tea-2 decreased the blood glucose level by 9.63% from 30 to 60 minutes after glucose administration in normoglycemic rats. The minimum value of plasma glucose was reached 2.5 hours after treatment. The hypoglycemic effect of the teas under study was statistically significant from 1 to 2.5 hours.

In STZ-induced diabetic rats, plasma glucose levels were 3.1 times higher than those in normal rats. Oral administration of the tea decoctions by diabetic rats showed significant reductions in the plasma glucose levels after 30 days of treatment. The maximum effect was observed after 60 days of treatment by all the tested tea preparations (Table 11). Chicory leaves contain inulin which regulates lipid/glucose metabolism and reported to have antihyperglycemic and antihyperlipidemic effects (Kaur *et al.*, 1989). Celery leaves is reported to have antihperlipidemic and diuretic effect, regulating body fluids and helps getting rid of excess fluid out of the body (Tsi *et al.,* 1996). Liquorice roots are reported to decrease the blood glucose levels in diabetic rats and decreases total body fat, by preventing the accumulation of excessive total body fat and visceral fat (Tominaga *et al.,* 2009). Nettle leaves possess antihyperglycemic effect and is reported to decrease body weight (Wagner *et al.*, 1989).

Table (7): Effect of the herbal teas on the total cholesterol level in hypercholesteremic rats (n=6)

Treatment	Duration of treatment (weeks)		
	0	4th week	8th week
	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)
Control	132.40 ± 2.71	129.20±4.43	127.80±4.95
Commercial herbal tea-**1** (400 mg/kg)	142.40 ± 7.14	126.40 ± 7.28	122.80 ± 5.12
Standard herbal tea-**1** (400 mg/kg)	138.80 ± 4.33	110.00 ± 6.97	97.00 ± 2.98
Commercial Herbal tea-**2** (360 mg/kg)	135.00 ± 7.29	132.20 ± 2.78	103.80 ± 5.47
Standard herbal tea-**2** (360 mg/kg)	133.80 ± 4.77	114.80 ± 3.51	97.20 ± 3.47

Table (8): Effect of the herbal teas on the triglycerides (mg/dl) level in hypercholesteremic rats (n=6)

Treatment	Duration of treatment (weeks)		
	0	4th week	8th week
	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)
Control	87.80±1.98	86.60±2.73	90.60±2.87
Commercial herbal tea-**1** (400 mg/kg)	88.20 ± 2.22	86.00 ± 3.05	81.40 ± 3.98
Standard herbal tea-**1** (400 mg/kg)	86.60 ± 3.53	81.80 ± 2.08	74.80 ± 1.66
Commercial Herbal tea-**2** (360 mg/kg)	89.40 ± 2.23	84.20 ± 1.59	81.40 ± 1.81
Standard herbal tea-**2** (360 mg/kg)	89.80 ± 2.29	83.60 ± 2.04	78.20 ± 2.22

Table (9): Effect of the herbal teas on the triglycerides (mg/dl) level in hypercholesteremic rats (n=6)

Treatment	Duration of treatment (weeks)		
	0	4th week	8th week
	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)
Control	492.60 ± 10.88	502.00 ± 7.94	528.40±26.80
Commercial herbal tea-**1** (400 mg/kg)	497.80 ± 13.47	443.60 ± 20.04	389.00 ± 9.58
Standard herbal tea-**1** (400 mg/kg)	466.20 ± 20.68	429.80 ± 17.54	402.20 ± 8.75
Commercial Herbal tea-**2** (360 mg/kg)	491.60 ± 17.26	432.60 ± 18.15	390.60 ± 7.30
Standard herbal tea-**2** (360 mg/kg)	488.80 ± 15.43	382.60 ± 16.19	357.60 ± 15.84

Table (10): Effect of the herbal teas on fasting blood glucose levels (mg/dl) in normoglycemic rats (n=6)

Treatment	Time (min.)						
	-30	0	30	60	90	120	150
	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)
Control	63.50±1.73	66.17±2.09	148.00±2.31	150.33±2.09	148.00±3.57	144.67±3.70	137.67±3.76
% Change		4.2	123.7	1.6	-1.5	-2.3	-4.8
Commercial herbal tea-**1** (400 mg/kg)	65.17±2.88	66.67±2.03	138.33±2.08	123.50±3.73	110.67±4.42	107.50±6.06	105.50±3.81
% Change		2.3	107.5	-10.7	-10.4	-2.9	-1.9
Standard herbal tea-**1** (400 mg/kg)	67.17±1.40	68.50±1.48	145.00±1.98	136.67±3.76	126.33±3.77	119.00±5.77	116.00±6.32
% Change		2.0	111.7	-5.7	-7.6	-5.8	-2.5
Commercial herbal tea-**2** (360 mg/kg)	66.50±3.97	68.33±2.99	144.17±2.66	139.83±2.80	132.33±3.61	130.33±3.42	121.67±5.51
% Change		2.8	111.0	-3.0	-5.4	-1.8	-6.4
Standard herbal tea-**2** (360 mg/kg)	66.17±2.06	67.00±1.55	135.00±2.41	122.00±2.98	111.00±4.07	98.67±3.27	96.33±2.40
% Change		1.3	101.5	-9.6	-9.0	-11.1	-2.4

Table (11): Effect of the herbal teas on blood glucose levels (mg/dl) in diabetic rats (n=6)

Treatment	Days of treatment		
	0	30	60
	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)	Mean ± SE (mg/dl)
Control	208.33±13.46	226.83±5.11	221.67±4.66
% Change		8.9	-2.3
Commercial herbal tea-**1** (400 mg/kg)	225.83±4.13	207.17±3.24	191.67±3.29
% Change		-8.3	-7.5
Standard herbal tea-**1** (400 mg/kg)	228.67±4.99	218.33±4.40	202.50±2.19
% Change		-4.5	-7.3
Commercial herbal tea-**2** (360 mg/kg)	223.33±4.74	210.00±7.18	200.33±12.59
% Change		-6.0	-4.6
Standard herbal tea-**2** (360 mg/kg)	224.83±4.35	206.17±4.56	189.83±3.81
% Change		-8.3	-7.9

Conclusion

Both commercial teas have nearly the same biological activities, although they contain different constituents and in different percentages as commercial herbal tea-2 contains the same amount of chicory and three times the amount of senna present in commercial herbal tea-1, on the other hand commercial herbal tea-1 contains nettle, majoram, liquorice celery and calendula, while commercial herbal tea-2 contains fennel. Thus though the investigated commercial products are indicated for reducing body weight, this study revealed their value as hypocholestermic and hypoglycemic drugs.

Acknowledgement

The authors would like to thank Dr. Ibrahim El-Ashmawy, lecturer of Pharmacology, Department of Pharmacology, Faculty of Veterinary Medicine, Alexandria University for his great help and support in carrying out the pharmacological part in this study.

Corresponding author

Dr. Eman G. Haggag*[2]
Department of Pharmacognosy, Faculty of Pharmacy, Helwan University, Cairo, Egypt. 11795
Work Tel and Fax No. +202-255-41601,
Cell + 01000023022
E-mail: wemisr@hotmail.com

References

1. Adams, R.P. (2004): Identification of Essential Oil Components by Gas Chromatography/Quadrupole Mass Spectroscopy. Allured Publishing Corporation Carol Stream, IL, USA.
2. Alexander, M.; (1978): Introduction to Soil Microbiology. Wiley Eastern Limited, New Delhi, Bangalore, Bombay, Calcutta.
3. Baker, F.J. and Breach, M.R, (1980): Medical Microbiology Techniques. Butterworths, London, Boston, Sydney, Wellington, Durban, Toranto.
4. Barbas, C. and Dams, A. (2005): Separation of aflatoxins by HPLC application. Agilent Technologies, Inc. Wilmington, DE, USA.
5. Baxter, R. and Holzapfel, W.H. (1982): A microbial investigation of selected spices, herbs and additives in South Africa. Journal of food science; 47: 570-578.
6. Bishr, M. M.; Haggag, E. G.; Moawed, M. M. and Salama, O. M. (2012): Characterization of fennel fruits: Type and Quality (1). Life Science Journal; 9: 611-616.
7. British Herbal Pharmacopoeia(1990): Vol. I, British Herbal Medicine Association.
8. Caballero, B. (2007): The global epidemic of obesity: An overview, Epidemiol Rev.; 29: 1-5.
9. Chen, G.; Cao, P. and Liu, R. (2011): A multi-residue method for fast determination of pecticides in tea by ultra performance liquid chromatography-electroscopy tandem mass spectrometry combined with modified QUECHERS sample preparation procedure. Food Chemistry; 125: 1406-1411.

10. Crellin, J.K.; Philpott, J. and Tommie Bass, A.L. (1989): A Reference Guide to Medicinal Plants: Herbal Medicine Past and Present. Duke University Press.
11. De Smet, P.A.G.M.; Keller, K.; Hansel, R. and Chandler, R.F. (1992): Adverse Effects of Herbal Drugs I. Springer-Verlag, Berlin, Heidelberg, New York, London, Paris.
12. Dewick, P.M. (1999): Medicinal natural products. John Wiley & Sons Ltd, Baffin Lane, Chichester, West Sussex, UD, England.
13. Egyptian Pharmacopoeia. (2005): General Organization for Governmental Printing Affairs, Cairo, Egypt.
14. El-Zawahry, Y.A.; Aziz, N.H. and El-Fouly, M.Z. (1991): Incidence of toxic and pathogenic microorganisms in different Egyptian and Saudi Arabian food commodities and their decontamination by γ-irradiation. Egypt. J. Microbiol; 26: 267-282.
15. Evans, W.C. (2002): Trease and Evans Pharmacognosy, 15th ed. WB Saunders Company Ltd, Edinburg, London, UK.
16. Ghaedi , M.; Shokrollahi, A. ;Kianfar, A.H.; Mirsadeghi, A.S.; Pourfarokhi,A. and Soylak, M. (2008): The determination of some heavy metals in food samples by flame atomic absorption spectrometry after their separation pre-concentration on bis salicyl aldhyde, 1,3 propan diimine (BSPDI) loaded on activated carbon. Journal of Hazardous Materials; 154: 128-134.
17. Grundy, S.M.; (2004): Obesity, metabolic syndrome, and cardiovascular disease. J. Clin. Endocrinol. Metab; 89: 2595–600.
18. Gulcin, I.; Kufrevioglu, O.I.; Oktay, M. and Buyukokuroglu, M.E. (2004): Antioxidant, antimicrobial, antiulcer and analgesic activities of nettle (Urtica dioica L.). Journal of Ethnopharmacology; 90: 205-215.
19. Halim, A.F.; Mashaly, M.M.; Salama, O.; Ali, A.F. and Sandra, P. (1990): Analysis of celery fruit oil and investigation of the effect of storage. Egyptian Journal of Pharmaceutical Sciences, 31: 107-113
20. Haslam, D.W. and James, P. (2005): Obesity. The Lancet, 366: 1197-1209.
21. Hayashi, S.; Yoshida, A.; Tanaka, H.; Mitani, Y. and Yoshizawa, K. (1980): Analytical studies on the active constituents in crude drugs. IV. Determination of sennosides in senna and formulations by high performance liquid chromatography. Chemical and Pharmaceutical Bulletin; 28: 406-412.
22. Hetmanski, M.T. and Scudaamore, K.A. (1989): A simple quantitative HPLC method for determination of aflatoxins in cereals and animal feedstuffs using gel permeation chromatography clean-up. Food additives and Contaminants; 6: 35-48.
23. IFOAM EU Group (2012): Guideline for Pesticide residue Contamination for International Trade in Organic. IFOAM EU Group Brussels, Belgium.
24. Jackson, B.P. and Snowdon, D.W. (1990): Atlas of Microscopy of Medicinal Plants, Culinary Herbs and Spices. Belhaven Press, Pinter Publication, London.
25. Kaur, N.; Gupta, P.P.; Saijpaol, A.K.; Indu, S. and Gupta, P.P. (1989): Triglyceride and cholesterol lowering effect of chicory roots in the liver of dexamethasone- injected rats. Med. Sci. Res.; 17: 1009-1010.
26. Meena, A.K.; Singh, A.; Sharma, K.; Kumari, S. and Rao, M.M. (2010): Physiochemical and preliminary and phytochemical studies on the rhizome of Glycyrrhiza glabra Linn. Int. J. Pharmacy Pharm Sci; 2: 48-50.
27. Mimica-Dukic, N. and Popovic, M. (2007): A promising sources of pharmacologically active compounds and Petrosellinum crispum, Apium graveolens and Pastinaca sativa, Recent progress in Medicinal Plant Species. Phytopharmacology and Therapeutic Values; 21: 132-133.
28. MRLs database (2011): Updated on. Insertion of MRL values for Commission Regulation (EU) No 978/2011, amending Annex III to Regulation (EC).
29. Okoh, O.O.; Sadimenko, A.P.; Asekun, O.T. and Afolayan, A.J. (2008): The effects of drying on the chemical components of essential oils of Calendula officinalis L. African Journal of Biotechnology; 7: 1500-1502.
30. Roy, A.K. and Chourasia, H.K. (1990): International Syp. and workshop on Food Contamination Mycotoxins and Phycotoxins. Cairo Egypt Abst. Book; 4: 69-70.
31. Saravanan, S.; Srikumar, R.; Manikandan, S.; Parthasarathy, N.J. and Devi, R.S. (2007): Hypolipidemic effect of Triphala in Experimentally Induced Hypercholesteremic rats. Yakugaku Zasshi; 127: 385-388.
32. Shoelson, S.E.; Herrero, L. and Naaz, A. (2007): Obesity, inflammation, and insulin resistance. Gastroenterology; 132: 2169-2180.
33. Tominaga Y.; Nakagawa K.; Mae T.; Kitano M.; Yokota, S.; Arai, T.; Ikematsu, H. and Inoue, S. (2009): Licorice flavanoid oil reduces total body fat and visceral fat in overweight subjects: A randomized, double-blind, placebo-controlled study. Obesity Research & Clinical Practice 3: 169-178.
34. Tsi, D. (1996): Effects of celery extract and 3-N-butylphthalide on lipid levels in generally hypercholesterolaemic rats. Pharmacol. Physiol.; 23: 214-217
35. Verma, R.S.; Verma, R.K.; Chauhan, A. and Yadav, A.K. (2010): Changes in the essential oil composition of Majorana hortensis Moench. cultivated in India during plant ontogeny. J. Serb. Chem. Soc.; 75: 441-447.
36. Wagner, H.; Willer, F. and Kreher, B. (1989): Biologically active compounds from the aqueous extract of Urtica dioica. Planta Medica; 55: 452-454.
37. Waynforth, H.B. and Flecknell, P.A. (1992): Experimental and Surgical Techniques in the Rat. Academic Press, New York.
38. WHO guidelines (2007): Assessing Quality of Herbal Medicines with Reference to Contaminant and Residues. Geneva.
39. WHO (2010): World Health Statistics. Geneva.
40. WHO guidelines (2012): Good Agriculture and Collection Practices (GACP) for Medicinal Plants. Geneva.

8/8/2012

Effect of Nano-Silica on the Efficacy of Swimming-Pool Water Treatment

Maryam Jamali [1], Mirmohammad Kashef [2], Khalil Farhadi [3]

[1.] Graduate student, Department of Sport Management, Faculty of Physical Education & Sport Sciences, University of Urmia, Urmia, Iran
[2.] Assistant Professor, Department of Sport Management, Faculty of Physical Education & Sport Sciences, University of Urmia, Urmia, Iran
[3.] Professor, Unit of Analytical Chemistry, Department of Chemistry, Faculty of Science, Urmia University, Urmia, Iran
mjamali38@yahoo.com

Abstract: This study reviews the efficacy of nano-silica on swimming-pool water treatment. The research involved an experimental study and was performed in-vitro and experimentally. At first, a nano-particle, called "nano-silica," was prepared in the laboratory and herbal additives such as turmeric, curries, saffron, and cinnamon were used to increase its antibacterial properties. Then, for microbiological tests, water samples of Urmia University's swimming pool were studied in a two-stage process: water samples before adding the nano-particle and after the addition of the nano-particle. Finally, to study the chemical and physical contaminations, among the relevant factors, the pH and turbidity were studied in the laboratory, again in two parts: before and after the addition of the nano-particle. The results showed a decrease in averages from 2.0633 to 1.0325 before and after adding the nano-particle respectively ($P < 0.05$). Among the mentioned additives, the curries (92 percent) and the turmeric (85 percent) had the most antibacterial properties. Although the nano-particle did not adjust the swimming pool water pH to the optimal level of 7.2, it reduced the pool water turbidity significantly. This study showed that by using the nano-silica and adding herbal additives, swimming pool water reaches a better quality.
[Maryam Jamali, Mirmohammad Kashef, Khalil Farhadi. **Effect of Nano-Silica on the Efficacy of Swimming-Pool Water Treatment**. *Life Sci J* 2012;9(3):2286-2289] (ISSN:1097-8135). http://www.lifesciencesite.com. 327

Keywords: Efficacy; Treatment; Nano-silica; Swimming pool

1. Introduction

Swimming is a popular sport that takes place in the swimming pools, water parks, ponds, lakes, rivers, and oceans. Over the past century, modern disinfecting systems for pools have improved the quality of aquatic entertainment (1). However, in recent decades, disease incidence due to swimming has increased significantly (2). The pool is a suitable location for transmission of infectious diseases. The health and hygiene of swimming pools can be investigated by considering microbial and chemical contaminations. Swimming is an important exercise with many health benefits, but many countries do not pay enough attention to the health and hygiene of these amusement parks. Unfortunately, chlorine alone cannot eradicate all risky contaminants. Furthermore, even if chlorine is administered, there can be no assurances that the water is free of human excrement and waste. All pathogenic microorganisms such as bacteria, viruses, and protozoa and parasite worms exist in human excrement and can be easily transmitted through public waters.

Swimming pools are often contaminated by the addition of substances from swimmers' bodies such as hair, fat, respiratory and digestive microbes, and other harmful bacteria and waste material in the skin. Since this contamination is increasing frequently and regularly as the pool is used by more people, pools are an ideal location for contamination of a lot of people. Extensive studies have shown that respiratory and gastrointestinal diseases are more common among swimmers than non-swimmers. To prevent such diseases, health and hygiene standards for swimming pools must be considered. These include: limpidness and clarity of pool water, temperature, amount of free chlorine, and residual amounts of microscopic organisms. While the pool is in use, the water should be clear, limpid, and clean. Some diseases occur due to improper operation or inappropriate handling of pool chlorine, which subsequently results in a swimmer getting in contact with or swallowing contaminated water, leading to a range of possible diseases such as typhoid, diarrhea, infectious hepatitis, gastrointestinal disease, conjunctivitis, trachoma, leptospirosis, fungal diseases and skin infections, schistosomiasis and giardiasis, swimmer's itch, upper-respiratory illnesses (such as sinus infections), infectious pharyngitis, middle-ear infections, or recurrent inflammations of mucous covering the eyes, ears and throat (1).

Pool chlorine intensifies the risk of asthma and allergies by triggering asthma and chest wheezing in children (3). New research from Lovine University of Brussels shows that swimming in pools

disinfected with chlorine puts children at risk of asthma and a variety of allergies. Children and adolescents who swim more than 1,000 hours in these pools (indoor or open) have more than eight times greater susceptibility to asthma. However, swimming in pools disinfected with a copper-silver method poses no danger. The Belgian researchers analyzed 190,000 teenagers from 13-14 years old in 21 countries (4). These adolescents were asked to explain their respiratory problems, hay fever, and allergic eczema. The researchers found a higher incidence of asthma and chest wheezing in small and large towns, where the density of indoor pools was higher. The prevalence of asthma and chest wheezing increased per one unit of indoor pool as 2.73 percent and 3.39 percent, respectively. Such problems were more common in West Europe than East Europe, perhaps owing to a greater number of pools in the western part of the continent (5).

The presence of chlorine in pool water has a very important effect on the occurrence of allergic diseases in the studied group. The nitrogen tri-chloride was identified as increasing asthma prevalence in users of indoor pools. The nitrogen tri-chloride is an irritating gaseous substance that can easily enter the lungs. This chemical, also called tri-chloramines, is released when chlorinated water reacts with urine, sweat, or other organic materials from swimmers' bodies. However, if chlorine is used properly, it is safe and effective. However, since a tremendous amount of chlorine is often used for water disinfection, it causes irritations in the organs that are in contact with the air and water in the indoor pool environment. As a result, long-term swimmers are more vulnerable than the average person to allergies and asthma (6).

As chlorine reacts with bacteria and other organisms' proteins and destroys them, it canalso react with skin proteins. This reaction causes the horned layer of cells or stratum corneum cells to lose their cohesion and effectiveness. This is the basis of skin damage caused by chlorine. People with sensitive skin will experience dryness, and itching due to contact with chlorinated water. The chlorine in pool water, especially high concentrations can cause stimulation, itching, irritation, and eye inflammation (especially in susceptible individuals). The allergy symptoms present as redness, irritation, itching, and pimples under eyelids. Vulnerable people should use waterproof goggles. Chlorine also can cause hair loss (6). Colored hair is very sensitive to chlorine and loses its color through chlorine exposure. Inhaling chlorine from pool water over the long term damages the lungs (especially in patients with respiratory irritations and asthma). If the chlorine concentration is not controlled properly, it can cause bronchitis over the long term. Chlorine gas has a sharp, nasty smell, and is yellowish-green. The industrial uses of chlorine include production of bleaching powders, paper and textile industries, drinking-water disinfectants, swimming pools, waste treatment, preparation of chlorinated organic and mineral compounds and metal chloride combinations, production of solvents and pesticides, polymers, and coolants (7). Chlorine gas is a strong stimulant of skin mucosa and the respiratory system. This gas combines with body moisture to produce an acid and is considered as a suffocating substance, since it causes severe contraction of the laryngeal muscles and mucosa swelling (6).

This study attempted to find alternatives to chlorine and its derivatives using updated technologies, which would be healthier and safer - but more costly compared to chlorine (8). The purpose of this study was to gauge the impact of nano-silica on the efficacy of cleaning swimming pool water. The following were the research objectives:

- To determine the effect of nano-silica on swimming-pool-water quality
- To determine the effect of nano-silica on chemical contaminations of swimming-pool water
- To determine the effect of nano-silica on physical contaminations of swimming-pool water
- To determine the effect of nano-silica on microbiological contaminations of swimming-pool water

2. Material and Methods

This was an experimental study and was performed experimentally using nanochemistry laboratory materials and equipment. At first, the nano-silica was prepared and synthesized. Then, the nano-particle was tested to measure other variables in the hypotheses. Finally, the comparison with samples collected from the pool was performed. In this study, the herbal materials such as turmeric, curry powder, cinnamon, and saffron were added to increase the antibacterial properties of the silica nanoparticles by applying the adsorption technique. Some amount of these spices was dissolved in alcohol and passed through filter paper. Then, the silica nanoparticles were added and the mixture was slowly stirred for 24 hours at environment temperature. Microbiological tests were performed in the laboratory in two steps: before and after adding the nano-silica. A spectrophotometer device was used to measure turbidity and pH.

3. Results

The test results showed that the research tool had a good reliability (Cronbach's alpha equal to 0.9).

The results are shown in the Table 1. The first hypothesis investigated the impact of nano-silica on the efficacy of water treatment in swimming pools. The average total, standard deviation and t-level were obtained as 12.1474, 1.51618, and 9.471, respectively. In the second test, we measured the impact of nano-silica on reducing chemical contaminations of swimming-pool water. The average total, standard deviation, and the t-level were obtained as 1.2650, 2.29249, and 1.104, respectively.

Table 1. Results of assumptions overview

Hypothesis		**Average**	**Standard deviation**	**Conclusion**
The use of nano-silica is effective on the efficiency of water treatment		12.1474	1.51618	Significant relationship
The use of nano-silica is effective on the reduction of chemical contaminations of the swimming pool water		1.2650	2.29249	Hypothesis rejection
The use of nano-silica is effective on the reduction of physical contaminations of the swimming pool water		.1571 PURE	.37573	Significant relationship
		.1691 D	.38156	
		.1730 K	.38751	
		.2676 ZM1	.39004	
		.1611 ZM2	.37705	
The use of nano-silica is effective on the reduction of microbiological contaminations of the swimming pool water	Before adding the nano-particle	2.0633	16781.63679	Significant relationship
	After adding the nano-particle	1.4000	1145.64392	
		26.6667	46.18802	
		40.0000	69.28203	
		6.4367	871.56201	

The third test studied the use of nano-silica to reduce physical contaminations of swimming-pool water. The average totals were:

- Water sample without chlorine: 1571
- d sample (cinnamon): 1691
- k sample (curries): 1730
- zm1 sample (saffron): 2676
- zm2 sample (turmeric):1611.

The standard deviations were 37573, 38156, 38751, 37705, and 3900, respectively. The last test reviewed the impact of nano-silica in reducing microbiological contaminations of swimming-pool water. The average total in swimming-pool-water samples before the nano-silica was added was 2.0633. After addition of the nanoparticle, the average total values in the D, K, ZM1 and ZM2 samples were 40.0000, 26.6667, 1.4000, and 6.4367, respectively. The standard deviation in the pure sample was 16781.63679 and in the test samples were 1145.64392, 46.18802, 69.28203 and 871.56201, respectively.

4. Discussions

This study reviewed the effects of nano-silica on reducing physical contaminations of swimming-pool water. These contaminations include insoluble impurities and colloidal materials introduced by swimmers and from the surrounding pool environment, and cause water turbidity. Based on the t-test used, the t values in D, k, zm1 and zm2 samples were more than the t value in pure water, which is equivalent to 5.928. The degree of freedom was 200 and the obtained t values in all groups were greater than the significance level. Since the calculated significance level was smaller than critical level, we failed to reject the hypothesis. Accordingly, we conclude that the impact of chlorine on reducing the physical contamination of pool water is positive. Jennifer Lynn used nano-titanium to remove sunscreen particles from swimming pools and concluded that this nano-particle can remove 100 percent of the particles (9).

The effect of nano-silica in reducing microbiological contaminations of pool water was evaluated. The t-test was used, and the average before adding the nanoparticles was equal to 2.0633. After adding nano-silica, it was 1.0325, which is larger. Thus, the significance level of the table was smaller than error ($P < 0.05$), confirming the hypothesis. Comparing the table data, we conclude that nano-silica is effective in reducing

microbiological contaminations in swimming pools. This hypothesis is confirmed by 95 percent confidence and is stronger than other variables. Additionally, Osman San studied antimicrobial properties of borosilicate glass powder with a spherical shape and concluded that adding silver oxide to nano-silicate significantly increases antibacterial properties of the powder (10). In a similar study, F. Barzegar used nano-titanium to reduce staphylococcus aureus and E. coli bacteria. The bacteria growth showed a reduction of 5.6 percent in the presence of nano-titanium with 1.5 percent concentrations (11). Acceptable results were not obtained in this study regarding pH reduction. Also, we found no research regarding the use of nano-silica to adjust pH. However, the results showed with 95 percent reliability that the use of nano-silica will generally significantly increase pool-water quality. Also, we achieved acceptable results regarding the reduction of physical and microbiological contaminations. Herbal additives in different combinations of nano-particles can be used in future research and by other researchers.

Acknowledgements:

The authors thank Dr. Ameri (Dean, Faculty of Exercise and Sport Sciecnes, Urmia University) for his financial support, Personels at Chemistry and Microbiology lab. (Urmia University) Specially Dr.Amir Tukmechil and Nooshin Zandi for their cooperation in the study, and Dr. Mehrdad Jalalian (Editor In-Chief, Electronic Physician Journal) for providing guidelines in scientific writing (12, 13).

Corresponding Author:
Maryam Jamali,
Department of Sport Management,
Faculty of Physical Education & Sport Sciences,
University Urmia, Urmia, Iran
E-mail: mjamali38@yahoo.com

References

1. Johnson, Ralph L., Tahmoores Nouraei, Kazem Saidi. Pool care guide. Kerman. Bahonare kerman University Press, Kerman. 2004 Chemoter10:100-50.
2. Fathi Abdulhamid., Elahi, Reza. Study the fungal and parasitic contaminations in the public pools in Mashhad and its chlorination role. 1th National Conference. 2002 may 25, 270(6):155-9.
3. Imandel, Karematokkah., The health indicators of water quality of the swim2ming pools; The scientific articles series of the first seminar on the country's pools health and hygiene; Tehran. 1997 jul22: 86-9.
4. Bryant, E. Disinfection alternatives for safe drinking water, Van Nostrand Reinhold, 1992march1025517-10 :(2) ؛.
5. Hilmarsdottir 1, Haraldsson H, SigurdardottirA, Sigurgeirsson B. Dermatophytes in a swimming pool facility. Acta Derm Venero. 2005 may118-241:(10)302؛.
6. Feng QL, Wu J, Chen GQ, Cui FZ, Kim TN, Kim JO. A mechanistic study of the antibacterial effect of silver ions on Escherichia coli and Staphylococcus aureus. J Biomed Mat Re .2000 Apri 5; 52(4): 662-8.
7. Fortner JD, Lyon DY, Sayes CM, Boyd AM, Falkner JC, Hotze EM, et al. C-60 in water: Nanocrystal formation and microbial response. Envir Sci Tech. 2005 June10;39: 4307-16.
8. Furno F, Morley KS, Wong B, Sharp BL, Arnold PL, Howdle SM, et al. Silver nanoparticles and polymeric medical devices: a new approach to prevention of infection? J Antimi Crob. 2009Chemoter12; 54(6): 1019-24.
9. The first training workshop on utilization management and the health standards of the swimming pools; the health center: No. 8, Mashhad.2007 October 21209-101:(8)؛
10. Mohammadi, Zohreh., Evaluation of new methods of refinement and disinfection of swimming pools water; the health center: No. 1. 2003 September78-54:(3)145؛.
11. Barzegari, Fatima. The Antibacterial property of nano titanium on bacteria. Scientific and research Journal of Yazd province, Iran. No. 1, Persian date: 2010 February27200-90:(6)؛
12. Jalalian, M., Danial A. H., Writing for academic journals: A general approach. Electronic Physician Journal. 2012; 4(2): 476-477. Available online at: http://www.ephysician.ir/2012/474-476.pdf.
13. Jalalian M. Writing an eye-catching and evocative abstract for a research article: A comprehensive and practical approach. Electronic Physician. 2012; 4(3): 520-524. Available online at: http://www.ephysician.ir/2012/520-524.pdf.

7/10/2012

Leucocyte Infiltration in Experimental Warm Hepatic Ischemia Reperfusion; Effect of Ischemic Pre and Post Conditioning; Implications of Adhesion Molecules

Zienab Alrefaie[1] and Laila Rashed[2]

[1]Physiology Department, Faculty of Medicine, King Abdulaziz University, Saudi Arabia and Cairo University, Egypt
[2]Biochemistry Department, Faculty of Medicine, Cairo University, Egypt
z_elrefay@yahoo.com

Abstract: Background: Very few studies described the potential effect of ischemic post conditioning (IPO) in warm hepatic ischemia. The present study hypothesizes that IPO might attenuate leucocyte infiltration. Furthermore, we aimed to compare such effect with that produced by ischemic pre conditioning (IPC), and to study the implications of vascular cell adhesion molecule-1(VCAM-1) and E selectin. Methods: 40 male Wistar rats were divided into 4 groups; group I, control group, group II ischemia reperfusion group I/R, group III underwent IPC, group IV underwent IPO. Serum levels of ALT, albumin, VCAM-1 and E selectin were determined. Liver tissue homogenate was used to assess levels of VCAM-1, E selectin and myeloperoxidase activity. Results: IPO significantly reduced serum ALT, liver VCAM-1 and E selectin levels and myeloperoxidase activity compared to I/R group, but insignificantly decreased VCAM-1 and E selectin in serum. IPO protective effects were less significant when compared to IPC group. Significant negative correlation was observed between serum E selectin and myeloperoxidase in the I/R group. Conclusion: Our results point to the protective effect of IPO in warm hepatic I/R injury through attenuation of leucocyte infiltration, and postulate that serum E selectin can be used as a marker to anticipate the degree of leucocyte infiltration in hepatic I/R injury.
[Zienab Alrefaie and Laila Rashed. **Leucocyte Infiltration in Experimental Warm Hepatic Ischemia Reperfusion; Effect of Ischemic Pre and Post Conditioning; Implications of Adhesion Molecules.** *Life Sci J* 2012;9(3):2290-2295] (ISSN:1097-8135). http://www.lifesciencesite.com. 328

Key words: E selectin, ischemia-reperfusion, liver, preconditioning, post conditioning, VCAM-1.

1. Introduction:

Warm hepatic ischemia is a feature of severe liver trauma, hypovolemic and endotoxic shock or inflow occlusion during liver surgery (Rougemont *et al.,* 2009). Activation of neutrophils have been implicated in the hepatic microvascular dysfunction and parenchymal damage associated with ischemia reperfusion (I/R) (Jaeschke and Farhhod, 1990). Activated neutrophils can cause endothelial and hepatocellular damage through the worsening of flow hindrance and the release of oxidants, proteases and hydrolytic enzymes. The concomitant release of myeloperoxidase by the activated neutrophils results in the formation of hypochlorous acid as the major oxidant (Jaeschke and Smith, 1997).

Leucocyte recruitment is a multistep process; it involves initial contact and adhesion to the endothelium, transendothelial migration and subsequent parenchymal cell adherence and damage (Teoh and Farrell, 2003).

Several studies have observed the endothelial cell expression of E selectin, intercellular adhesion molecule (ICAM) and vascular cell adhesion molecule-1 (VCAM-1) which mediate leucocyte-endothelial cell adhesion *in vitro* and *in vivo* (Kim *et al.,* 2001).

After I/R, cellular adhesion molecules are activated and/or upregulated on the surface of neutrophils and sinusoidal endothelial cells (SECs). This is induced by a variety of inflammatory molecules namely cytokines and chemokines (Martinez-Mier, 2000).

Selectins are expressed on endothelial cells, platelets and leucocytes. E selectin expressed on endothelial cells mediates the initial capture and tethering of leucocytes on (SECs) (Adams *et al.,* 1996).

VCAM-1 is a member of the immunoglobulin like family. It is transcriptionally induced on SECs and its interaction with integrins induces signals in the endothelial cells that trigger changes in their morphology allowing leucocyte transmigration and consecutive tissue injury (Matheny *et al.,* 2000).

Several strategies have been described to ameliorate I/R injury. Ischemic preconditioning which involves short periods of ischemia separated by intermittent reperfusion prior to sustained ischemia has shown many protective effects against I/R injury (Centurion *et al.,* 2007).

Recently very few studies described the ischemic postconditioning strategy in liver I/R injury, it is the application of several brief cycles of ischemia and reperfusion at the onset of sustained reperfusion after a prolonged period of ischemia (Sun *et al.,* 2004).

Ischemic postconditioning approach could be effective when ischemic preconditioning is not feasible as in non surgical contexts and unscheduled ischemic situations. As far as we know, there are only

few studies suggesting that the liver acquires protection after ischemic postconditioning and the possible mechanisms of protection are still largely unknown.

Aim:

The present study addressed the potential application of ischemic postconditioning in the prevention of hepatic I/R damage specially aimed to fully translate these findings to the clinical arena. We hypothesize that this protective effect might be mediated through attenuating leucocyte infiltration. Furthermore, we aimed to compare such effect of ischemic postconditioning with that produced by ischemic preconditioning and to study their relation to VCAM-1and E selectin adhesion molecules.

Methods:

Animals:

This study was approved by the local animal care committee of Kasr-Al Aini Faculty of Medicine, Cairo University, Cairo, Egypt, and carried out in accordance with the international principles of laboratory animal research.

Forty male Wistar rats weighing 200-250 g were included in the present study The rats were housed in wire-meshed cages at 24°C with constant humidity and 12:12 h light-dark cycle. The animals were fed *ad libitum* with a commercial rat diet consisting of pellet and tap water prior to the studies. All rats were adapted to eating a commercial diet for at least 1 week before the experimental protocol was started.

Experimental groups and study design:

Animals were fasted the night before the experimental procedure. They were randomly divided into four groups 10 rats each; group I (control group), group II (ischemia reperfusion I/R group), group III (ischemic preconditioning IPC group) and group IV (ischemic postconditioning IPO group). Rats were anesthetized by intraperitoneal injection of pentobarbital 40 mg/ kg body weight. Control animals were subjected to midline abdominal incision and sham laparotomy.

Group II I/R, rats were subjected to midline abdominal incision, exposure of the hepatic pedicle and occlusion of the left lateral and median lobes by applying atraumatic microvascular clamp for 60 minutes to induce partial hepatic warm ischemia followed by removal of the clamp and reperfusion for 120 minutes.

Group III IPC, rats underwent the ischemic preconditioning strategy by applying 10 minutes ischemia and 15 minutes reperfusion prior to the 60 minutes ischemia, and 120 minutes reperfusion (Rüdiger *et al.,* 2002).

Group IV IPO, rats underwent the ischemic postconditioning strategy by applying 3 brief cycles of ischemia separated by reperfusion with 30 seconds each at the onset of reperfusion following 60 minutes ischemia (Santos *et al.,* 2010). Reperfusion was completed to 120 minutes.

At the end of reperfusion period, all animals were sacrificed by intraperitoneal injection of pentobarbital 150 mg/ kg body weight. Blood samples were collected from retro-obrital plexus of veins and ischemic liver lobes were harvested.

Hepatocellular function:

Blood samples were centrifuged for 10 minutes at 3000 round per minute. Separated serum was stored at -70°C until analysis. Colorimetric determination of alanine transaminase (ALT) and serum albumin as indicators of hepatocellular injury was carried out according to (Reitman and Frankel, 1957) and (Doumas *et al.,* 1971) respectively.

VCAM-1 and E selectin:

VCAM-1 and E selectin levels were determined in serum and liver tissue homogenate supernatant by enzyme immuno assay using ELISA kit according to the manufacturer's instructions (R&D Systems, Inc USA). Values were expressed as ng/mg tissue in the liver and ng/dl in the serum. Homogenization of liver tissue was performed after the tissue samples had been diluted in 5 vol of homogenate buffer [10 mM HEPES (pH 7.9), 10 mM KCL, 0.1 mM EGTA, 1 mM DTT, and 0.5 mM phenylmethanesulfonyl fluoride] using a vertishear tissue homogenizer. Liver homogenates were centrifuged at 3,000 g for 15 min at 4°C and supernatants were collected.

Determination of myloperoxidase (MPO) activity in liver homogenate:

According to (Mizutani *et al.,* 2003), liver tissue (0.5 gm) was homogenized in 10 ml of homogenization buffer pH (4.7) [0.1 mol/L NaCl, 0.02 mol/L $NaPO_4$ and 0.015 mol/L sodium ethylenediamine tetracetic acid (EDTA)], centrifuged at 260 x g for 10 minutes and the pellet underwent hypotonic lysis using (0.2% NaCl) solution. This was followed 1minute later by addition of an equal volume of solution containing (1.6% NaCl and 5% glucose). After further centrifugation, the pellet was then suspended in resuspension buffer pH 5.4 (0.05 mol/L NaPO4 containing 0.5% hexadecyltrimethylammonium bromide) and rehomogenized. One milliliter aliquots of the suspension were freezed and thawed three cycles in liquid nitrogen, then centrifuged for 15 minutes at 3000 g. the pellet was discarded. MPO activity was assayed by measuring the change in optical density at 450 nm using tetramethylbenzidine, as substrate (1.5 mmol/L) and H_2O_2 (0.5 mmol/L). Results were expressed as MPO relative milli units/ mg tissue. One unit of MPO activity was defined as the quantity of

enzyme degrading one mmol peroxide at 25°C. The activity of purified known human neutrophil MPO was used as the standard (Sigma Chemical Co, USA).

Statistical analysis:

Data are presented as mean ± standard deviation. Comparison between groups was calculated using one way analysis of variance, and association of variables was calculated using Pearson correlation (SPSS package version 12; SPSS, Inc, Chicago, Illinois).

P values < 0.05 were considered as statistically significant.

3. Results:

Serum ALT and albumin, Table I and

Serum level of ALT was significantly elevated following I/R (group II) when compared to sham operated control group ($P < 0.001$). Ischemic pre and post conditioning significantly reduced the ALT level ($P < 0.01$, $P < 0.05$ respectively). As regards albumin level, it decreased significantly in the I/R group when compared to control group ($P < 0.001$). Ischemic preconditioning attenuated the liver functional damage with resultant higher albumin level when compared with I/R group ($P < 0.001$). Ischemic postconditioning strategy led to mild improvement in albumin level which failed to reach statistical significance.

Leucocyte infiltration, Table I

To assess mononuclear leucocyte infiltration, myeloperoxidase activity was investigated. Our results showed that I/R significantly increased leucocyte infiltration (0.59 ± 0.055 mU/mg versus 0.39 ± 0.043 in sham operated group, $P < 0.001$). Both conditioning strategies attenuated leucocyte infiltration as they significantly reduced MPO activity although this effect was less marked in IPO group, (0.4 ± 0.068 and 0.51 ± 0.075 in IPC and IPO groups respectively, $P < 0.001$ and $P < 0.01$ when compared with I/R group respectively).

Liver and serum VCAM-1 and E selectin, Table II

To provide an insight on the mechanism of leucocyte infiltration in relation to adhesion molecules, the level of VCAM-1 and E selectin in liver tissue besides to their soluble fractions in serum were assessed. The 60 minute ischemia followed by 120 minute reperfusion remarkably increased liver content of VCAM-1 and E selectin when compared with the control group, 32.82 ± 9.95 ng/mg versus 11.86 ± 2.71 and 2.85 ± 0.65 versus 1.24 ± 0.32 respectively $P < 0.001$ for both adhesion molecules.

Comparing the effects of IPC and IPO strategies on the liver VCAM-1 and E selectin levels revealed suppression of both adhesion molecules by both conditioning strategies significantly. This suppression was insignificantly more marked in the IPC group.

Soluble fractions of VCAM-1 and E selectin got also elevated in I/R group when compared to control group, 9.17 ± 2.3 ng/dl versus 6.4 ± 1.97 ($P < 0.01$) and 1.86 ± 0.27 versus 0.69 ± 0.43 ($P < 0.001$) respectively. The elevation in serum VCAM-1 and E selectin induced by I/R was significantly alleviated by ischemic preconditioning but not by ischemic postconditioning.

Correlation results, Table III

To investigate the relation of VCAM-1 and E selectin levels with leucocyte infiltration, Pearson correlation tests were performed between variables in different groups. Our results demonstrated a positive correlation between liver VCAM-1 and MPO ($r = 0.723$, $P < 0.05$) and a negative correlation between soluble fraction of E selectin and MPO ($r = -0.687$, $P < 0.05$) in the I/R group.

Table I: Levels of alanine transaminase (ALT), albumin and myeloperoxidase (MPO) in all experimental groups:

Groups	**ALT** (U/dl)	**Albumin** (g/dl)	**MPO** (mU/mg)
Sham operated control group (Group I)	45.04 ± 3.26	5.12 ± 0.39	0.39 ± 0.043
Ischemia reperfusion group (Group II)	68.28 ± 8.24 $P < 0.001^{*}$	3.29 ± 0.42 $P < 0.001^{*}$	0.59 ± 0.055 $P < 0.001^{*}$
Ischemic preconditioning group (Group III)	61.41 ± 3.31 $P < 0.01^{**}$	4.16 ± 0.25 $P < 0.001^{**}$	0.4 ± 0.068 $P < 0.001^{**}$
Ischemic postconditioning group (Group IV)	61.88 ± 5.26 $P < 0.05^{**}$	3.58 ± 0.45 $P < 0.01^{***}$	0.51 ± 0.075 $P < 0.01^{**}$ $P < 0.001^{***}$

*: Significant when compared to control group

**: Significant when compared to ischemia reperfusion group

***: Significant when compared with ischemic preconditioning group

Table I I: Levels of liver (L) vascular cell adhesion molecule 1 (VCAM-1) and E selectin and soluble (S) VCAM-1 , and E selectin in all experimental groups:

Groups	**L- VCAM-1** (ng/mg)	**L- E selectin** (ng/mg)	**S- VCAM** (ng/dl)	**S- E selectin** (ng/dl)
Sham operated control group (Group I)	11.86 ± 2.71	1.24 ± 0.32	6.4 ± 1.97	0.69 ± 0.44
Ischemia reperfusion group (Group II)	32.82 ± 9.94 $P < 0.001^{*}$	2.85 ± 0.65 $P < 0.001^{*}$	9.17 ± 2.3 $P < 0.01^{*}$	1.86 ± 0.27 $P < 0.001^{*}$
Ischemic preconditioning group (Group III)	18.22 ± 6.33 $P < 0.001^{**}$	1.96 ± 0.2 $P < 0.001^{**}$	6.5 ± 1.09 $P < 0.01^{**}$	1.42 ± 0.59 $P < 0.05^{**}$
Ischemic postconditioning group (Group IV)	21.86 ± 5.5 $P < 0.01^{**}$	2.07 ± 0.55 $P < 0.01^{**}$	10.39 ± 1.05 $P < 0.001^{***}$	2.05 ± 0.27 $P < 0.01^{***}$

*: Significant when compared to control group
**: Significant when compared to ischemia reperfusion group
***: Significant when compared with ischemic preconditioning group

Table (III): Correlation results between myeloperoxidase (MPO), liver (L) vascular cell adhesion molecule 1 (VCAM-1) and soluble (S) E selectin in I/R group

Parameter	**L- VCAM-1**		**S- E Selectin**	
MPO	r	*p*	r	*p*
	0.723	< 0.05	- 0.687	< 0.05

4. Discussion:

Recruitment and activation of neutrophils into liver vasculature, and in particular hepatic sinusoids, have been implicated in microvascular dysfunction and parenchymal damage associated with hepatic I/R injury (Cutrin *et al.,* 2000).

In the present study, results revealed a substantial liver damage at the end of the I/R period as indicated by the significant elevation of serum ALT and concomitant decline of serum albumin.

Ischemic postconditioning strategy significantly contributed to attenuation of hepatic I/R injury leading to significant lowering of ALT level when compared with I/R group and elevation of albumin level which did not reach statistical significance. The degree of liver damage was notably reduced by ischemic preconditioning which decreased the hepatic enzymatic leakage and ameliorated the suppression in plasma protein synthesis. In accord with our results, only the study of (Santos *et al.,* 2010) observed that levels of ALT were increased with lower intensity in ischemic postconditioning when compared with I/R group, while the hepatoprotective efficacy of ischemic preconditioning has been demonstrated in many experimental and clinical studies. (Clavien *et al.,* 2003) and (Bedirli *et al.,* 2005).

Although the protective effect of ischemic postconditioning against I/R injury in the present study was less prominent when compared to ischemic preconditioning, our results provide evidence to the minimizing effect of ischemic postconditioning on hepatocellular damage in warm hepatic I/R injury and add to the few researches available in the literature about hepatic ischemic postconditioning.

The effect of ischemic postconditioning strategy on leucocyte infiltration and its correlation to cell adhesion molecules hasn't been previously investigated in experimental models of warm hepatic I/R.

The results of the present study showed a significant increase in the MPO activity in the livers subjected to 60 minutes ischemia and two hours reperfusion compared to sham operated livers. The myeloperoxidase is used as an index of hepatic leucocyte accumulation and activation (Shen *et al.,* 2003). Our observation accords with that of (Tsuchihashi *et al.,* 2006) and (Wu *et al.,* 2009), who demonstrated a significant increase in MPO activity in warm I/R models in mice, but no previous work directly assessed the effect of ischemic pre or postconditioning on MPO activity. In the present work, both strategies of conditioning significantly attenuated the elevation in MPO activity indicating inhibition of leucocyte accumulation and consequent hepatocellular damage which was evident by the decrease in ALT level and the increase in albumin level.

The hepatic VCAM-1and E selectin was significantly elevated in I/R group. Our results accords with (Teoh *et al.,* 2007) who observed significant increase in VCAM-1-1 in mice livers following I/R, and (Hafez *et al.,* 2007) who revealed elevation of E selectin in canine hepatic I/R. Both conditioning

strategies in our model significantly down regulated the liver levels of VCAM-1 and E selectin.

Serum levels of E selectin and VCAM-1 were significantly increased in the rats of I/R group, this increase was ameliorated by ischemic preconditioning strategy, but not by ischemic postconditioning.

Our results showed that ischemic postconditioning resulted in less marked reduction of liver levels of VCAM-1 and E selectin than preconditioning and failed to reduce the levels of their soluble fractions in serum. (Tsuchihashi *et al.,* 2006) in their study demonstrated that 90 minutes ischemia significantly increased expression of vascular endothelial growth factor VEGF, and its level peaked at 2 hours of reperfusion. VEGF is known to function via the expression of pro-inflammatory cytokines like tumor necrosis factor α, TNF- α, which in turn together with VEGF induce expression of adhesion molecules including E selectin, ICAM-1 and VCAM-1 (Reinders *et al.,* 2003). This may partially explain our findings, as ischemic preconditioning increases liver tolerance to ischemia prior to starting I/R, this may result in more lowering of VEGF and its resultant cascade more than ischemic postconditioning which is implemented at the onset of reperfusion after establishment of ischemia for 1 hour leading to more expression of VEGF, TNF- α and adhesion molecules. In addition, (Peralta *et al.,* 2001) have suggested that ischemic preconditioning protects against systemic disorders associated with I/R by blocking TNF- α release and increasing activated adenosine monophosphate kinase. Such effect has not been investigated or shown to be produced by ischemic postconditioning; this may also explain the difference between effects of both conditioning strategies on the level of soluble fractions of VCAM-1 and E selectin.

An interesting finding in our results is the correlations between levels of adhesion molecules and activity of MPO, the positive correlation between liver VCAM-1 and MPO can be expected as the higher the level of liver VCAM-1, would result in more tethering, and infiltration by leucocytes. The significant negative correlation between soluble fraction of E selectin and MPO in the present study can be explained by the fact that the soluble fractions of such adhesion molecules are partly released from the activated endothelial cells (Pigott *et al.,* 1992), this means that more endothelial-leucocyte interaction, with increased leucocyte infiltration will lead to less shedding of E selectin, and lower levels of its soluble fractions

Conclusion

Our results revealed that ischemic postconditioning could contribute to liver protection against I/R injury in the initial phase of warm hepatic ischemia by attenuating leucocyte infiltration and decreasing VCAM-1 and E selectin levels in the liver. Although the protection offered by ischemic preconditioning was more significant when compared to that produced by ischemic postconditioning, yet the present findings endorse the clinical potential of ischemic postconditioning which enables modification of reperfusion after the occurrence of ischemic injury, in situations with unscheduled ischemia.

Our results also postulate that soluble E selectin can be used as a marker to judge the degree of leucocyte infiltration in hepatic warm ischemia reperfusion injury. Further investigations are still needed to elucidate the molecular mechanisms underlying inhibition of leucocyte infiltration observed with ischemic postconditioning.

Corresponding author
Zienab Alrefaie
Physiology Department, Faculty of Medicine, King Abdulaziz University, Saudi Arabia and Cairo University, Egypt
z_elrefay@yahoo.com

References

Adams DH, Hubscher SG, Fisher NC, Williams A, & Robinson M . Expression of E selectin and E selectin ligands in human liver inflammation. Hepatology 1996; 24:533-8.

Bedirli A, Kerem M, Pasaoglu H, Erdem O, Ofluoglu E & Sakrak O. Effect of ischemic preconditioning on regenerative capacity of hepatocyte in the ischemically damaged rat livers. J Surg Res., 2005;125 (1):42-48.

Centurion SAR, Centurion LM, Souza MEJ, Gomes MCJ, Sankarankutty AK, Mente ED & Castro e Silva O. Effects of ischemic liver preconditioning on hepatic ischemia/reperfusion injury in rat. Transplantat Proc. 2007;39 (2):361-364.

Clavien PA, Selzner M, Rudiger HA, Graf R, Kadry Z, Rousson V& Jochum W. A protective randomized study in 100 consecutive patients undergoing major liver resection with versus without ischemic preconditioning. Ann Surg., 2003;238 (6):843-850.

Cutrin JC, Boveris A, Zingaro B, Corvetti G & Poli G. In situ determination by surface chemiluminescence of temporal relationship between evolving warm ischemia-reperfusion injury in rat liver and phagocyte activation and recruitment. Hepatology 2000;31:622-632.

Doumas BT, Watson WA & Biggs HG. Albumin standards and the measurement of serum albumin with bromcresol green. Clin Chim Acta 1971;31(1):87-96.

Hafez T, Moussa M, Nesim I, Baligh N, Davidson B & Abdul-Hadi A. The effect of intraportal prostaglandin E1 on adhesion molecule expression,

inflammatory modulator function, and histology in canine hepatic ischemia/reperfusion injury. J Surg Res., 2007;138(1):88-99.

Jaeschke H, Farhhod A & Smith CW. Neutrophils contribute to ischemia/ reperfusion injury in rat liver in vivo. FASEB J. 1990;4(15):3355-3359.

Jaeschke H & Smith CW. Mechanisms of neutrophil-induced parynchymal cell injury. J Leukoc Biol., 1997;61(6):647-653.

Kim I, Moon SO, Kim SH, Kim HJ, Koh YS & Koh GY. Vacular endothelial growth factor expression of intercellular cell adhesion molecule 1(ICAM-1), vascular cell adhesion molecule 1 (VCAM-1) and E selectin through nuclear factor-k B activation in endothelial cells. J Biol Chem., 2001;276(10):7614-7620.

Martinez-Mier G, Toledo-Pereyra LH & Ward PA. Adhesion molecules in liver ischemia and reperfusion. J Surg Res., 2000;94:185-94.

Matheny HE, Deem TL & Cook-Mills JM. Lymphocyte migration through monolayers of endothelial cell lines involves VCAM -1 signaling via endothelial cell NADPH oxidase. J Immunol., 2000;164:6550-6559.

Mizutani A, Okajima K, Uchiba M, Isobe H, Harada N, Mizutani S &Noguchi T. Antithrombin reduces ischemia/reperfusion-induced renal injury in rats by inhibiting leukocyte activation through promotion of prostacyclin production. Blood, 2003;101(8):3029-36.

Peralta C, Fernández L, Panés J, Prats N, Sans M, Piqué JM, Gelpí E & Roselló-Catafau J. Preconditioning protects against systemic disorders associated with hepatic ischemia-reperfusion through blockade of tumor necrosis factor-induced P selectin upregulation in the rat. Hepatology, 2001;33(1):100-113.

Pigott R, Dillon LP, Hemingway IH & Gearing AJ. Soluble forms of E selectin, ICAM-1 and VCAM-1 are present in the supernatents of cytokine activated cultured endothelial cells. Biochem Biophys Res Commun., 1992;187:584-9.

Reinders ME, Sho M, Izawa A, Wang P, Mukhopadhyay D, Koss KE, Geehan CS, Luster AD, Sayegh MH & Briscoe DM. Proinflamatory functions of vascular endothelial growth factor in alloimmunity. J Clin Invest., 2003;112:1655-1665.

Reitman S & Frankel S. A colormetric method for the determination of serum glutamic oxalocetic and glutamic pyruvic transaminases. Am J Clin Path., 1957;28(1):56–63.

Rougemont O, Lehmann K & Clavien P. Preconditioning, organ preservation, and postconditioning to prevent ischemi-reperfusion injury to the liver. Liver Transplantation, 2009;15:1172-1182.

Rüdiger HA, Kang KJ, Sindram D, Riehle HM & Clavien PA. Comparison of ischemic preconditioning and intermittent and continuous inflow occlusion in the murine liver. Ann Surg., 2002;235(3):400-7.

Santos CH, Pontes JC, Miiji LN, Nakamura DI, Galhardo CA & Aguena SM. Postconditioning effect in the hepatic ischemia and reperfusion in rats. Acta Cir Bras, 2010;25(2):163-8.

Shen XD, Ke B, Zhai Y, Gao F, Anselmo D, Lassman CR, Busuttil RW & Kupiec-Weglinski JW. Stat 4 and Stat6 signaling in hepatic ischemia/ reperfusion injury in mice: HO-1 dependence of Stat4 disruption-mediated cytoprotection. Hepatology, 2003;37:296-303.

Sun K, Liu ZS & Sun Q. Role of mitochondria in cell apoptosis during hepatic ischemia-reperfusion injury and protective effect of ischemic postconditioning. World J Gastroentrol., 2004;10(13):1934-1938.

Teoh NC & Farrell GC. Hepatic ischemia reperfusion injury: pathogenic mechanisms and basis for hepatoprotection. J Gastroenterol Hepatol., 2003;18(8):891-902.

Teoh NC, Ito Y, Field J, Bethea NW, Amr D, Mccuskey MK, Mccuskey RS, Farrell GC & Allison AC. Diannexin, a novel annexin V homodimer, provides prolonged protection against hepatic ischemia-reperfusion injury in mice. Gastroentrol., 2007;133:632-646.

Tsuchihashi S, Ke B, Kaldas F, Flynn E, Busuttil RW, Briscoe DM & Kupiec-Weglinski JW. Vascular endothelial growth factor antagonist modulates leukocyte trafficking and protects mouse liver against ischemia/reperfusion injury. Am J Pathol., 2006;168(2):695-705.

Wu YJ, Ling Q, Zhou X, Wang Y, Xie H, Yu JR & Zheng S. Urinary trypsin inhibitor attenuates hepatic ischemia-reperfusion injury by reducing nuclear factor –kappa B activation. Hepatobiliary Pancreat Dis Int., 2009;8(1):53-58.

Spiritual Intelligence and Happiness for Adolescents in High School

*Laleh Babanazari[1], Parviz Askari[2], Mahnaz Mehrabizade Honarmand[3]

[1.] PhD student, Department of Psychology, Science and Research Branch, Islamic Azad University, Khousetan-Iran
[2.] Associate professor, Department of Psychology, Islamic Azad University, Ahvaz-Iran
[3.] Associate professor, Department of Psychology, Shahid Chamran University, Ahvaz-Iran
*Laleh_Babanazari@yahoo.com

Abstract: The aim of the current study was to investigate the relationship between spiritual intelligence and happiness in for Adolescents in High School. The research sample consisted of 221 high school students who took spiritual sensitivity scale and General Health Ques-tionnair.the results of the study showed that there is a significant relationship between spiritual intelligence and happiness. The results of regression analysis showed that awareness sensing, mystery sensing, value sensing and community sensing significantly anticipated happiness.
[Laleh Babanazari, Parviz Askari, Mahnaz Mehrabizade Honarmand. **Spiritual Intelligence and Happiness for Adolescents in High School.** *Life Sci J* 2012;9(3):2296-2299] (ISSN:1097-8135). http://www.lifesciencesite.com. 329

Keywords: Spirituality, spiritual intelligence, happiness, adolscents.

1. Introduction

Adolescence is considered a complex stage of life with its own specific biological, psychological, and sociological aspects. According to Erikson (1968), the development of a healthy individual identity is a major task of adolescence during which every adolescent experiences an identity crisis. If an integrated sense of identity cannot be established by the end of adolescence, the state of identity confusion is experienced. Adolescence is also a period of cognitive development. Rapid cognitive changes result in increased interest in abstract ideas and issues (Piaget and Inhelder, 1973). These changes take place in a context of cognitive, physical, and psychosocial development (Collins and Repinski, 1994; Steinberg, 2005; La Greca and Harrison, 2005) which enables adolescents to become more stable and mature (Lerner, 1985; Moore and Boldero, 1991). The rapid changes in development may cause adaptation problems. For instance, adolescents who experience identity confusion-related distress had more school and behavioural problems (Wires et al. 1994), many adolescents have a propensity for risk taking behaviours as a result of cognitive immaturity (Steinberg, 2004). These negative experiences prevent adolescents from fulfilling their responsibilities and developmental tasks (Mcknight et al. 2002). As a result, the changes experienced during this period might affect adolescents' mental health. In the literature, numerous studies have focused on various factors for increasing individual's mental health (Buss, 2000; Lyubomirsky, 2001). Spirituality is one of these factors. It means different things depending upon an individual's personal interpretation on world view (Mcsherry & cash, 2004). In recent years, the specialized studies relating to the spirituality are developing ever increasingly. Research results demonstrated beneficial effects of spirituality on individual's adaptation and coping with social pressure and life stressors (Pargament and Smith, 1998; Ferguson, 2001; Vannes & Kasel, 2003). Studies have also found correlations between spirituality and mental health variables such as stress (Woodbury, 1992); anxiety (Alvordo, 1995); emotional instability and mood disorders (Jang & Johnson, 2004; Leach, & Lark, 2004); depression (Genia, 2001; Doolittle & Farrell, 2004 & koening, 2007), neurotism and substance abuse (Elmer, MacDonald, & Friedman, 2003).

Similar studies have also shown relationships between spirituality and mental health in adolescents(Wong, Rew & Slaikeu, 1993; Cotton, Zebracki, Rosenthal, Tsevat, & Drotar, 2006; Cotton, Larkin, Hoopes, Cromer & Rosenthal, 2005; Dew, Daniel, Goldston, & Koening, 2008). But during the last decade, research on mental health have mostly emphasized on positive strengths and potentialities of human being rather than their disappointment and unhappiness conditions such as anxiety and depression. While there are many studies between spirituality with mental disorders and negative effects, there isn't enough investigation in positive aspects of human strengths such as happiness. happiness consists of three components: (1) one's average level of satisfaction over a particular period; (2) the quantity and extent of one's positive affect; and (3) the relative absence of one's negative affect (Argyle, 2001).Theoretically, Spirituality can relate to mental health, happiness and subjective well being by means of affecting their coping strategies, their attribution style, their connectedness with environment and their sense of meanings. James

(1901/1999) and Maslow argued that on individual's spiritual experience can act as a mechanism for problem solving in relation to issues of meaning and value (Adams and Hyde, 2008). so it is possible the conceive of spirituality as a type of intelligence (Emmons, 2000; Zohar & Marshall, 2000 and Hyde, 2004).because the intelligence concerns the ability to solve problem and adaptation with environment (Ruzgis & Grigorenkeo,1994). Spiritual intelligence mixed concepts of spiritual and intelligence in a new concept. Zohar and Marshall (2000) define spiritual intelligence as the mental aptitude used by human beings to address and find solution to problems of meaning and value in life. It is the intelligence makes whole and gives integrity. Spiritual intelligence includes various methods that can coordinate innate life and spiritual with extend life and it may lead to well being and important of life quality (vaguan, 2003).while we have many inquiries between spirituality, psychological health and subjective well being in adolescents, there is no investigation in spiritual intelligence. So Carrying out such a research is of high importance between students which constitute a relatively large class of people in society and is a step toward identifying the effective factors on the happiness and decreasing mental disorders. According to the aforementioned goal, this study aimed to assess relationship between spiritual intelligence and happiness of the adolescents in Iran.

2. Material and methods

2.1. Participants

In the current research, 221 students on high school of Shiraz were chosen by multiple cluster sampling.

2.2. Measures

2.2.1. Oxford happiness inventory

It consists of wide range of a individual happiness used the department of experimental psychology at Oxford University. (Abir et al, 2008). The scale include 29 items and each item is presented in four incremental levels numbered from 0 to 3 and the score will be added and the final score on the basis the number of questions was between 0-87. Cronbach's alpha coefficient for the original questionnaire of Oxford was 0.90 – 0.92 (Argyle et al, 1989). Validity and reliability in Oxford happiness inventory were acceptable. (Cheng & Furnham, 2003). In this study internal consistency of Oxford happiness inventory was 0.89.

2.2.2. Spiritual sensitivity scale

Spiritual sensitivity scale is the spiritual intelligence scale applied to multiple Intelligence scale is applied to multiple Intelligence profile questionnaire (MIPQ: Trri & Komulainen, 2002). Terri, Nokelainen and Ubani (2006) extend 20 items of this scale based on Hay's (1998) and Bradford's (1995) definition of spirituality the spiritual intelligence scale applied as the eighth dimension of the MIPQ IS based on spiritual sensitivity scale consisting of following four dimensions:

I. *Awareness sensing*
II. *Mystery sensing*
III. *Value sensing*
IV. *Community sensing*

Terri, Nokelainen and Ubani (2006) Evaluated Spiritual sensitivity scale with an empirical sample of preadolescents, adolescents and adults (N=496) and estimated the reliability range from 0.62 to 0.75.In this study internal consistency of spiritual sensitivity scale was divide into four subscale: awareness sensing, Mystery sensing, value sensing and community sensing. Their consistencies were 0.73, 0.69, 0.71, and 0.67 respectively. The total score was used as measure of spiritual intelligence.

2.3. Procedure

Design of current research is an expost facto (co relational study), in which the relation between spiritual intelligence and mental health has been investigated.

3. Results

In the analysis of data, person's correlation coefficient was used to study correlation between spiritual intelligence and mental health, step by step regression analysis mental was used in order to consider that how much score of spiritual intelligence can predict the scores of mental health.

To study the relation between spiritual intelligence and Happiness investigators used multiple correlation analysis, Inspecting data in table 1,we can conclude that there's a significant correlation between spiritual intelligence and happiness ($r=0.8$, $p<0.01$). It can be concluded that there's a significant and positive relation between happiness and spiritual intelligence.

Also the correlation of four subscales of spiritual intelligence (i.e. Awareness sensing, Mystery sensing, Value sensing and community sensing) is significant by happiness. Step by step regression was used in order to consider that how much scores of spiritual intelligence can predict score of happiness which its results are presented in table 2.

As it is seen from the table, all subscales of spiritual intelligence can significantly predict the happiness. In the first step aware sensing is entered into the regression equation. This variable solely predicts 53 percents of scores variance of happiness.

Mystery sensing is entered into the equation in the second step which the rate of explanation coefficient (R^2) is reached to 0.62 by adding this variable, which is 0.08, is added to the explanation coefficient. In the third step with entering value sensing into the equation, 0.08 is added to the explanation coefficient and finally by adding

Community sensing in the forth step, the rate of explanation coefficient is reached to 0.67. Generally, all subscales of spiritual intelligence can predict 67 percent of variations in the scores of happiness.

4. Discussion & Conclusion

The aim of this research was to study relationship between spiritual intelligence and happiness for adolescents in high school. The results of the study revealed a significant correlation between domains of spiritual intelligence (i.e. Awareness sensing, Mystery sensing, Value sensing and community sensing) and happiness of high school students. While there is no exclusive research studying spiritual intelligence and happiness, but these finding were consistent with the studies related to spirituality. These studies toted that those who engage in meaningful relationships (Myers & Diener, 1995) and have a well-developed sense of spirituality (Myers, 2000) tend to be happier. Dockery (2005) found that open-mindedness, feeling in control of one's life, and having aspirations which transcend enhancing one's financial status, such as aspirations in social and moral matters is significantly correlated with happiness.

Since many joys are temporary and vanish quickly human beings unstable usually seek more joy. Activities done by those who seek spirituality such as helping others and compassion, can lead them to happiness (Shaw, 2008). Spirituality contributes to promote the mental health by providing a framework for describing life's experiences and because of that creating a sense of integrity and existential interconnection. Individuals with spiritual experience and religious beliefs can cope with their stress and psychological problems and the confrontation methods are stronger in them, spirituality creates a power which affects on the physical postures, feelings, thoughts and communications and will be affected by them.

Actually, spirituality has a protective effect and acts against stress and leads to gain physical and psychological healthy, having goal and meaning in life, hopefulness, optimism and improves individual's psychological status (Harvey, 2004). During adolescence, spirituality represent important sources of hope, ideals, worldviews and role models that influence the course of identity development (King, 2003; Roeser, Issac, Abo - Zena, Brittian, & Peck, 2008; Smith & Denton, 2005). The intelligence use of spiritual information can contribute to positive life out comes such as emotional wellbeing, positive social functioning and an enhanced overall quality of life (Emmons, 2000). Spiritual intelligence includes various methods that and can coordinate innate life and the spirit with external life and it may lead to happiness (Vaguan, 2003). Therefore, promoting spiritual intelligence of the students adolescents can help them to have a meaningful and happy life, And individual who are happier have longer life expectancy, are more active, and are less likely to have conditions associated with mental disease (Post, 2005; Veenhoven, 2008). This study is not without limitations. First, the demographic characteristics of the study sample must be taken into account before the results can be generalized. Another limitation of this study is that all participants were adolescents attending high school.

Table 1. Correlation matrix between spiritual intelligence and mental health

variable	Awareness sensing	mystery sensing	value sensing	community sensing	spiritual intelligence
Happiness	0.73	0.64	0.68	0.4	0.8

P< 0.01

Table 2. Step by step regression analysis for predicting of happiness

Step	predictive variable	B	Beta	R	R^2
1	aware sensing	3.27	0.73	0.73	0.53
2	aware sensing	2.48	0.54	0.78	0.62
	mystery sensing	2.23	0.36		
Step	predictive variable	B	Beta	R	R^2
3	aware sensing	1.2	0.43	0.81	0.66
	mystery sensing	1.57	0.25		
	value sensing	1.67	0.27		
4	aware sensing	1.85	0.41	0.82	0.67
	mystery sensing	1.52	0.24		
	value sensing	1.54	0.25		
	Community sensing	0.58	0.09		

The results showed here should also be tested on adolescents who are not in high school or engaged in further education, have chronic illness and psychiatric diagnosis.

Contact us:
Laleh Babanazari.
Tel: +98-0917-321-9776; Fax: +98-0721-221-1228.
E-mail address: Laleh_Babanazari@yahoo.com

References

1. Abir, K. B., Jaclene, A. Z., & Wagdy, E. N. (2008). Happiness: Theoretical and Empirical Considerations. Nursing Forum. 43(1), 12–23.
2. Alvordo, K. A. (1995). The relationship of religious variable to death depression and death anxiety. Clinical psychology. 51(20), 202-204.
3. Argyle, M. (2001). The Psychology of Happiness. New York: Elsevior North – Holland.
4. Argyle, M., Martin, M., & Crossland, J. (1989). Happiness as a function of personality and social encounters. In J.P Forgas 8 J.M. Innes.
5. Buss, D. M. (2000). The evolution of happiness. American Psychologist, 55, 15–23.
6. Cheng, H., & Furnham, A. (2003). Personality, self-esteem, and demographic predictions of happiness and depression. Personality and Individual Difference, 34, 921–942.
7. Collins, W. A., & Repinski, D. J. (1994). Relationships during adolescence: Continuity and change in interpersonal perspective. In R. Montemayor, G. R. Adams, & T. P. Gullotta (Eds.), Personal relationships during adolescence (pp. 7–36). Thousand Oaks: Sage.
8. Cotton, S., Zebracki, K., Rosenthal, S. L., Tsevat, J., & Drotar, D. (2006). Religion/spirituality and adolescent health outcomes: A review. Journal of Adolescent Health, 38, 472 – 480.
9. Cotton, S., Larkin, E., Hoopes, A., Cromer, B. A., & Rosenthal, S. L. (2005). The impact of adolescent spirituality on depressive symptoms and health risk behaviors. Journal of Adolescent Health, 36(6):529.
10. Dew, R.E,, Daniel, S. S., Goldston, D. B., Koenig, HG. (2008). Religion, spirituality, and depression in adolescent psychiatric outpatients. Journal of Mental Disorders, 196(3):247-51.
11. Dockery, A. M. (2005). The Happiness of Young Australians: Empirical Evidence on the Role of Labour Market Experience. Economic Record. 81, 322–335.
12. Elmer, L., MacDonald, D., & Friedman, H.(2003).Transpersonal psychology, physical health, and mental health: Theory, research and practice. Humanistic Psychologist, 31, 159-181.
13. Erikson, E. (1968). Identity: Youth and crisis. New York: Norton.
14. Genia, V. (2001). Evaluation of spiritual well-being scale in sample of college student, International journal for psychology of religion, 11, 25-30.
15. Harvey. M. (2004). Development and psychometric validation of the state –trait spiritual inventory unpublished dissert on universally of north texts.
16. Kingsley. J., & Hyde, B. (2003). Spiritual intelligence: A critique. Journal of Religious Education, 51, 13-20.
17. La Greca, A. M., & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. Journal of Abnormal Child Psychology, 26, 83–94.
18. Leach, M. M., & Lark, R. (2004). Dose spirituality add to personality in the study of trait forgiveness? Personality and Individual Difference, 37(1), 147-156.
19. Lyubomirsky, S. (2001). Why are some people happier than others? The role of cognitive and motivational processes in well-being. American Psychologist, 56, 239–249.
20. Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. Review of General Psychology, 9, 111–131.
21. Mcknight, C. G., Huebner, E. S., & Suldo, S. (2002). Relationships among stressful life events, temperament, problem behaviour, and global life satisfaction in adolescents. Psychology in the Schools, 39, 677–687.
22. Moore, S., & Boldero, J. (1991). Psychosocial development and friendship functions in Adolescence. Sex Roles, 25(9/10), 521–536
23. Myers, D. G., & Diener, E. (1995). Who is happy? Psychological Science, 6, 10-19.
24. Pargament, K.I., & Smith, B.W. (1998). Pattern of positive and negative religious coping with major life stressors. journal for the study of Religion.710-724.
25. Piaget, J., & Inhelder, B. (1973). Memory and intelligence. New York: Basic Books.
26. Post, S. (2005). Altruism, happiness, and health: it's good to be good. International Journal of Behavioral Medicine , 12(2), 66-77.
27. Ruzgis, P., & Grigorenko, L. (1994).Cultural meaning systems, intelligence and personality. Cambridge, MA: Cam-bridge University press.
28. Show, I. (2008). Society and Mental Health: The Place of Religion, Pavilion Journals. 13(1), 4-7.
29. Steinberg, L. (2004). Risk-taking in adolescence: What changes, and why? Annals of the New York Academy of Sciences, 1021, 51–58.
30. Tirri, K., Komulainen, E. (2002). Identification of multiple intelligences with the Multiple Intelligence Profiling Questionnaire IIIP. Psychology Science Quarterly, 50 (2), 206-22.
31. Van Ness, P.H. & Kasl, S.V.(2003). Religion and Cognitive Dysfunction in an Elderly Cohort. Journal of Gerontology: Social Science, 58(1), 21-29.
32. Veenhoven. R. (2008). Healthy happiness: effects of happiness on physical health and the consequences for preventive health care. Journal of Happiness Studies, 9(3), 449-469.
33. Wires, J. W., Barocas, R., & Hollenbeck, A. R. (1994). Determinants of adolescent identity development: A cross-sequential study of boarding school boys. Adolescence, 29(114), 361–378.
34. Wong, Y. J., Rew, L., & Slaikeu, K. D. (2006). A systematic review of recent research on adolescent religiosity/spirituality and mental health. Issues in Mental Health Nursing. 27, 161-183.
35. Woodbury, A M. (1992). Social support network and adjustment in childhood: A longitudinal analysis. (dissertation). Boston: Boston University.
36. World Health Organization. (2001). mental health: new understanding, new hope. The World Health Report Geneva. World Health Organization.

7/24/2012

Relationship between Quality of Work Life, Organizational Health and Commitment with Job Satisfaction

Alireza Heidarie[1], Parviz Askary[1], Sara Saedi[1], Bahman Gorjian[2]

[1] Department of Psychology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran
[2] Department of TEFL, Abadan Branch, Islamic Azad University, Abadan, Iran
Askary47@yahoo.com

Abstract: The research purpose is to evaluate the relationship between quality of work life, organizational health and organizational commitment with job satisfaction. Research tools were Mirsepasi's (1996) Quality of work life, life, Tamiminazhad's (Year) Organizational Health, Meyer and Allen's (1987) Organizational Commitment, Shokrkon and Arshade's (1990) Job Satisfaction. The sample that comprised 188 individuals was selected by using simple random sampling among the staff of Islamic Azad University, Ahvaz branch. Data were analyzed through stepwise regression reveal that quality of work life, organizational health and organizational commitment correlated to job satisfaction.

[Alireza Heidarie, Parviz Askary, Sara Saedi, Bahman Gorjian. **Relationship between Quality of Work Life, Organizational Health and Commitment with Job Satisfaction.** *Life Sci J* 2012;9(3):2300-2306] (ISSN:1097-8135). http://www.lifesciencesite.com. 330

Keywords: quality of work life, organizational health, organizational commitment, job satisfaction.

1. Introduction

Nowadays, the concept of quality of work life is changed to be an important social issue in the contemporary management (Luthans, 1998) while in the past decades the focus was only on the private life. The proponents of quality of work life theory are seeking some new systems for aiding the staff to have balance between their work life and private life (Akdere, 2006).The plan of the quality of work life includes any improvement in organizational culture that causes progress among staff in the organization (Filippo, 1998). So the system of quality of work life has emphasized on the individual as the most important variable in management (Shareef, 1990). The research findings show that the components of these plans decrease the staff's complaints and their absence and also increase the positive attitudes of the staff and their participation in programs of suggestions system. (Gordon, 1993) On the other hand, satisfaction of the staff needs leads to a long term efficiency of organization.

Nowadays, the experimental studies carried out in the domain of quality of work life have accepted a new view point of job satisfaction, the concepts related to vocation and job. Although, both the concepts quality of work life and job satisfaction are considered to be synonyms in many texts, several experts in management and industrial psychology believe that they are different conceptually. The difference between these two is the notion that job satisfaction is considered as one of the effects of quality of work life (Sirgy, et all.2001). Danna & Griffin (1999) underline the point that quality of work life resembles a pyramid including three factors; life satisfaction which is at the top, job satisfaction in the middle and satisfaction of other aspects of job like salary, colleagues, and observers at the bottom. Therefore, work life satisfaction is an issue further than job satisfaction. So these two concepts while correlated are conceptually different from each other.

In general, work life quality is a comprehensive plan that enhances the staff satisfaction. It also fosters their learning in the environment and aids them in management and variation issues. Staff's un-satisfaction of their quality of work life is a problem that regardless of their status and position suffers them. The purpose of many organizations is to enhance staff's quality of work life and job satisfaction (Saraji, 2006). In addition to quality of work life, organizational health has also good effects on staff satisfaction and organization's work and it can be an important predicator for effectiveness of the organization (Ruzegar, 2007, cited by Purtorab, 2010). According to Armichel (1990) effective organizations are accounted as the most important devices for progress in a society and from among others, organizations are regarded as effective that in addition to other necessary qualifications have health. Suitable organizational environment can be effective on staff motivation, improvement of staff's mentality, individuals cooperation in taking decisions and increase in creativity and be an important source in the staff mental support and vice versa. So variation in any part of organizational support causes an immediate change in the quality of work. A healthy atmosphere occurs at a place where individuals come with interest and be proud of working there. In fact the health of an organization has physically and mentally an important effect on the target system and

it has also an important effect in terms of safety, dependency, their capability growth and doing the roles assigned from their Para systems (Korkmaz, 2007).

Luthans and Klingle (2000) hold that organizational health is a new concept which includes the organization ability for doing its own job effectively which leads to its growth and improvement. A healthy organization is a place where individuals want to stay there and work and be beneficial and effective.

In addition to knowing the organizational commitment, staff can have an effective role on the organizational work (Mottaza, 1988). A loyal staff that is compatible with goals of organization and tends to preserve the organization membership is ready to perform some thing further than his job. The existence of such a staff causes growth in work, decrease in absence rate, firing and the like. On the other hand, an unsatisfied staff has a negative effect on the whole purpose of the organization (Mohamadian et al. 1389). Organizational commitment is an organizational theory which is usually mentioned as identification in a particular organization (Shiuan, Yu & Rilley, 2003). Researchers have justified and defined organizational commitment from different angles. John Maier and Nathalie Allen (1987) expressed that organizational commitments are three categories:

1. *Emotional commitment includes staff emotional dependence on identification of organization, and being involved in organizational activities. The staff with a strong emotional commitment will be loyal to their own organization.*
2. *Continual commitment that includes a commitment which is based on giving value to the organization. And a staff is involved on the organizational life. The staff having this kind of commitment, because of knowing the expenses resulted by firing will stay with the organization.*
3. *Norm commitment is that an individual stay at the organization because of the pressure caused by the norms and morality. The staff having this commitment should be loyal to their organization. (Wood, 2008).*

In most of organizational plans the attempt was on increasing the staff's job satisfaction by enhancing their interior will (Dales, 1989). Besides, nowadays job satisfaction is an important job theory that most of the studies related to the organizational behavior both in theoretical and practical researches is concerned with and is accounted as a central variable (Erdheim, 2006) Besides, the researches show that over 300 researches have been done on this domain every year which shows that no case study has been emphasized more than job satisfaction (Spector, 2007).

Job satisfaction is one of the important issues in job success which enhances efficiency and personal satisfaction. Researches have examined job satisfaction from different view points and concluded that if the job provides the individuals with pleasure, the person is satisfied with his job which is a combination of both inside, enjoyment, and outside, salary.

Several studies have shown that most of the experts agreed on these factors as the main elements of job satisfaction.

1. Job condition, 2. Interaction with colleagues, 3.the job itself, 4. Salary &bonus, 5. Growth & advancement, 6. Appreciation, 7. Control and reply, 8. Job security, 9. Style of leadership, 10. Way of organization (Hong et al, 2007). Briefly, the literature review denotes to the fact that there is a strong *relationship* between quality of work life and health with job satisfaction.

Gunlu, Aksarayli and Sahin Percin (2010) in his study have examined the correlation of organizational commitment to job satisfaction among the managers in Turkish hotels. The findings showed that generally job satisfaction and norm and emotional commitment have a meaningful relationship. Heinonen and Saarimaa (2009) in their study carried out in Fenland concluded that the increase of quality of work life led to job satisfaction and finally increase of efficiency and production.

In a study done by Okpara and Wynn (2008) on the relationship between job satisfaction and organizational commitment, it was concluded that there was a meaningful correlation between job satisfaction and organizational commitment.

Celik (2008) has surveyed the relation of job satisfaction and organizational commitment. In his study, he used variance analysis. The results indicated that there was a meaningful correlation between satisfaction and commitment. Che Rose, Beh , Uli and Idris (2006) in a study ,entitled as the analysis of quality of work life and job variables, 475 subjects from among Malaysian electronic managers were participated and the results showed that job satisfaction, job success and job balance showed 63 percent of quality of work life. In general, the findings indicated that there was a positive and meaningful relationship between job satisfaction and quality of work life. Hua, also indicates that job satisfaction and quality of work life have not only positive relationship but also quality of work life has a strong effect on the decrease of job pressure and job satisfaction.

Fourie (2004) in a research implemented on the effective predicators of job satisfaction concluded

that there was a meaningful correlation between job satisfaction and quality of work life. Krueger et al. (2002) concluded that quality of work life is one of the pre-assumptions of job satisfaction. The results of this study show that job satisfaction has a multi-dimensional meaning and is a product of evaluation of job place. The findings of this study show that all the aspects of job satisfaction are related to the quality of work life and its improvement fosters job satisfaction.

Riley (2000) in a research on the quality of work life, self-assessment and life satisfaction among African Americans, came to a conclusion that job satisfaction and quality of work life are not only strongly correlated, but also lead to general quality of life. Pruijt (2000) in a study maintains that there is a relationship between the quality of work life and factors like absence, job satisfaction, abounding the job, and commitment.

Begley and Czajka (1993) also found a meaningful relationship between job satisfaction and organizational health in their study. Generally speaking, considering the essential role of each of the afore-mentioned concepts on the growth of the organization, a question raised that whether there is a relationship between quality of work life and job satisfaction. Or whether there is a relationship between organizational health and job satisfaction. Through answering these questions the relationship between quality of work life, organizational health, and job satisfaction would be revealed among the staff of Islamic Azad University, Ahvaz branch.

The main purpose of this study is to investigate the correlation of quality of work life, and organizational health with job satisfaction among the staff working at Azad University of Ahvaz.

-to investigate the correlation of organizational health and job satisfaction among the staff working at Azad University of Ahvaz.

-to investigate the correlation of organizational commitment and job satisfaction among the staff working at Azad University of Ahvaz

-to investigate the correlation of quality of work life, organizational health and organizational commitment among the staff working at Azad University of Ahvaz

The hypotheses in this study are:

Hypothesis 1: there is a meaningful relationship between quality of work life and job satisfaction.

Hypothesis 2: there is a meaningful relationship between organizational health and job satisfaction.

Hypothesis 3: there is a meaningful relationship between organizational commitment and job satisfaction.

Hypothesis 4: there is a multi-dimensional and meaningful relationship between quality of work life, organizational health and organizational commitment with job satisfaction.

2. Methodology

This study is done based on the above hypotheses that investigate the correlation of quality of work life, organizational health, and organizational commitment with job satisfaction among the staff working at Azad University of Ahvaz

2.1. Population, subjects, and sampling

The population was all of the staff working at Azad University of Ahvaz in 1389. Since the list of names of the staff was available, the sampling was run randomly. Based on the kind of the research and the number of predictor variables according to Murgan table, the minimum number of the sample was estimated to be 200. Since it was probable that the sample number would decrease, this number was increased to be 220. Finally, after omitting the unacceptable questionnaires, the data of 188 questionnaires was extracted and analyzed.

2.2. Instrument

In this study based on the kinds of variables, three criterions were used for evaluation and measurement.

1. Questionnaire of quality of work life

Questionnaire of quality of work life was prepared and validated by Mirsepasi (1996) for physical and mental health in the staff workplace. This Questionnaire includes 8 factors related to quality of work life and 50 notions. The factors were: fair payment, obeying rules, continual growth, social attachment, safety, growth of individual capabilities, and social unity. In this research, alpha was used and correlation coefficient was estimated by correlating to the questionnaire of quality of work life, that was estimated to be p =0.30, r =0.034.

2. Questionnaire of organizational health

Organizational health criterion was prepared by Iman Tamiminegad (2007).It included 50 questions with negative and positive scores. In this descriptive study, the correlation coefficient between each member and the whole score of the scale, the score for micro scale of organizational tasks was 0.78, for organization interior process 0.95, and for organizational change and growth 0.84 was meaningful at p value of 0.01. Also, the reliability of the questionnaire was calculated through Cronobakh Alpha to be 0.93.

3. Questionnaire of organizational commitment

For evaluation of organizational commitment, questionnaires of Alen and Mir were used. In this questionnaire organizational commitment of people including 7 questions, continual commitment including 6 questions, and norm commitment including 2 questions have been used. In this study for determining the perpetuity, Alpha coefficient was used to be 0.67. For reliability

of the questionnaire, this score was correlated to job satisfaction and it was estimated that they have a positive and meaningful relationship p=0.041 and r=0.52 which denoted to the fact that the questionnaire of organizational commitment was reliable.

4. JDI

This questionnaire is one of the most accurate and prevalent JDI instrument of measurement which was firstly prepared by Smith, Hulin, and Kenedal. This questionnaire has been translated and validated in Iran by Shokrkon and Arshadi (1990). The five aspects that compose job satisfaction included the nature of job, protectorate, elation, salary, and colleagues. In this study, the stability was estimated through Cronobach Alpha that is, it was 0.80 in the part of my job, 0.89 in my colleague, raises 0.74, and my salary 0.75. For determining the reliability of the questionnaire, the score was correlated to the score of job attachment questionnaire and it was realized that there was a meaningful relationship between the scores. (r=0.31, p=0.027) shows that the questionnaire of job satisfaction is reliable.

3. Findings

Based on the target variables and the data accurate ways of statistics such as frequency, percentage, deviation, and distribution were used for description of data. Finally, for answering the research hypotheses based on the kind of data, step by step regression analysis was applied. The results are presented in Table 1.

Table1. Correlation among quality of work life, organizational health, commitment with job satisfaction

Variable	Sex	N	Mean	SD
Quality of work life	Female	97	117.12	**36.19**
	Male	91	118.53	**37.09**
Organizational health	Female	97	147.4	**27.52**
	Male	91	146.06	**28.66**
Organizational commitment	Female	97	68.525	**9.071**
	Male	91	68.065	**9.280**
Job satisfaction	Female	97	138.39	**23.13**
	Male	91	136.79	

As is depicted in Table 1, the results of score distribution on the relationship of quality of work life, health and organizational commitment with job satisfaction show that different descriptive criterions like average and standard deviation indicate that the subjects score distribution tends to the normal score distribution as Table 2 shows.

For testing the first hypothesis which says that there is a meaningful relationship between quality of work life and job satisfaction, Pearson correlation analysis was used. Besides, as you can see on table 2 there is a positive and meaningful relationship between quality of work life and job satisfaction. So the first hypothesis was verified and this meaningfulness was depicted in all of the criterions of job satisfaction. For instance, in part (my job) r=0.725 is meaningful at p value of p<0.0001 with part (boss), r= 0.488, part (colleagues), r=0.435, part (raises) r=0.473, and part (salaries). In other words, the higher the quality of work life among the staff, the more job satisfaction, and also the less the quality of work life among the staff, the less job satisfaction will be.

Table 2. Correlation of relationship of quality of work life, organizational health, commitment with job satisfaction

Model	*Q.WL*	*organizational health*	*organizational commitment*	*P*
Job satisfaction	0.651	0.570	-0.469	*0.0001*
Job satisfaction (My Job)	0.527	0.416	-0.342	*0.0001*
Job satisfaction (My Boss)	0.488	0.447	-0.389	*0.0001*
Job satisfaction (My Colleague)	0.435	0.381	-0.316	*0.0001*
Job satisfaction (My Promotion)	0.473	0.477	-0.375	*0.0001*
Job satisfaction (My Salary)	-0.294	0.381	-0.294	0.0001

For testing the second hypothesis which hypothesizes that there is a meaningful relationship between organizational health and job satisfaction, Pearson correlation analysis was used. As you can see on table 2, there is a meaningful and positive correlation r=0.570 at p<0.0001 between organizational health and job satisfaction. This positive correlation is evident in job satisfaction members. For instance, in part (my job) r=0.416 is meaningful at p<0.0001 with part (boss), r= 0.477, part (colleagues), r=0.381, part (raises) r=0.477, and part (salaries) r=0.381. In other words the higher the organizational health, the higher the job satisfaction.

For testing the third hypothesis which presents that there is a meaningful relationship between organizational commitment and job satisfaction, Pearson correlation analysis was used. As it is

depicted in table 2 there is a meaningful relationship between organizational commitment and job satisfaction (r=0.469) at p<0.0001. In other words the higher the organizational commitment, the higher the job satisfaction among the staff. For testing the fourth hypothesis which presents that there is a meaningful relationship between quality of work life, health and organizational commitment with job satisfaction, regression step by step way was used.

As is demonstrated in table 3, based on the regression analysis, determining of correlation coefficient between quality of work life, health and organizational commitment with job satisfaction and depiction of relative portion of each predictive variable in showing the variable variance of the main factor, job satisfaction, denotes to the fact that there is a relationship between quality of work life, health and organizational commitment with job satisfaction. (RS=0.489, MR=0.705).Therefore, the fourth hypothesis is verified.

4. Results and discussion

The data collected from the first hypothesis and the model gained by Pearson correlation show that there is a meaningful relationship between quality of work life and job satisfaction. So, the evidence is high enough to verify the first hypothesis. Regarding the second hypothesis, the results show that there is a positive and meaningful relationship between organizational health and job satisfaction. So, the second hypothesis is verified. With regard to the third hypothesis, the findings showed that there was a positive and meaningful relationship between organizational commitment and job satisfaction. Regarding the fourth hypothesis, the findings from the regression analysis reveal that the above results led the researcher to draw the conclusion that meaningful relationship between quality of work life, health and organizational commitment with job satisfaction.

Moreover, it is worth mentioning that the findings of this study are in line with the researchers conducted by Ganlo et al (2010), Hinon and Sarima (2009), Okpera and Vin (2008), Klik (2008), Hong et al (2007), Seraji (2006), Rily(2000), and Erik Ternit et al (1995). It is evident that considering the identity of variables like quality of work life and organizational health is turned to the assumption of relationship between these variables is verified. Indeed, it could be confirmed that if these factors exist, the job satisfaction will be increased among the staff.

Although the findings of the present study support the results gained by other studies, the researcher encounter many limitations. The main limitation was the worried-ness of the learners about the evaluation. In spite of the validation done before answering the questionnaire, the learners were worried about their own evaluation and pretend to be better than what they are.

Also, based on the findings of this study, the following suggestions are rendered for improvement in quality of work life, organizational health and commitment and preventing job non-satisfaction.

Regarding the non-venal rewards, the university managers should know the effects of these rewards on the individuals and for enhancing the their motivation, they should use ways other than salaries and payments like better conditions for working, appreciation for accomplishing a task, and having a sense of collaboration and cooperation in doing efforts.

According to this research's findings, a safe and healthy workplace is an important factor in quality of work life. So, emphasizing on physical conditions of workplace like lightening, air conditioning tools, and also considering the staff opinions in the programs could be beneficial.

Concerning the progress factors, the universities should use the staff abilities, experiences, and skills so that they can progress, feel more safety, and use their own creativities. Social unity is one of the effective factors on the staff quality of work life which could be gained by providing the essential facilities for work and protecting them by the people in charge and colleagues.

In the domain of overall condition of life, it is recommended that the effective factors on this issue should be analyzed and strengthened. Also the external factors which affect the staff job satisfaction should be recognized and emphasized. In so doing, the universities could encourage the staff to update their information and provide them with opportunities to study more. Moreover, providing entertainments and recreation for the staff and their families could be beneficial in enhancing the staff quality of work life and surely their job satisfaction.

Besides, in the domain of organizational health, it is worth mentioning that the knowledge, experience, and the ability of the staff affect the trust, commitment, motivation and as a result the stress and health of the staff. The universities should choose the staff based on their own profession and also offer a suitable training for the staff to their job which could enhance their abilities and also fostering the staff ability, safety, and health. In addition, if accurate and precise information about the organizational changes rendered to the staff, there would be less probabilities that these changes endanger the staff mental health.

It should be mentioned that nowadays the choice of an individual, the extent of being risky, and the extent of using one's skill and ability is a determining notion in reduction of ones stress and work anxiety.

In work places where the choice of people is more, there is less probability that endangers staff's mental health. But work places at which the choice of people is less, it is more probable that the people be mentally in danger. In this domain the universities can do efforts like job planning and collaborative management that lead to decrease on the unpleasant results on health.

Table 3. Multivariate regression (Step wise) among quality of work life, organizational health, commitment with job satisfaction

Criterion Variable	Statistical Indices	Multivariate regression	RS	F P	Quality of work life	Organizational health	Organizational commitment	
	Predicting Variable							
	quality of work life	0.651	0.421		β=0.651 t=11.754 p=0.000			
Job satisfaction	quality of work life, organizational health	0.692	0.473	85.963 0.0001	β=0.552 t=9.639 p=0.0001	β=-0.255 t=-4.460 p=0.0001		
	quality of work life, organizational health, organizational commitment	0.705	0.489	61.396 0.0001	β=0.452 t=6.565 p=0.0001	β=-0.208 t=-4.460 p=0.0001	β=1860. t=2.620 p=0.0001	β=1860.●●

References

1. Akdere, M. (2006). *Improving quality if work life implications for human resources*.
2. Askari, G., & Kaldi, A. (2003). *The study of primary teachers' job satisfaction in Tehran. Business Review, 1*(173),1-24.
3. Unpublished PhD thesis. Allameh Tabatabei University of Tehran. Department of Educational Management.
4. Begley, T. M., & Czajka, J. M. (1993). Panel analysis of the moderating effects of commitment on job satisfaction, intent to quit, and health following organizational change. *Journal of Applied Psychology, 78*(4), 552-556.
5. Begley, T., Czajka, J. (1993). Panel analysis of the moderating effects of commitment on job satisfaction, intent to quit, and health following organizational change. *Journal of Applied Psychology*, *78*(4), 552-556.
6. Cassio Wayne, F. (1998). *Managing Human Resource,* Boston: McGraw. Hill.
7. Çelik, C.(2008). Relationship of Organizational Commitment and job satisfaction: *A FIELD STUDY OF TAX OFFICE EMPLOYEES*. Mersin University, TURKEY 138-155. http://ces.epoka.edu.al/icme/11.pdf
8. Che Rose, R., & Beh, L., Uli, J., & Idris, K.(2006). An analysis of quality of work life (QWL) and career-related variables. *American Journal of Applied Sciences 3 (12),* 2151-2159.
9. Che Rrose, R., & et al. (2006). An analysis of quality of work life (QWL) and career relatedvariables. *American Journal of Applied Sciences, 12,* 2151-2159.
10. Cote, S., & Heslin, P,. (2003). "Job Satisfaction and Organizational Commitment". www.rotman.utoronto.ca.scote/hightermhotel.pdf.
11. Dales, B. (1991). Personnel, the management of people at work, Max Well Macmillan International Edition.
12. Danna, K., & Griffin, R. W. (1999). Health and well-being in the work place. A Review and Synthesis of the Literature, *Journal of Management, 25,* 357-384.
13. Erdheim, J., Wang, M., & Zickar, M. J. (2006). Linking the big five personality constructs to organizational commitment. *Personality and Individual Differences, 41,* 959-970.
14. Fatness, L. E. (2003). *Job Satisfaction*: Sage Publications Thousand Oaks London New Delhi.
15. Federico, R. (2003). Vanderbilt making study to improve quality of work life. *Vanderbilt University Medical Center for More Information Journal*, Available at: www.mc.vanderbilt. Edu.
16. Filippo, E. B. (1998). Personal Management, McGraw-Hill Publishing.
17. Fourie, A. S. (2004). *Predicting satisfaction with quality of work life,* Master's Thesis, University of South Africa.
18. French, J. R. D., & Caplan, R. D. (1973). *Organizational stress in individual strain*.
19. Gordon, J. R. (1993). A diagnostic approach to organizational behavior, Allyn and Bacon. *Instructors Manual for Human*.
20. Gordon, J.R. (1993). *A Diagnostic Approach to Organizational Behavior*; Forth Edition, Allyn and Bacon.
21. Gunlu, E., Aksarayli, M., & Sahin, P. (2010). "Job Satisfaction and Organizational Commitment Of

Hotel Managers in Turkey OF HOTEL". *International Journal of Contemporary Hospitality Managemen.t* `Volume: 22 Issue: 5 ISSN: 0959-6119.
22. Heinonen, S., & Saarimaa, R. (2009). Better job satisfaction through quality of work life –how can telework help?
23. Hong Lu, E., Alison, K. W., & Barrball, L.(2007). Job satisfaction and its related factors. *International Journal of Studies, 44,* 575.
24. Hoseeinzadeh, D, Labadi, Z, & Salehi, P. (2004). The basis of industrial-organizational psychology. Tehran: Maziyar.
25. Hua, J. (2006). *A study of relationship on bureau of investigation officials, quality of work life, work pressure and job satisfaction*. MA thesis, Public Affairs Management.
26. Jahed, H.A. (2005). Organizational health. Tadbir, 16 (159), 16-29.
27. Korkmaz, M. (2006). The relationship between organizational health and robust school vision in elementary schools. *Educational Research Quarterly, 1,* 14-36.
28. Korkmaz, M. (2007). The effect of Leadership style on organizational Health. *Educational Research Quarterly, 3,* 22-54.
29. Krueger, P., & et al (2002). Organization specific predictors of job satisfaction findings from a Canadian multi sit quality of work life, *Health Service Research.*
30. Luthans, F. (1998). *Organizational Behavior*. McGraw-Hill.
31. Lynden, A. J., & William, K. (2000). Supervision organizational Health. *supervision Journal,* 3-5.
32. Merkamali, S. M. (2005). *The increase of teachers' job satisfaction with the managing fullness of tech management*.
33. Mirkamali, S. M., & Naranji Sani, F. (2008). Study of the relationship between job quality and faculty members' job satisfaction in Tehran and Sharif Universities. Journal of Research and Planning in Higher Education, 48, 71-101.
34. Mohammadi, R. (1997). Relationship between the role of management, job satisfaction, mental stressful factors and nurses' mental health in private and public hospitals in Tehran. Unpublished PhD thesis. Islamic Azad University of Tehran. Advanced Research Branch.
35. Mohebali, D. (1997). The Better Work Life: A Factor in Increasing Productivity. *Quarterly Journal of Management Studies, 13(14),* 54.
36. Mottaza, C. J. (1988) Determinats of Organizational commitment. Human relations,Vol.41 No.6, 467-482.New York: AMA.
37. Okpara , J.o.,Wynn,p.(2008).The impact of ethical climate on job satisfaction, and commitment in Nigeria. Implications for management development. *Journal of Management Development* , 9 (27), 935-950.
38. Pourtorab, H. (1990). Relationship between work quality, job affiliation, healt organization and organizational commitment among the staff of Ahvaz Melli Bank. Unpublished MA thesis. Islamic Azad University, psychology Department.
39. Pruijt, H. (2000). Performance and quality of working life, *Journal of organizational Change Management.*
40. Riley, A. (2000). The quality of work life, self-evaluation and life satisfaction among Africans.
41. Sabeti, Z. (1990). The survey of organizational atmosphere with primary teachers in Qum. Unpublished MA thesis. Governmental Management Center of Qum.
42. Sagie, A. (1998). Employee absenteeism organizational commitment and job satisfaction: Another look. *Journal of Vocational Behavior, 52(2),* 156-171.
43. Saraji Nasl & dargahi, H. (2006). Study of quality of work life (QWL). *Iranian Journal of Public Health, 35*.
44. Shareef, R. (1990). QWL Programs Facilitate Change. *Personnel Journal, 69,* 50-67.
45. Shiuan, C.B., Yu, J.D & Rilley, J.H(2003).Organizational Commitment Supervisory Commitment and Employee Outcomes In The Chinese Context Proximal Hypothesis or Global Hypothesis. *Journal of Organizational Behavio.,* Vol.24,No.3.
46. Shokrkon, H. (2004). People in organizations and the basis of organizational behavior. Tehran: Roshd.
47. Sirgy, M., Joseph, D. E., Fraty, P. S., & Bond, J. L. (2001). A new measure of quality of work life (QWL) based on need satisfaction and Spillover theories, *Social Indicators Research, 55,* 247.
48. Spector, P. E. (1997). The role of frustration in anti-social behavior at work. In R. A, Thousand Oaks. Perspectives on Justice: Theory and Applications, 87- 108. New York: Cambridge University Press.
49. Spector, P. E. (2007). *Job Satisfaction: Application, Assessment, Cause, and Consequences*. Thousand Oaks, CA: Sage Publications.
50. Wood, N. E. (2008). A study on The Relationship between Percived Leadership Styles s of Hospital Clinical Leaders and Perceived Empowerment, Organizational Commitment, and Job Satisfaction of subordinate Hospital Nurses in a Management Position, A Dissertation presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy.

8/21/2012

ZERO B-SPLINEPOLYNOMIAL APROXIMATION METHOD FOR CHAOTIC FUNCTIONAL INTEGRAL EQUATIONS AND CONTROLING BY PARAMETERS COIFFICIENT ARRAY

Ali Moharrami [a]

[a]Faculty of Engineering, University of Zanjan, P.O. Box 45195-313, Zanjan, Iran
ali.moharrami@ymail.com

Abstract. In this article, we study an approximation of a functional integral equations by zero B-Spline polynomial. We use the polynomialapproximation we have n unknown determined coefficients. We used zero B-Spline function. For n knots of x_j we have a linear system. When we solved this system we could found determined coefficients. And this method error was little when n be enough large.
[Ali Moharrami. **ZERO B-SPLINEPOLYNOMIAL APROXIMATION METHOD FOR CHAOTIC FUNCTIONALINTEGRAL EQUATIONS AND CONTROLING BY PARAMETERS COIFFICIENT ARRAY.** *Life Sci J* 2012;9(3):2307-2309] (ISSN:1097-8135). http://www.lifesciencesite.com. 331

Keywords: Chaos, ordinary differential equations, system of differential equations, approximation, strange attractors

1. Introduction

In many natural and real phenomenons, differential ofIntegral equations can be seen.These systems may have different behavior in different qualifications [2]. Many of these equations are called functional integral equations. Fredholm and Voltrra integral equations are special type of these equations [3]. In nearest year everybody can to solve these equations by differential numerical method such that polynomial approximation [6].We used B-Spline equation in this paper [5]. When we have linear functions, we can approximateunknown function by a polynomial function. So we must found their coefficients. We solved the linear system and found this determined coefficient.A Integral equations can be chaotic when we give differentparameters coefficient. We study these systems and controlling it.

2. Chaos

A dictionary definition of chaos is a disordered state of a collection; a confused mixture. This is an accurate description of dynamical systems theory today or of any other lively field of research. (Morris W. Hirsch).

When a system in nature is mathematically modeled, we find that their graphical representations are not straight light lines and the system behavior is not so easy to predict. After researches on complex systems, now we know that noise is actually important information about the experiments. When noise is inserted in to the result graph, the graph no longer appear as straight line, neither its point are predictable. Once, this noise was referred to as the chaos in an experiment. For chaos applications we can mention, much like physics, chaos theory provides a foundation for the study of all other scientific disciplines. It is actually a toolbox of methods for incorporating non-linear dynamics for the study of science.

3. functional integral eqquations

functional integral equation of the second kind is given by:

$$y(x) + p(x)y(h(x)) + \lambda \int_a^b k(x,t)y(t)dt = g(x), \qquad a \leq x \leq b \tag{2.1}$$

Also, Voltra functional integral equation of the second kind is given by:

$$y(x) + p(x)y(h(x)) + \lambda \int_a^x k(x,t)y(t)dt = g(x), \qquad a \leq x \leq b \tag{2.2}$$

But, functional integral equation of first kind is given by:

$$p(x)y(h(x)) + \lambda \int_a^b k(x,t)y(t)\,dt = g(x), \qquad a \leq x \leq b \tag{2.3}$$

Also, Voltra functional integral equation of first kind is given by:

(2.4)

$$p(x)y(h(x)) + \lambda \int_a^x k(x,t)\,y(t)\,dt = g(x)\,, \qquad a \le x \le b$$

4. Zero B-spline polynomial Aprroximation method

Definition 3.1. *Let $\Psi(x): \mathbb{R} \to \mathbb{R}$ be interpolation polynomial. So determined coefficients $\{\alpha_i\}_{i=1}^n$ such that*

$$\Psi(x) = \sum_{i=1}^{n} \alpha_i \phi_i(x)$$

We let $\Psi(x)$ be an approximation of $y(x)$. This method given an approximation of functional integral when our function are orthogonal.

Definition 3.2. *Let h be a partition of the interval $[a,b]$; defined by the knots $\{x_j\}_{j=1}^n$, such that*

$$a = x_1 \le x_2 \le \cdots \le x_n = b$$

We approximate $y(x)$ of (2.1) by a polynomial of $\Psi(x)$ such that (2.5). So we have:

$$\Psi(x) + p(x)\Psi(h(x)) + \int_a^b k(x,t)\Psi(t)\,dt = g(x)$$

When we use Definition.2.1 we have:

$$\sum_{i=1}^{n} \alpha_i \phi_i(x) + p(x) \sum_{i=1}^{n} \alpha_i \phi_i(h(x)) + \int_a^b k(x,t) \sum_{i=1}^{n} \alpha_i \phi_i(t)\,dt = g(x)$$

Then

$$\sum_{i=1}^{n} \alpha_i \phi_i(x) + p(x) \sum_{i=1}^{n} \alpha_i \phi_i(h(x)) + \sum_{i=1}^{n} \alpha_i \int_a^b k(x,t)\phi_i(t)dt = g(x)$$

And for (2.2) in homogenous temperament by Voltra functional integral equation we have:

$$\sum_{i=1}^{n} \alpha_i \phi_i(x) + p(x) \sum_{i=1}^{n} \alpha_i \phi_i(h(x)) + \sum_{i=1}^{n} \alpha_i \phi_i(t) \int_a^x k(x,t)\phi_i(t)dt = g(x)$$

Definition 3.3. *Let $B_i^{(0)}(x): \mathbb{R} \to \{0,1\}$ be a zero B-Spline such that*

$$B_i^{(0)}(x) = \begin{cases} 1 & x \in [t_i, t_{i+1}] \\ 0 & otherwise \end{cases} \tag{3.7}$$

When we used $B_i^{(0)}(x)$ in (3.2) then we have:

$$\sum_{i=1}^{n} \alpha_i B_i^{(0)}(x) + p(x) \sum_{i=1}^{n} \alpha_i B_i^{(0)}(h(x)) + \sum_{i=1}^{n} \alpha_i \int_a^b k(x,t) B_i^{(0)}(t)dt = g(x) \tag{3.8}$$

And for (3.3) we have:

$$\sum_{i=1}^{n} \alpha_i B_i^{(0)}(x) + p(x) \sum_{i=1}^{n} \alpha_i B_i^{(0)}(h(x)) + \sum_{i=1}^{n} \alpha_i \int_a^x k(x,t) B_i^{(0)}(t)dt = g(x) \tag{3.9}$$

We stay to found coefficient $\{\alpha_i\}_{i=1}^n$, so we let $x = x_j$ for $j = 1,2,\ldots,n$. We have linear system such that

$$\sum_{i=1}^{n} \alpha_i B_i^{(0)}(x_j) + p(x) \sum_{i=1}^{n} \alpha_i B_i^{(0)}(h(x_j)) + \sum_{i=1}^{n} \alpha_i \int_a^b k(x_j,t) B_i^{(0)}(t)dt = g(x_j) \tag{3.10}$$

And

(3.11)

(3.12)

$$\sum_{i=1}^{n} \alpha_i B_i^{(0)}(x_j) + p(x) \sum_{i=1}^{n} \alpha_i B_i^{(0)}(h(x_j)) + \sum_{i=1}^{n} \alpha_i \int_a^x k(x_j,t) B_i^{(0)}(t) dt = g(x_j)$$

Definition 3.4. *Let* $\overline{I_n}(x), I_n(x): \mathbb{R} \to \mathbb{R}$ *be a operation integral for* $B_i^{(0)}(x)$ *such that:*

$$I_i(x) = \int_a^b k(x,t) B_i^{(0)}(t) dt$$

And

$$\overline{I_n}(x) = \int_a^x k(x,t) B_i^{(0)}(t) dt$$

Definition 3.5.*Let* A *be a squire matrix of* $n \times n$*, also* A *and* G *be a vector of* $n \times 1$*. So we can rewrite the linear systems (3.4) and (3.5) as follows*

$$AA = G$$

Where

$$A = \begin{pmatrix} B_1^{(0)}(x_1) + B_1^{(0)}(h(x_1)) + I_1(x_1) & \cdots & B_1^{(0)}(x_n) + B_1^{(0)}(h(x_n)) + I_1(x_n) \\ \vdots & \ddots & \vdots \\ B_n^{(0)}(x_1) + B_n^{(0)}(h(x_1)) + I_n(x_1) & \cdots & B_n^{(0)}(x_n) + B_n^{(0)}(h(x_n)) + I_n(x_n) \end{pmatrix}$$

And

$$A = (\alpha_1, \alpha_2, \ldots, \alpha_i)^T, \qquad G = (g(x_1), g(x_2), \ldots, g(n))^T$$

When we solve this linear system, we found determined coefficients $\{\alpha_i\}_{i=1}^n$ *and* $\Psi(x)$ *is a interpolation polynomial for* $y(x)$*.*

5. error analysis

Definition 4.1. *Let f be a scalar function or an operator, also* $\Phi = (\phi_1, \phi_2, \ldots, \phi_n)$ *be a vector. We define* $f(\Phi)$ *as follows*

$$f(\Phi) = (f(\phi_1), f(\phi_2), \ldots, f(\phi_n))^T$$

Definition4.2. *for all knots of* $\{x_j\}_{j=1}^n$ *we let* e_j *and* $\hat{e_j}$ *be an error of* $\phi(x_j)$ *and* $\phi(h(x_j))$ *such that:*

$$e_j = y(x_j) - \phi(x_j)$$

And

$$\hat{e_j} = y\left(h(x_j)\right) - \phi(h(x_j)). \tag{4.3}$$

Theorem 4.1. *This approximate method is convergent*.

If $\det(A) = 0$ when increase n, we have the computational error. So n not be very large.
When we study error of this method, we see that this equation can be in chaotic mod by parameter coefficient.

References

[1] C. T. H. Baker, The numerical treatment of integral equation, Oxford university prees, Oxford, 1977.
[2] 1.G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
[3] L. M. Delves, J. L. Mohamed,Computational methods for integral equations, Cambridge university press, 1985.
[4] L. M. Delves, J. L. Mohamed, Numerical solution of integral equations, Oxford university press, Oxford, 1974.
[5] K. Maleknejad, H. Derili, Numerical solution of integral equations by using combination of Spline-collocation method and Lagrange interpolation, vol. 175, 2006, pp.1235-1244.
[6] M.T.Rashed, Numerical solutions of functional integral equations ,Applied Mathematic and computaition, vol. 156, pp. 507–512,l 2004.

8/29/2012

The Uptake of Heavy Metals in Plants

Leila Ghanbarizadeh [1], Tayeb Saki Nejad [2]

[1.] Soil Science Department, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran

[2.] Assistant professor Department of plant physiology Ahvaz Branch, Islamic Azad University, Ahvaz, Iran

leilaghanbari@miau.ac.ir

Abstract: Absorption of these elements is often taken place through the root and transmitted to pneumatic organs. The action depends on different factors such as: (1) Total amount of these elements in soil; (2) Proportion of all the elements which have a form absorbable in a plant; (3) Plant ability for carrying metals along root-plant system. In 1980, United Nations Organization declared its anxiety in relation to war effects on the environment and paid great attention to environmental effects of nuclear war. In 1995, in Persian Gulf War and Kosovo war also, tests have been indications of great destructions in relation to the environment. It is a long time that war and its due environmental damages have attracted a lot of attentions. Soil pollution also is one of the most important war environmental effects. Cultivation of crops in a land intensely polluted chemically and the use of waters contaminated with lethal compounds in agricultural farms will cause irrecoverable effects. In most cases, war bombardment and various bullets used during wars contaminate soils in terms of heavy metals. The study done by environmental Organization, Forest Organization and Switzerland National Development Plan (SAEFA) show that the contacts of bombs and bullets widely pollute heavy metals. Lead and copper are the main polluting metals. Due to the movement of most aquatic species and the close relationship between contaminated sediments and waters on the other hand and the lack of distinction between these two, investigation of the effects of trace elements in aquatic ecosystems is very hard. Soil erosion also is the most important process that pollutes aquatic ecosystem by heavy metals.The issue of plants intoxication by trace elements also is emphasized for two reasons. Firstly, in case of outbreak of intoxication in agricultural plants, their function is significantly reduced per surface unit. Secondly, the onset of intoxication in plants of an area and loss of vegetation causes sharp increase in water and wind erosion in those areas.

[Leila Ghanbarizadeh, Tayeb Saki Nejad. **The Uptake of Heavy Metals in Plants**. *Life Sci J* 2012;9(3):2310-2313] (ISSN:1097-8135). http://www.lifesciencesite.com. 332

Keywords: Heavy Metals, Plants

1. Introduction

In 1980, United Nations Organization declared its anxiety in relation to war effects on the environment and paid great attention to environmental effects of nuclear war. In 1995, in Persian Gulf War and Kosovo war also, tests have been indications of great destructions in relation to the environment.

It is a long time that war and its due environmental damages have attracted a lot of attentions. Soil pollution also is one of the most important war environmental effects. Cultivation of crops in a land intensely polluted chemically and the use of waters contaminated with lethal compounds in agricultural farms will cause irrecoverable effects. In most cases, war bombardment and various bullets used during wars contaminate soils in terms of heavy metals. The study done by environmental Organization, Forest Organization and Switzerland National Development Plan (SAEFA) show that the contacts of bombs and bullets widely pollute heavy metals. Lead and copper are the main polluting metals.

Due to the movement of most aquatic species and the close relationship between contaminated sediments and waters on the other hand and the lack of distinction between these two, investigation of the effects of trace elements in aquatic ecosystems is very hard. Soil erosion also is the most important process that pollutes aquatic ecosystem by heavy metals.

The issue of plants intoxication by trace elements also is emphasized for two reasons. Firstly, in case of outbreak of intoxication in agricultural plants, their function is significantly reduced per surface unit. Secondly, the onset of intoxication in plants of an area and loss of vegetation causes sharp increase in water and wind erosion in those areas.

But one of the most important aspects of the issue is penetration of these metals into plants and subsequently the animals feeding on them.

The onset of gastrointestinal complications and numerous cancers in relation to these metals are attributed to foodstuffs. For example, in the case of lead, it is more emphasized on its toxicity effect in men, animals, aquatic organisms and birds; however,

this metal rarely causes intoxication in plants. Therefore, it can penetrate into a plant with high concentration without having any dangers to it; but after entering other creatures' bodies, it can be dangerous. Of course currently, there are lots of blind spots in relation to man's knowledge about war. Discontinuation of studying systems, lack of registered information and the existing problems related to sampling have limited studying in this field.

Bombardments, destruction of houses and cities and villages and homelessness of many individuals, have constantly placed people under pressure; but the discomforts and diseases after the war should not be disregarded. Iran and Iraq war is not an exception and has caused a lot of damages to the environment. Unfortunately, after the war and clearing the occupied territories, the lands are used for agriculture, aquaculture and other cases without investigation in terms of soil and water pollution state and the products enter the market and this can result in serious problems.

2. Review of previous studies

As pollution caused by war is of great importance in today's world, lots of studies have been done in this relation.

During Iran and Iraq war, surface soil compaction caused flooding in farmlands and left great effects. On the other hand, change and conversion of the flow of rivers, cutting off irrigation waters, saturation and becoming a salt marsh have been reported as lands turned into wetlands at the time of destruction of irrigation channels.

Karun River in Khuzestan province is one of the most important regions in terms of economic activities. Due to war, it was contaminated severely. Drowned ships and carcasses of the aircraft which are still seen along Arvand River threaten fishing industry and ecology of the region.

In Persian Gulf War also, 6-8 million barrels of crude oil were spilled in the sea. This oil was created due to sinking of oil tankers or bombardment of oil platforms. Smoke arising from burning of wells also has had great impacts.

Because of burning of these platforms, 40000 tons of sulfur dioxide, 3000 tons of hydrogen sulfide and 500000 tons of carbon monoxide in addition to 50000 tons of Greazy Soot particles were released. From its effects, it can be referred to black rainfall in Himalayas which is 2700 kilometers away, or acid rain in China and also reduction of temperature in Kuwait.

Based on the studies done by Zare-Maivan (1998), lots of people informed about the change of quality of drinking water and also irrigation water in Iran.

In an experiment done in Khuzestan, the lead levels of acid rain fallen in Dezful and Ahvaz were respectively reported 0/24ppm and 0/33ppm in comparison with 0/11ppm and 0/18ppm in Bandar Abbas and Shiraz. The amounts of chlorides, sulfides, iron, sodium and nitrate also have been very high and this issue can affect all aspects of human lives. For example, drinking, irrigation and underground waters are contaminated and it is very dangerous.

Over the studies done by Sedigh et al., regional dispersion of thousands of tons of heavy metals, caused by Persian Gulf War in Iran, has been reported.

The underground water discharged from Zagros is one of the most important drinking and irrigation water supply resources. High levels of acidity and contaminated sediments, which are considered as dangers for people in this area, have been reported in this mountain (including SO_4^{-2} and other contaminants).

Main polluting materials such as NO_x and SO_4^{-2}, smoke particles, organic materials and carbon resulting from burning of wells can be stopped by Zagros Mountain due to the height, but through washing by precipitation enter catchment and groundwater and finally can threaten underground and surface waters.

Throughout World War II also, contamination of the Pacific Ocean has been reported. Burning vessels and explosion of submarines all have helped the pollution of this area. A lot of islands local and migrant birds were annihilated in those areas. Their nests were burnt and their eggs were destroyed and there was extinction danger of many species. Many hunting animals (ferals) also were lost in the islands of this ocean.

In 1995, Al-Ajami reported that during Persian Gulf War, due to destruction and loss of protecting layers of soil, bulk motion of coastal sand in Kuwait was accelerated after the attack of Iraq. It was followed by blocking of irrigation canals, roads and products and fields entries, especially covering of %20 of farm lands.

Mine application, digging tunnels, fogging caused by oil, oil spilling, formation of oil lakes and movement of military vehicles all affect flora and fauna.

During the studies done by Zaman and Al-Sadir Avi, the critical effects of war on plant community in Kuwait became quite clear. A very high level of heavy metals was measured in vegetation. The existence of oil lakes severely threatened animals and birds. In discharging only one oil lake, lots of dead birds, which were trapped in this area, were found.

According to the studies done by Omar Aldosari on deserts in Kuwait, it became clear that these areas are the shelter of more than 374 plant species which made them appropriate places for bird and animal life. These places attract thousands of migratory birds. In these areas, there are more than 300 different bird species, %61 percent of which is native. Extensive movement of vehicles, digging tunnels and channels, explosions and other military activities have greatly damaged this community.

Due to precipitation of oil particles and aerosols on perennial plants, these plants include a high level of heavy metals. The plants should be prevented from grazing domestic and wild animals because they can intensely poison them.

Based on the studies done by Savari and Nabavi on Persian Gulf waters during Iran and Iraq war and also Persian Gulf War, the rate of heavy metals such as lead, cadmium, copper, zinc, nickel and cobalt was higher than standards in sediments in this area. During the war with Iraq, the rate of lead in waters of the northern Persian Gulf which were directly attacked was more than the time of Persian Gulf War. The rate of these metals in this area in comparison with oceans water that was studied by Menari Railey and Chaster is much higher and in some cases 1000 times or more.

On the base of these studies, it was specified that the rate of lead, in the sediments of Khuzestan region to Boushehr and the north of Kharg Island, is high. Other metals like copper and zinc show higher amount especially in Kharg and Bushehr regions. For nickel and cobalt also such a trend can be obviously seen especially in sediments of regions such as Bandar Rig and Kharg Island which are located near Norouz wells.

In addition, in a study done on the rate of heavy metals in Shayegan region, intense contamination of sediments and aquaculture in terms of heavy metals was reported. As the power supplies of Shadegan wetland are Jarrahi River, Karun flooding and also winter outbursts of Bahman Shir River through coastal estuaries; therefore, there is the danger of contamination of this wetland which is one of natural environments for lots of plant species and birds.

The studies by Farrokhian and Imandel confirm the existence of a large amount of metals such as lead, cadmium and zinc in the animal bodies and also water and soil environments. One of the reasons can be attributed to the sediments resulting from Bahman Shir River, and also carrying contaminated sediments from Abadan and Khorramshahr.

3. Absorption of heavy metals in plants

Absorption of these elements is often taken place through the root and transmitted to pneumatic organs. The action depends on different factors such as:

- Total amount of these elements in soil
- Proportion of all the elements which have a form absorbable in a plant
- Plant ability for carrying metals along root-plant system

Due to some surveys, Tiffen (1977) mentioned that plants are pseudo acceptors for trace elements or heavy metals; however, this statement was expressed based on apparent indications.

Absorbency of these elements by plant depends on the chemical form and the position of these elements in soil. That part of metals which have been located in solution phase can more easily be absorbed by root but on the contrary, absorption of the parts which form a bond with solid phase of soil (for example, inside crystal network of initial stone) is hard.

However, another effective factor is the charge of absorbing parts of the surface of minute particles such as clay and organic materials.

The higher the charge is, the more rigidly it is absorbed.

Moreover, acidity, organic material and drain conditions are factors which affect metals chemical form and thus its absorption by plant.

Due to having cationic exchange ability, the root surface can absorb metals.

When heavy metals in soil are more than the standard level, they damage roots or leaves and finally the product; and if used for animal's grazing or man's nourishment, they can be dangerous. For example, the intensity of cadmium and lead may not harm plant but it is very harmful for the feeding man.

However, the damages to microscopic creatures should not be neglected.

Rath et al. (1987) reported that microbes are the first community damaged by the presence of heavy metals. Growth reduction and fixation of nitrogen by cyanobacteria can be seen as the result of adding heavy metals to soils.

In general, through entering the bodies of these microscopic organisms, these elements affect their metabolism; and in many cases, they produce toxic substances which lead to the loss of organisms.

In case of human and other creatures feeding on contaminated materials also, we see creatures' physiological, physical or psychological disruption; because, after entering a body, the materials cause illness. These elements often enter a body through skin, digestive system and inhalation.

4. Absorption of heavy metals in soil

The most important chemical feature of soils is their ability in absorbing and exchanging positively charged ions on colloids surface. Due to the type of

research, heavy metals including zinc, cadmium, lead, chromium, nickel, and also manganese and copper have been studied in terms of quantity and their changes in soil.

There are different attitudes about cations absorption on colloids surface and probably the simplest attitude is the law of mass effect which is discussed under the title of The Law of Mass Action in chemistry. For instance, if we consider one of the elements under study, the following equation can be presented for it:

$$nA^{+m} + mB^{+n} \leftrightarrow mB^{+n} + nA^{+m}$$

As we see, the equation consists of 2 components. One component is related to a solution phase and the other is a solid phase. Given that the dominant cation in most Khuzestan soils is calcium, the issue of covalent elements exchange, which is easily justified, is raised:

$$Cax + Pb^{+2} \leftrightarrow Pbx + Ca^{+2}$$

Below, we examine each heavy metal under study in soil.

Acknowledgements:

The research is financed by Shahid Chamran University of Ahwaz

Corresponding Author

Leila Ghanbarizadeh (Corresponding author)

Soil Science Department, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran

Tel: +987118421715

E-mail: leilaghanbari@miau.ac.ir

References

1. Bergman, W.C. and Cumacov, C.J., 1977.Diagnosif of nutrient requirement by plant. Berlin: verlag
2. Bolt, G.H. and Brugg enwert, M.G., 1976. Soil chemistry: Abasic elements . Amesterdam: Elsevier.
3. Bowen, H.J., 1979.Environmental chemistry of the element. An assessment of environmental and solution parameter .Impact on trace-metal sorption by soil. Soil Science Society American Journal. 65:597-612
4. Brauer, J., 2001. War and nature: The problem of data and collection. College of Business Administration .Center for Research and Studies of Kuwait. http://www.warabaq.htm.
5. Cairney, T.R., 1993. Contamination land problem and solution. Blackie Academic and Professional. London, Tokyo.13:305-310.
6. Chaney, S.D., Arbuscular mycorrhiza effects on heavy metal uptake by corn. http://www.Bar.ars.usda.htm.
7. Chpman, H.D., and P.F. Pratt., 1961. Methode of Analysis for Soils, Plants and Water. Division of Agriculture Science.
8. Chen, T.B., W.J. Wong, and H.Y. Zhou, 1997. Assessment of trace metal distribution and contamination in surface soil of Hung Kong. Environmental pollution.96:305-310.
9. Ciccu, R.S., 1995. Contamination of Persian Gulf war veterans and other by depleted uranium. http://www.war55.htm.
10. Elson, and M.D., Hass, 1995. Lead. The completed guide to diet and nutritional medicine. Natural health science .www.bastyr.edu.
11. Ernest,M.D.,1988.Metala and toxicity and chemical risk assessment .Environmental Corporation . Washington. DC.
12. 1Griodano,P,M.,1975.Effect of municipal waste on crop yields and uptake of heavy metal.Journal environmental quality .4:394-400.
13. Haffen,B.A.,1972.Man health and environment. Buryess publishing on basty.edu. Company, USA. 269p. http://www.basty.edu.
14. Hanchtte,J.,1997.Pentagon was aware of Gulf chemical threat. Gannet News Service. http://www.Environment news.htm.
15. Heil.D.A.,2000.Biochemistry and Mgmt of salt and potentiality toxic element in Arid Zone –soil, sediment and water .http://www.Colorado aes project 100216-1999-2000.htm.
16. Hodgson,J.F.,1960.Cobalt reaction whit montmorillonite. Soil Science Society American Journal.24:164-168.
17. Jaffer,T.M.,1979.Accumulation plants from New Caledonia .Science Journal.193:579-580.
18. Jakson,M.L.,1965.Soil Chemical Analysis. Prentic Hall, Inc. Englewood Cliffs ,N.
19. Jopony,M.,and S.D.Young,1994.The solid-solution equilibria of lead and cadmium in polluted soil. Department of Physiology and environmental science university of Nottingham European Journal of Soil Science.45:59-70.
20. Kabata.,Pendias,Alian and Pendias,H.H.,1984.Trace elements in soil and plants. London :C.R.C.
21. Karuskopf,K.B.,1972.Geochemistry of micronutrient in agriculture. Soil Science Society American Journal.7:82-86.
22. Kim H.T.,1992.Principle of soil chemistry. Secound Edition.2:17-29.
23. Krupa, M.S.,1997. Environmental and economical repercussion of the Persian Gulf war on Kuwait. ICE case studies .http://www.in.prov.htm.
24. Lamberrt.M.A., and R.M., Green.1998.New method of clean of heavy metal in soil and water. Environmental Science Technology Brief for Citizens. sandia national laboratories. http://www.A:/abst.htm.
25. Leaning,J.,2000.Environmentaland health:L5 impact of war.Camj.163(9):1157-61.
26. Lindgrane,R.E.,1999.Heavy metal. http://www.xxx.htm.
27. Lindsay.W.L.,1979. Chemical equilibria in soil. Colorado State University for Collin.
28. Little,C.M.,1998.Micronutrient outline. file://A:/cu3.htm.
29. Mahaffey,K.E.,1989.Nutrition essentiality and toxicity . C.R.C.
30. Revendra,N.D.,2001.An Assessment of environmental and solution parameter impact on trace metal sorption by soil. Soil Science Society American Journal.65:597-602.
31. Russll's soil conditions and plant growth.1988. Ed.by A. Wild .Department of Soil Science of Reading .11 th. Longman scientific and technical.
32. Ziplett,G.B. and F.X.Han,2001.Redistribution of heavy metal in arid zone soil under a wetting- dring soil moisture regime. Journal of Soil Science.Croplight.1:18-27.

9/1/2012

Effect of Drought Stress on the Element Sodium Accumulation in Maize Root

Tayeb Saki Nejad [1], Leila Ghanbarizadeh [2]

[1.] Assistant professor Department of plant physiology Ahvaz Branch, Islamic Azad University, Ahvaz, Iran
[2.] Soil Science Department, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran
drtayebsaki@aol.com,
Tayeb saki1350@yahoo.com

Abstract: The conditions of soil and water are the most important factors effect on root growth and its activity. The roots are affected directly by water of the soil and it is affected indirectly by other physical factors such as ventilation, mechanical resistance, temperature and nutrition transmission from the soil to the root. Reviewing the process of sodium transmission and accumulation in the root at various depths of the soil showed following results: The effect of Irrigation period, growth phases and their interaction and also the effect of replications on the percentage of the root sodium accumulation at various depths of the soil have no significant effect. Duncan test presented 2-3 mean groups; on the other hand, by increasing the stress, the percentage of Potassium accumulation will increase. Maximum percentage of accumulation was observed in I3 treatment (0.64) and minimum percentage of Potassium was observed in the treatment without stress (0.12%). Reviewing the process of sodium accumulation at 3 sampling depths of A=0-20 cm, B=20-40, C=40-60 cm shows that maximum percentage of sodium was observed at C depth. By applying various levels of water stress, maximum percentage of accumulation of this element was observed at B. the accumulation of this element was in lower parts of the root and also a preventive status against sodium transmission was observed.
[Tayeb Saki Nejad, Leila Ghanbarizadeh. **Effect of Drought Stress on the Element Sodium Accumulation in Maize Root**. *Life Sci J* 2012;9(3):2314-2318] (ISSN:1097-8135). http://www.lifesciencesite.com. 333

Keywords: Maize, Drought Stress, Sodium, Root

1. Introduction

Different physical and chemical factors in rhizospher area such as plant characteristics are responsible for absorbing mineral by the root. believe that these factors are(44, 37 & 41):

1. Chemical composition of nutrition, their concentration in rhizospher solution of the soil, pH and ventilation.
2. The position of the elements in the soil, proportional to the distance of the plant root.
3. Element movement in relation with mass flow and diffusivity that implies on plant ability to create gradient of the material concentration and water potential in rhizospher
4. Growth, dissemination, form and physiological power of the root to move and absorb nutrition.
5. Secretion of organic material with low molecular mass of the root such as Amino Acid, gelatinous material with high molecular mass (mucilage), moulting and restoration of cells and tissues cause to move mineral directly or indirectly which provides necessary energy for microbial activity in rhizospher.

However, intensity of water and nutrition or single ions absorption is different, material enter the root in a solution shape and follow the same way with water flow. When the root is located in a solution which has a uniform concentration completely, the concentration in vascular tubes is higher than external solution. At the time of physical movement of ions (mass flow or diffusivity) to free space of the root (from Endoderm width to woody vascular), caution flow is more than anion flow. This is the result of abundance of negative charges on the surface of the cell wall. The number of the cautions and anions get into the root isn't usually equal. By getting same ions out of the root there would be a balance. The amount of nutrition with fix concentration which goes from the solution to the root depends on the position of plant salt and sweating rate (metabolic demand). The relationship between root Florence and ion absorption (such as iron absorption) is shown (22, 31). The ions within the root move actively or inactively. The active movement depends on metabolism and the energy which is provided by breathing and includes ion movement from an area that has low electrochemical potential to an area with high potential in 2 sides of the membrane and against the concentration gradient. Physical process of ion movement by active transmission might be the reason of against ion movement in the concentration gradient (inactive transmission). When external concentration of the material is low, (mechanism I: it shows the characteristics of active process) or it is high (mechanism II: it shows characteristics of inactive process) many minerals enter the root in free ion forms but there is exceptions such as urea or clats of the component. To explain the intensity of the

element flow on the root surface, the word [power of the root absorption] [flux] is discussed and it is expressed as the ratio of element entrance per unit area(X).

X= water absorption speed (gcm^2 root surface s^{-1}) / external concentration (gcm^3)

Believe that the intensity of phosphorous and potassium flow to the root is a function of their concentration with the shape of saturation curve and they described it adjusted equation (7, 11).

In natural conditions, different parts of the root have different ability to absorb and transmit the material. Root age, volume and incomplete contact between the root and the soil, also effect on it. Irregular dissemination of the root in the soil and incomplete contact between the root and the soil, the interaction of causing microbe symbiotic, soil moisture, ventilation, temperature and pH effect on the element absorption of the root. Although, most of the ions absorbed by the root have positive effect on plant metabolism and its growth, accumulation of some elements such as aluminum, nitrite cause poisoning. Too much aluminum leads to stop growth and coraling of the root due to disorder in meitosis division in the root tip and decreases effective activity of the root and increases root toughness by pectin composition. Researcher reported that the amount of aluminum absorption by the root depends on root cation exchange capacity of the plant (r^2=0.991), therefore, this characteristic of the root might be used as a criterion to consolidate of aluminum. Absorption of material from the soil is a function of some factors which includes 3 groups, the root, rhizospher and soil mass. For example, in rhizospher where the soil changes are done completely by the root, the root causes to biological weather damage of phosphates, carbonates and silicates (2, 5, 7, and 25). Complex interference of these factors needs mathematical methods and much information. According to equation, (13, 14, 17) developed a model to measure the amount of material absorption from the soil. In this model, 10 characteristics of the soil and the plant are used which are: concentration of soil solution, differential coefficient of ion diffusivity in the soil, maximum flow intensity, constant, minimum concentration in which the plants are able to evacuate solution, root radius, the distance between the roots and intensity of water absorption, root growth constant and primary root length. Material absorption models by the root consist other characteristics such as root development speed, average root radius, average length and density of pull dims .Some authors believe that environment factors such as temperature, pH and the soil moisture are effective in these models. For instance Kasman says that the plant shows different models to sodium ion accumulation. We can point to a plan which needs Na+ that could be completely replaced by potassium and increases growth such as sugar beet or plant which couldn't be absorbed Na but couldn't be replaced of K+ completely, growth increasing by Na+ is observed such as cabbage, cotton, pea, linen, wheat and spinach. There are plants which absorb little Na+ such as barley, rice, oat, tomato, ryegrass, potato, this little Na+ could be replaced of potassium. Other models includes the plants such as corn, rye, soya, crop bean and timothy in which replacement of K+ by Na+ isn't observed and growth increasing by sodium is meaningless(1, 52).

2. Material and Methods

This experiment was performed in factorial and split plot method with 4 replications. The main and secondary treatment are defined and executed as follows:

1. Main treatment consists various irrigation which are defined and planned as follows:

I0: complete irrigation at FC point
I1: 75% of S0 treatment irrigation, moderate stress
I2: 50% of S0 treatment irrigation, severe stress
I3: 25% of S0 treatment irrigation, very severe stress (at PWP point)

To apply the treatment of water stress, weight method was used to determine the percentage of soil moisture once in 3 days. The percentage of weighted moisture and volumetric percentage of the soil moisture was measured by this method due to constant volume of sampling cylinder bore (V), the percentage of weighted moisture and volumetric percentage of soil moisture were measured by following formulas:

Mass percentage of the moisture:

$$\%\theta_M = \frac{W_1 - W_2}{W_2} * 100$$

Volumetric percentage of the moisture:

$$\%\theta_V = \frac{W_1 - W_2}{V} * 100$$

Then, the amount of water entering to each plot is calculated by using Parshal Flume

$$V = \frac{\theta_V . A . D_S}{E} = \frac{\theta_m . P_a . A . D_S}{E} = \frac{(Fc - pwp) p_a . A . D_S}{E}$$

2. Secondary treatment

It includes various plant growth phases which are defined and planned as follows:
S0: vegetative phase: from the plant establishment to stem appearance stage.
S1: reproductive phase: from stem appearance to browning of silk and pollination.
S2: seed filling phase

3. Results

Reviewing the process of sodium transmission and accumulation in the root at various depths of the soil showed following results:

1. *The effect of Irrigation period, growth phases and their interaction and also the effect of replications on the percentage of the root sodium accumulation at various depths of the soil have no significant effect. (Table 1).*
2. *Duncan test presented 2-3 mean groups, on the other hand, by increasing the stress, the percentage of Potassium accumulation will increase. Maximum percentage of accumulation was observed in I3 treatment (0.64) and minimum percentage of Potassium was observed in the treatment without stress. (0.12%) (Table 2)*
3. *Reviewing the process of sodium accumulation at 3 sampling depths of A=0-20 cm, B=20-40, C=40-60 cm shows that maximum percentage of sodium was observed at C depth. By applying various levels of water stress, maximum percentage of accumulation of this element was observed at B. the accumulation of this element was in lower parts of the root and also a preventive status against sodium transmission was observed. (Fig 1).*

Table 1. The results of variance analysis of the percentage of root sodium accumulation at various soil depths (cm)

S.O.V	df	A =0 – 20	B =20 – 40	C =40 – 60
Replication	3	0/0011 $^{n.s}$	0/0011 $^{n.s}$	0/0011 $^{n.s}$
Irrigation period	3	0/0071 $^{n.s}$	0/0081 $^{n.s}$	0/0061 $^{n.s}$
E_a	9	-	-	-
Main plot	15	-	-	-
Growth phase	2	0/0021 $^{n.s}$	0/0031 $^{n.s}$	0/0012 $^{n.s}$
Interaction effect	6	0/0001 $^{n.s}$	0/0001 $^{n.s}$	0/0001 $^{n.s}$
E_b	24	-	-	-
Sub plot	32	-	-	0_
Total	47	-	-	-
CV%	-	17	18	15

The process of Na+ movement accumulation occurred at C and B depth, especially at C height. Their transmission to A depth was negligible. Most of absorbed sodium in the root, accumulated at C depth. This process increased by applying more severe water stress. The slope of regression equation (y= *0.09x-.005*) showed this increasing process. It is because of not sodium transmitting to upper parts by the plant. In some plants such as corn, sodium transmission to the shoots is impaired by endodermis layers to prevent harmful effect of it. Although this species are sensitive to sodium, on the other hand, some plants such as sugar beet resist against this element by transmitting sodium to different parts of the plant that causes to dilute the salt in a special tissue.

Table 2: comparison of root sodium percentage means in Duncan test at the level of 1% at various soil depths (cm)

Treatment	A =0 – 20	B =20 – 40	C 40 – 60 =
I_0	c0/14	c0/12	B0/11
I_1	c0/15	b0/16	B0/11
I_2	b0/43	a0/41	A0/32
I_3	a0/51	a0/43	A0/34
S_1	c0/03	c0/01	c0/02
S_2	a0/63	a0/52	a0/71
S_3	b0/09	b0/06	b0/08
I_0 S_1	e0/022	c0/01	e0/021
I_0 S_2	c0/091	b0/062	cd0/078
I_0 S_3	d0/062	b0/06	d0/072
I_1 S_1	e0/027	c0/017	e0/03
I_1 S_2	ab0/11	ab0/083	bc0/095
I_1 S_3	a0/116	a0/092	a0/13
I_2 S_1	e0/032	c0/022	e0/038
I_2 S_2	bc0/092	ab0/091	B0/1
I_2 S_3	bc0/093	a0/093	ab0/11
I_3 S_1	e0/033	c0/02	e0/029
I_3 S_2	ab0/112	a0/111	a0/131
I_3 S_3	ab0/11	a0/101	a0/127

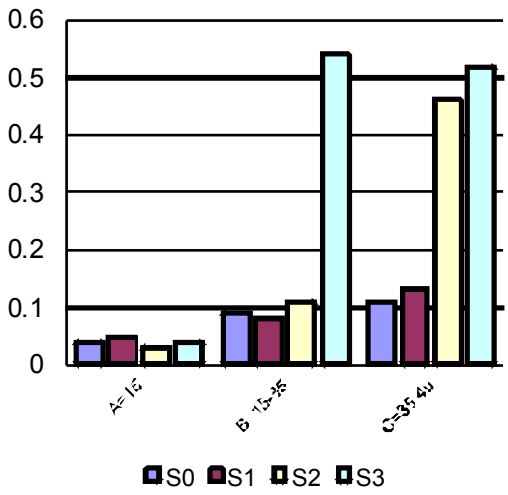


Figure 1: Effect of different levels of water stress (s) on the *percentage of sodium* accumulation in roots at different depths (cm from the floor)

4. Discussions

Sodium accumulation and transmission process showed that maximum percentage of sodium accumulation is in the root tip and transmission upward is so limited by applying water stress. David has discussed about prevention of endoderm layers from sodium permeation to the shoot in the corn.

Acknowledgements:
Department of plant physiology Ahvaz Branch, Islamic Azad University, Ahvaz, Iran

Corresponding Author:
Dr. Tayeb saki Nejad
Assistant professor Department of plant physiology Ahvaz Branch, Islamic Azad University, Ahvaz, Iran
drtayebsaki@aol.com,
Tayeb saki1350@yahoo.com

References

1. Andrade,F.H.,Cirilo,A.G.,Uhart,S.A., and Otegui (1996). Ecofisiologia a del cultiva de maiz. Crop science 37: 1103-1109
2. Banziger,M., Betran,F.j., (1997). Efficiency of high-nitrogen selection environments for improving maize for low-nitrogen.. Crop science 37: 1103-1109
3. Banziger,M., Edmeadas (1999) selection for drought tolerance increases maize yields over a range of N levels.. Crop science 39: 1035-1040
4. Banziger,M., Edmeadas (1997). Drought stress at seedling stage-Are there genetic solutions? Mexico DF, CIMMYT (pp.348-354)
5. Bolanos, J. and Edmeades, (1991), Value of selection for osmotic potential in tropical maize. Agro. J. 83: 948-956.
6. Boyer, J.S., (1974). Water transport in plants: mechanisms of apparent changes in resistance during absorption. Plant 117: 182-207.
7. Chimenti, C. Cantagallo, and guevara, (1997). Osmotic adjustment in maize: Genetic variation and association with water uptake. Agro. j, sb : 179 – 188
8. Edmeads,l. Banziger, f. Mickelson, c. and Pena,s. (1996), Developing Drought and low N-Tolerant Maize proceedings of a Symposium, March 25-29, CIMMYT, El Batten, Mexico.
9. Dow, E.W. 1981. Resistance to drought and density stress in Canadian and European maize (Zea Mays L.) hybrids, Univ. of Gulf, Ontario, Canada.
10. Jones, H.G. (1980). Interaction and integration of adaptive response to water stress- Royal Soc. London, series B 273: 193- 205
11. Jordan, W.R., and F.R. Miller, (1980) Genetic variability in sorghum root systems: New York P.383-399
12. Michel, B.E, (1983). Evaluation of the water potentials of polyethylene glycol 8000 vote in the absence and presence of other solutes. Plant in the apex leaves of what during water stress. Aust. J. Plant physiol. 6:379-389.
13. Gardner, B.R., D.C. Nielsen, and C.C. Shock. 1992. Infrared thermometry and the Crop Water Stress Index. I. History, theory, and baselines. J. Prod. Agric. 5:462-466.
14. Gardner, B.R., D.C. Nielsen, and C.C. Shock. 1992. Infrared thermometry and the Crop Water Stress Index. II. Sampling procedures and interpretation. J. Prod. Agric. 5:466-475.
15. Nielsen, D.C., and S.E. Hinkle. 1992. Emergence patterns and soil temperatures of rige planted corn. Proceedings of the 1992 Central Plains Irrigation Short Course and Irrigation Exposition. Kansas State University Cooperative Extension Service. p. 104.
16. Nielsen, D.C., and S.E. Hinkle. 1992. Field evaluation of corn crop coefficients based on growing degree days or growth stage. Agron. Abs. p. 20.
17. Hinkle, S.E., D.G. Watts, W.L. Kranz, and D.C. Nielsen. 1993. Corn crop coefficients based on growing degree days or growth stage. ASAE Paper No. 93-2523.
18. Nielsen, D.C., and S.E. Hinkle. 1993. Field evaluation of corn crop coefficients based on growing degree days or growth stage. ASAE Paper No. 93-2524.
19. Nielsen, D.C., H.J. Lagae, and R.L. Anderson. 1993. Time-domain reflectometry measurements of surface soil water content. Agron. Abs. p. 8.

20. Kasele, I., F. Nyirenda, J.F. Shanahan, D.C. Nielsen, and R. d'Andria. 1994. Ethephon alters corn growth, water use, and grain yield under drought stress. Agon. J. 86:283-288.
21. Nielsen, D.C. 1994. Non-water-stressed baselines for sunflowers. Agric. Water Management 26:265-276
22. Kasele, I.N., J.F. Shanahan, and D.C. Nielsen. 1995. Impact of growth retardants on corn leaf morphology and gas exchange traits. Crop Sci. 35:190-194.
23. Nielsen, D.C., H.J. Lagae, and R.L. Anderson. 1995. Time-domain reflectometry measurements of surface soil water content. SSSAJ 59:103-105.
24. Nielsen, D.C. 1995. Water use/yield relationships for central Great Plains crops. Conservation Tillage Facts. Conservation Tillage Fact Sheet #2-95. USDA-ARS, Akron, CO.
25. Nielsen, D.C., and S.E. Hinkle. 1996. Field evaluation of basal crop coefficients for corn based on growing degree days, growth stage, or time. Trans. ASAE 39:97-103.
26. Nielsen, D.C., G.A. Peterson, R.L. Anderson, V. Ferreira, R.W. Shawcroft, K. Remington. 1996. Estimating corn yields from precipitation records. Conservation Tillage Facts. Conservation Tillage Fact Sheet #2-96. USDA-ARS, Akron, CO.
27. Osunam CE (1981). Estudio preliminary sober el. system de cultivates de maize de hummed residual en Los Lianas de Durango. Tesis, Univ. Autonomy de Nayarit, Mexico. Passioura, J. P. 1983. Roots and drought resistance. Agric. Water Management. 7:265-280.
28. Portas, C.A.M., and H.M.Taylor. (1975) Growth and survival of young plant roots in dry soil. Soil SCI. 121:170-175.
29. Scholander, P.F., T. Hamel. E.D. Bradstreet and E.A Hemming (1965). Sap Pressure in vascular plants/ Science 148: 339-346.
30. Scharp, RE, and W.J. Davis. (1979). Solute regulation and growth by roots and shoots of water stressed plant. Plant 147: 73-49.
31. Slavic, B. (1974). Methods of studying plant water Relations. Springier Overflag, New York.
32. Turner, N.C., and M.M.Jones. (1980). Truer maintenance by osmotic adjustment: A review and evaluation. P. 87-103.Wiley Interscience, New York.
33. Wenkert, W.(1981). The behavior of Osmotic potential in leaves of maize. Env. Expel. Botany 2:231-239.
34. Wilson, J.P., and M.M.Ludlow. (1983). Time trends of solute accumulation and the influence of potassium fertilizer on osmotic adjustment of water stressed leaves of tropical grasses. Aust. J. Plant physiol. 10:52-337.
35. Elings, A,. J. white and G.O, Edmeades (1996) modeling the consequences of water limitation at flowering and Nitrogen shortage intropical maize Germplasm) CIMMYT, Apdo, Mexico PP 156
36. Black, C.A. (1968). Soil – plant Relationships and Ed john Wiley, New York.
37. Watanabe, F.S., Olsen and, Danielson (1960). P availability as relate to soil moisture, Trans Intern. Con, soil. III: 450
38. Swanson. E. R, (1966-71). welled Economically optional levels of Nitrogen fertilizer for corn: An analysis based on experimental data. I lioness Agriculture. E con. 13 (2): 16 (1973).
39. Waggoner, P. E; D.N, moss and j.D, Hesketh (1963). Radiation in the plant environment and photosynthesis Agron. J. 55:36.
40. Moss, D. N; R.B, muss Grave and E.R. Lemon (1961). Photosynthesis under field condition III some effects of light, carbondioxide, Temperature and soil moisture on photo synthesis, respiration and transpiration of Corn Crops. Sci. 1: 83-87.
41. foth. H.D; L, kinra, and j, N, Pratt, (1960) corn root development Michigan State Univ. Agr. Exp. Sta. Quart. Bull, 43 (1): 2.
42. Wiersum, L.K. (1967) themass – flow. Theory of phloem Transport; supporting collation j. exp. Bot 18: 160-162.
43. Stinson. H.T., J r., and D.N. Moss, 1960 some effect of ahead upon corn hybrids tolerant and in tolerant of dense planting Agron. J., 52:482.
44. Bader, S.A (1971) Effect of tillage practice on corn root distribution and morphology. Agron. J, 63:724.Hanway, j.j; (1952) plant analysis guile for corn needs). Better crops with plant food. 46 (3) 1.
45. Lou, A, (1963) A contribution to the study ofinorganic nutrition in maize with special attention to potassium Fertilize 20.
46. Vows, R.D, (1970) (P- most limiting nutrient for corn in low) in proc. 22 ND Ann. Fertilizer Ag. Chem. Dealers conf., lowa state university Ames, lowa.
47. DenmeD, O. T, and R.H. Shaw, (1962) Availability of soil water to plans as effected by soil mousier content and meteorological conditions Agron. J. 54: 385-90.
48. Hall, NS and W.V chandler, (1953). Artier technique timesaver growth. And active of plant root systems. North Carolina Agr, Exp. Sta. Tech. Bull. 101.

9/1/2012

Reliability of a Series Chain for Time Dependent Stress – Strength Models of Weibull Distribution

A.I. Shawky[1] F. H. Al-Gashgari[2]

[1]Department of Statistics, Faculty of Science, King Abdulaziz University, P.O. Box 80203, Jeddah 21589, Saudi Arabia.
[2]Department of Statistics, Faculty of Science for Girls, King Abdulaziz University, P.O. Box 53873, Jeddah 21593, Saudi Arabia.
aishawky@yahoo.com

Abstract: In this work, we study consider the problem of determining the reliability of a series chain consisting of k identical links. The stress acting on the chain is deterministic. We consider the case of repeated applications of stresses, i.e., cycles of stresses. We also consider the change of the distribution of strengths of the links with time, i.e., during different cycles of stresses. We find an expression of the reliability function after m cycles of stresses. The strengths of the links of the chain could be random- independent, random- fixed or deterministic. We introduce a two-sided confidence interval for the reliability. As an application, the case of weibull distribution is studied. Finally the system is applied to simulated data and real data for numerical illustration.
[A.I. Shawky and F. H. Al-Gashgari. **Reliability of a Series Chain for Time Dependent Stress – Strength Models of Weibull Distribution.** *Life Sci J* 2012; 9(3):2319-2324]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 334

Key Words: Stress- strength Model, Time dependent, Reliability of a series chain, Weibull Distribution

1. Introduction:

In stress – strength models a component fails at any time the applied stress X is greater than its strength Y and there is no failure if Y > X. Thus P(Y > X) is a measure of the reliability of the component.

The problem of estimating R= P(Y > X) has been studied in the literature in both distribution free and parametric frameworks. However in this paper we are concerned with the parametric case.

Church and Harris [1] derived the maximum likelihood estimator (MLE) of R assuming X and Y are independent normal and that the distribution of X is completely known. Downton [2] obtained the MVUE of R in the case of independent normal where the parameters of X and Y are unknown. Reiser and Guttman [3] presented two approximate methods for obtaining confidence intervals and an approximate Bayesian probability interval. Owen *et al.* [4] discussed the normal case for equal standard deviation and presented non parametric confidence limits for this problem, in addition to the normal case. The problem considered here has been extensively studied for many other models including exponential [5], Gamma [6] and Burr distributions [7]. Nassar *et al.* [8] obtained confidence intervals for R= P(Y > X), where Y and X follow Rayleigh and normal distribution distributions respectively.

If the stress and strength change with time, we call it time dependent stress- strength model. Kapur and Lamberson [9] stated that time dependent stress-strength (SST) are models that consider the repeated application of stresses and also, consider the change of the distribution of strength with time, which may caused by aging and/or cumulative damage. Such models are frequently observed in practice. Shaw *et al.* [10] discussed a time dependent stress-strength models for non-electrical and electrical systems. Furthermore, Schartz *et al.* [11] studied an application of time dependent stress-strength models of non-electrical and electrical systems. Xue and Yang [12] obtained formula for estimating upper and lower bounds for stress – strength interference reliability when X and Y are s-independent normally distributed. However, not too much work is done on time dependent models. Mokhles and Khayar [13] studied the time dependent stress- strength model with Rayleigh and exponential distributions.

In this paper, we obtained an explicit expression for the reliability function of a series consisting of k links after m cycles of stress. The repeated stress, in our case, is deterministic. To derive the reliability under three strength forms of the links of the chain: random- independent, random- fixed and deterministic. As an application, Weibull distribution is considered. we find a two- sided confidence intervals for the reliability in case of random- independent and random fixed strength. We apply our results in both simulation study and real data.

2. Assumption and Notation.

1- The system is a series chain consisting of k links.
2- The links are identical and independent.
3- The chain is subjected to cycles of common repeated stresses. These stresses are the main cause to break the chain and are independent of the strength of the links of the chain.
4- The chain will break (fail) if the stress on the chain exceeds the strength of the chain for the first time.

5- The repeated stress acting on the chain is deterministic, i.e., the stress during cycle j is given by x_0, for all j, $j = 1, 2, \dots, m$, where x_0 is known value.
6- Y_{ij} is the strength of link i during cycle j, $i = 1, 2, \dots, k,\ j = 1, 2, \dots, m$.
7- $E_{k,j}$ event that no failure occurs on jth cycle.
8- $R_{k,m}$ is the reliability of the chain of k links after m cycles.

3. The System Reliability

Mokhles and Khayar [13] and Kapur and Lamberson [9] discussed the reliability of the system assuming three different models .

Model I: Random-Independent Strength

In this model, the strength of ithlink during the jth cycle is a random variable , which denoted by Y_{ij}, i = 1,2, … , k and j = 1,2, … , m, are non-identical independent distributed random variables having c.d.f $G_j(y)$ and p.d.f $g_j(y)$. Since the chain consists of k links connected in series, the strength of the chain on the jth cycle is given by

$$Y_j^* = min(Y_{1j}, Y_{2j}, \dots, Y_{kj}),$$

with c.d.f $G_{Y_j^*}(y) = [1 - G_j(y)]^k$.

The system reliability is

$$R_{k,m} = \prod_{j=1}^{m} \Pr(E_{k,j}) = \prod_{j=1}^{m} \Pr(Y_j^* > x_0) = \prod_{j=1}^{m} [1 - G_j(x_0)]^k. \quad (1)$$

Model II: Random-Fixed strength

In this model, the random variable of strength varies in time (during cycle j) in a known manner, i.e., the strength of ith link on the jth cycle Y_{ij} is given by

$$Y_{ij} = Y_{i0} - a_j, \quad i = 1, 2, \dots, k; \quad j = 1, 2, \dots, m, \quad (2)$$

where Y_{i0} is the initial random strength of the ith link, and a_j is a known non-decreasing function in j .
Assuming that Y_{i0} are i.i.d, i= 1,2,…,k having c.d.f. $G_0(y)$ and p.d.f. $g_0(y)$, then the strength of the chain during the jth cycle is

$$Y_j^* = Y_0^* - a_j, \quad (3)$$

where,

$$Y_0^* = min(Y_{10}, Y_{20}, \dots, Y_{k0}),$$

having c.d.f. $G_{Y_0^*}(y) = [1 - G_0(y)]^k$.
Thus, the system reliability is

$$R_{k,m} = P_r(E_{k,m}) = P_r(Y_m^* > x_0) = [1 - G_0(x_0 + a_m)]^k . \quad (4)$$

Model III: Deterministic Strength

In this model, the strength of ith link on the jth cycle is deterministic given by y_{ij} , $1 \le i \le k$; $1 \le j \le m$. Since the chain consists of k links connected in series, the strength of the chain on the jth cycle will be

$$Y_j^* = min(y_{1j}, y_{2j}, \dots, y_{kj}).$$

Since,

$$R_{k,m} = P_r(E_{k,1}, E_{k,2}, \dots, E_{k,m}),$$

where, $E_{k,j}$ is the event that $(y_j^* > x_0)$, we get

$$R_{k,m} \begin{cases} 1 & if\ y_j^* > x_0 \quad for\ all\ j,\ 1 \le j \le m \\ 0 & if\ y_j^* < x_0 \quad for\ some\ j,\ 1 \le j \le m. \end{cases}$$

Remarks.

1. Taking k= 1, we obtain the reliability of an item after m cycles of stress.
2. Taking $a_m = 0$, we obtain the reliability of the system in the static case.

4. Confidence Intervals for System Reliability.

We obtain confidence intervals (C.I.) for system reliability under Models I and II in considering the Weibull distribution.

For Weibull distribution, the distribution function is

$$G(y) = 1 - e^{-\frac{y^p}{\theta}}, \quad y > 0,\ p,\ \theta > 0 \quad (5)$$

Assume that

$$G_j(y) = 1 - exp\left(-\frac{y^p}{\theta_j}\right), \text{ for Model I,}$$

$$G_0(y) = 1 - exp\left(-\frac{y^p}{\theta_0}\right), \text{ for Model II.}$$

Using Equations (1) and (4), we obtain

$$R_{k,m} = \begin{cases} e^{-k\,\eta\,x_0^p,} & \text{for Model I} \\ e^{-k\,\eta_0\,(x_0+a_m)^p,} & \text{for Model II,} \end{cases} \quad (6)$$

where $\eta = \sum_{j=1}^{m} \frac{1}{\theta_j}$ and $\eta_0 = \frac{1}{\theta_0}$.
If the parameters θ_0 and θ_j, j=1, 2,…, m are known, then by equation (6), we obtain the exact reliability .
If the parameters θ_0 and θ_j, j=1, 2,…, m are unknown, we can then replace these parameters by their MLEs, to get MLE, $\hat{R}_{k,m}$ of $R_{k,m}$ for the two models as follows

$$\hat{R}_{k,m} = \begin{cases} e^{-k\,\hat{\eta}\,x_0^p,} & \text{for Model I} \\ e^{-k\,\hat{\eta}_0\,(x_0+a_m)^p,} & \text{for Model II,} \end{cases} \quad (7)$$

where $\hat{\eta} = \sum_{j=1}^{m} \frac{1}{\hat{\theta}_j}$ and $\hat{\eta}_0 = \frac{1}{\hat{\theta}_0}$. $\hat{\theta}_0 = \sum_{i=1}^{n_0} \frac{y_{0i}^p}{n_0}$

and $\hat{\theta}_j = \sum_{i=1}^{n_j} \frac{y_{ij}^p}{n_j}$, p is known parameter.

Let $y_{j1}, y_{j2}, \dots, y_{jn_j}$ and $y_{01}, y_{02}, \dots, y_{0n_0}$ be random samples of sizes n_j and n_0 drawn from $G_j(y)$, j=1,

2,…, m, and $G_0(y)$ respectively. For simplicity, we shall set $n_j = n$.

It can be easily shown that $\hat{\theta}_j$, j=1, 2, …, m and $\hat{\theta}_0$ have Gamma distribution with parameters $\left(n, \frac{\theta_j}{n}\right)$, j=1,2, …, m and $\left(n_0, \frac{\theta_0}{n_0}\right)$ respectively, or $\left(\frac{2n\hat{\theta}_j}{\theta_j}\right), j = 1, 2, \dots, m$ and $\left(\frac{2n_0\hat{\theta}_0}{\theta_0}\right)$, have a Chi-square distribution with n and n_0 degrees of freedom respectively, therefore

$$E(\hat{\theta}_j) = \theta_j, \qquad var(\hat{\theta}_j) = \frac{\theta_j^2}{n}.$$
$$E(\hat{\theta}_0) = \theta_0, \qquad var(\hat{\theta}_0) = \frac{\theta_0^2}{n_0}.$$

Define $W_j = \hat{\theta}_j - \theta_j$, j= 1,2,…, m and $U = \hat{\theta}_0 - \theta_0$. It is clear that W_j, j= 1,2,…, m and U are asymptotically normally distributed with zero means and variance as $\frac{\theta_j^2}{n}$, $\frac{\theta_0^2}{n_0}$, respectively.

Therefore, $\hat{R}_{k,m}$ can be rewritten as:

$$\hat{R}_{k,m} = \begin{cases} \prod_{j=1}^{m} e^{-kx_0^p \eta_j^*}, & from\ Model\ I \\ e^{-k(x_0+a_m)^p \eta_0^*}, & from\ Model\ II, \end{cases} \quad (8)$$

where $\eta_j^* = \sum_{j=1}^{m} \frac{1}{W_j+\theta_j}$ and $\eta_0^* = \frac{1}{U+\theta_0}$.

Using Taylor's expansion and Equation (8), we obtain

$$\hat{R}_{k,m} = \begin{cases} R_{k,m} + k\, x_0^p\, R_{k,m} \sum_{j=1}^{m} \frac{W_j}{\theta_j^2} x + \mathbb{R}_1, from\ Model\ I \\ R_{k,m} + \frac{1}{\theta_0^2} k\,(x_0 + a_m)^p R_{k,m} U + \mathbb{R}_2, from\ Model\ II, \end{cases} \quad (9)$$

where $\mathbb{R}_1$ and $\mathbb{R}_2$ are remainder terms.

For the models I and II, $\hat{R}_{k,m}$ are asymptotically normal with means $R_{k,m}$ as given by Equation (6), and variances

$$\sigma^2_{\hat{R}_{k,m}} = \begin{cases} (k\, x_0^p\, R_{k,m})^2 \sum_{j=1}^{m} \frac{1}{n_j \theta_j^2}, & from\ Model\ I \\ \frac{1}{n_0}\left(\frac{k}{\theta_0}(x_0 + a_m)^p\right)^2 R_{k,m}^2, & from\ Model\ II. \end{cases} \quad (10)$$

Hence, $\hat{R}_{k,m}$ in (7) is a consistent estimator of $R_{k,m}$.

4.1. Two- Sided Approximate Confidence Interval for $R_{k,m}$

Since $\hat{R}_{k,m}$ in (7) is asymptotically normal with mean $R_{k,m}$ and variance given by Equation (10), thus a two-sided approximate (1 - α)100% confidence intervals of $R_{k,m}$ for the two models are obtained by

$$\Pr\{\hat{R}_{k,m} - z_{\alpha/2}\, \hat{\sigma}_{\hat{R}_{k,m}} < R_{k,m} < \hat{R}_{k,m} - z_{\alpha/2}\, \hat{\sigma}_{\hat{R}_{k,m}}\} = 1 - \alpha, \quad (11)$$

where $\hat{R}_{k,m}$ is given by (7), $\Pr(Z > z_{\alpha/2}) = \alpha/2$ and Z has a standard normal distribution,

$$\hat{\sigma}^2_{\hat{R}_{k,m}} = \begin{cases} (k\, x_0^p\, \hat{R}_{k,m})^2 \sum_{j=1}^{m} \frac{1}{n_j \theta_j^2}, & from\ Model\ I \\ \frac{1}{n_0}\left(\frac{k}{\theta_0}(x_0 + a_m)^p\right)^2 \hat{R}_{k,m}^2 & from\ Model\ II. \end{cases} \quad (12)$$

4.2. Exact Two- Sided Confidence Interval for $R_{k,m}$

Since, $\left(\frac{2n\hat{\theta}_j}{\theta_j}\right)$, $j = 1, 2, \dots, m$ and $\left(\frac{2n_0\hat{\theta}_0}{\theta_0}\right)$ have a Chi-square distribution with $2n$ and $2n_0$ degrees of freedom respectively. Thus, the two-sided approximate $(1-\alpha)100\%$ confidence intervals of $R_{k,m}$ for the two models are obtained by:

For Model I

$$\Pr\left\{\chi^2_{(2n_j,\alpha)} < \frac{2n_j}{\theta_j}\hat{\theta}_j < \chi^2_{(2n_j,1-\alpha)}\right\} = 1 - \alpha,$$

$$\Pr\left\{\exp\left(-kx_0^p \sum_{j=1}^{m} \frac{\chi^2_{(2n,1-\alpha)}}{2n\,\hat{\theta}_j}\right) < R_{k,m} < \exp\left(-k\, x_0^p \sum_{j=1}^{m} \frac{\chi^2_{(2n,\alpha)}}{2n\,\hat{\theta}_j}\right)\right\} = 1 - \alpha. \quad (13)$$

For Model II

$$\Pr\left\{\chi^2_{(2n_0,\ \alpha)} < \frac{2n_0}{\theta_0}\hat{\theta}_0 < \chi^2_{(2n_0,1-\alpha)}\right\} =$$

$$\Pr\left\{\exp\left(-k(x_0 + a_m)^p \frac{\chi^2_{(2n_0,\ 1-\alpha)}}{2n_0\hat{\theta}_0}\right) < R_{k,m} < \exp\left(-k\,(x_0 + a_m)^p \frac{\chi^2_{(2n_0,\alpha)}}{2n_0\hat{\theta}_0}\right)\right\} = 1 - \alpha, \quad (14)$$

where $1 - \alpha$ is the confidence coefficient.

When p=1 and p=2, we get the exponential and Rayleigh cases, respectively, which are discussed in [13].

5. Special Case

If the strength of link i, $i = 1, 2, \dots, k$, during repeated cycles of stress are independent but identical random variables, we have in Model I, $G_j(y) = G(y)$ for all j. Then equation (1) becomes

$$R_{k,m} = [1 - G(x_0)]^{km}. \quad (15)$$

For Weibull distribution, using Equations (5)- (7), we obtain

$$R_{k,m} = e^{-kmx_0^p/\theta}, \quad (16)$$

$$\hat{R}_{k,m} = e^{-kmx_0^p/\hat{\theta}}, \quad (17)$$

where $\hat{\theta} = \frac{1}{n}\sum_{i=1}^{n} y_i^p$, $y_1, \dots, y_n$ is a random sample drawn from G(y) in (5).

Also,

$$\sigma^2_{\hat{R}_{k,m}} = \frac{1}{n}\left(\frac{kmx_0^p}{\theta}\right)^2 R^2_{k,m}. \quad (18)$$

Therefore, an exact two-sided (1 - α)100% confidence interval for $R_{k,m}$ is given by

$$\Pr\left\{\exp\left(-km\,x_0^p \frac{\chi^2_{(2n,\ 1-\alpha)}}{2n\,\hat{\theta}}\right) < R_{k,m} < \exp\left(-km\,x_0^p \frac{\chi^2_{(2n,\ \alpha)}}{2n\,\hat{\theta}}\right)\right\} = 1-\alpha. \quad (19)$$

For Model II, putting $a_j = 0$ in Equations (2-3), we return to the static case. Hence

$Y_{ij} = Y_{i0}$,

$Y_j^* = Y_0^* = min(Y_{10}, Y_{20}, \dots, Y_{k0})$,

and $R_{k,m} = [1 - G_0(x_0)]^k$.

Therefore, for Weibull distribution, we get

$$R_{k,m} = e^{-\frac{k\,x_0^P}{\theta_0}}, \quad \hat{R}_{k,m} = e^{-\frac{k\,x_0^P}{\hat{\theta}_0}}, \quad \text{and}$$

$$\hat{\sigma}^2_{\hat{R}_{k,m}} = \frac{1}{n_0}\left(\frac{k\,x_0^P}{\hat{\theta}_0}\right)^2 (\hat{R}_{k,m})^2.$$

When p=1 and p=2, we obtain the exponential and Rayleigh cases which are discussed in [13].

6. Illustrative Examples and Simulation Study.

Example 1. Simulated Data.

A simulation study is made by taking the average of 1000 generated samples drawn from Weibull distribution with parameters $\theta_1 = 10000, \theta_2 = 8000$ and $\theta_0 = 9000$ while for the identical case, we take $\theta_1 = \theta_2 = 9000$. $R_{k,m}$, $\hat{R}_{k,m}$, $\hat{\sigma}^2_{\hat{R}_{k,m}}$, exact and approximate (1 - α)100% confidence interval (C.I.) for Model I and Model II are calculated and presented in Tables 1-9. For simplicity, we take k=1, m=2, a=0.01, $a_m = a.m$, p=3 and $x_0 = 10$. The results are presented in Tables 1-9.

Table 1. Non-Identical Random Independent Strength, $R_{1,2} = 0.798516$

n	$\hat{\theta}_1$	$\hat{\theta}_2$	$\hat{R}_{1,2}$	$\hat{\sigma}^2$
5	10127	8102	0.7667	0.00430
15	09966	7973	0.7869	0.00122
25	10150	8120	0.7943	0.00065
50	10048	8038	0.7962	0.00034
75	10004	8003	0.7964	0.00022
100	10028	8023	0.7974	0.00017
250	09974	7979	0.7975	0.00007

Table 2. Approximate C.I. for $R_{1,2}$ in case Non-Identical Random Independent Strength.

$1-\gamma$	0.90		0.95		0.99	
n	C. I.	D	C. I.	D	C. I.	D
5	(0.6637,0.8697)	0.2060	(0.6444, 0.8890)	0.2447	(0.6057, 0.9277)	0.3220
15	(0.7303,0.8436)	0.1133	(0.7196, 0.8542)	0.1346	(0.6984, 0.8755)	0.1771
25	(0.7516,0.8370)	0.0854	(0.7436, 0.8451)	0.1015	(0.7275, 0.8611)	0.1336
50	(0.7661,0.8262)	0.0601	(0.7605, 0.8319)	0.0714	(0.7492, 0.8432)	0.0940
75	(0.7718, 0.8209)	0.0491	(0.7672, 0.8255)	0.0583	(0.7580, 0.8348)	0.0767
100	(0.7763,0.8186)	0.0423	(0.7723, 0.8226)	0.0503	(0.7644, 0.8306)	0.0662
250	(0.7840,0.8108)	0.0268	(0.7815, 0.8133)	0.0318	(0.7764, 0.8183)	0.0419

Table 3. Exact C.I. for $R_{1,2}$ in case Non-Identical Random Independent Strength.

$1-\gamma$	0.90		0.95		0.99	
n	C. I.	D	C. I.	D	C. I.	D
5	(0.6597, 0.8765)	0.2168	(0.6233, 0.8983)	0.2750	(0.5541, 0.9324)	0.3783
15	(0.7257, 0.8479)	0.1222	(0.7059, 0.8622)	0.1563	(0.6676, 0.8869)	0.2193
25	(0.7479, 0.8405)	0.0926	(0.7333, 0.8518)	0.1185	(0.7049, 0.8719)	0.1670
50	((0.7634, 0.8288)	0.0654	(0.7533, 0.8372)	0.0839	(0.7340, 0.8523)	0.1183
75	(0.7696, 0.8230)	0.0534	(0.7615, 0.8300)	0.0685	(0.7460, 0.8428)	0.0968
100	(0.7744, 0.8205)	0.0461	(0.7674, 0.8266)	0.0592	(0.7541, 0.8377)	0.0836
250	(0.7828, 0.8120)	0.0292	(0.7784, 0.8159)	0.0375	(0.7703, 0.8233)	0.0530

Table 4. Random –Fixed Strength, $R_{1,2} = 0.894242$

n	$\hat{\theta}_0$	$\hat{R}_{1,2}$	$\hat{\sigma}^2$
5	9051	0.872905	0.00318343
15	9054	0.887508	0.00078603
25	9018	0.890439	0.00043954
50	8866	0.890785	0.00021521
75	8965	0.892493	0.00013871
100	8965	0.892945	0.00001029
250	8984	0.893692	0.00004047

Table 5. Approximate C.I. for $R_{1,2}$ in case Random –Fixed Strength

1- γ	0.90		0.95		0.99	
n	C. I.	D	C. I.	D	C. I.	D
5	(0.7870, 0.9588)	0.1718	(0.7709, 0.9749)	0.2040	(0.7386, 1.0072)	0.2686
15	(0.8426, 0.9324)	0.0898	(0.8342, 0.9408)	0.1067	(0.8173, 0.9577)	0.1404
25	(0.8564, 0.9244)	0.0680	(0.8500, 0.9308)	0.0808	(0.8373, 0.9436)	0.1063
50	(0.8668, 0.9148)	0.0480	(0.8623, 0.9193)	0.0570	(0.8532, 0.9283)	0.0751
75	(0.8732, 0.9118)	0.0386	(0.8695, 0.9154)	0.0459	(0.8623, 0.9227)	0.0604
100	(0.8762, 0.9096)	0.0333	(0.8731, 0.9127)	0.0396	(0.8669, 0.9190)	0.0521
250	(0.8832, 0.9042)	0.0210	(0.8812, 0.9061)	0.0249	(0.8773, 0.9101)	0.0328

Table 6. Exact C.I. for $R_{1,2}$ in case Random –Fixed Strength

1- γ	0.90		0.95		0.99	
n	C. I.	D	C. I.	D	C. I.	D
5	(0.8066, 0.9354)	0.1288	(0.7826, 0.9472)	0.1646	(0.7348, 0.9653)	0.2305
15	(0.8523, 0.9212)	0.0689	(0.8405, 0.9289)	0.0884	(0.8173, 0.9421)	0.1248
25	(0.8637, 0.9162)	0.0525	(0.8551, 0.9224)	0.0673	(0.8382, 0.9333)	0.0951
50	(0.8720, 0.9091)	0.0371	(0.8661, 0.9138)	0.0477	(0.8547, 0.9221)	0.0674
75	(0.8774, 0.9073)	0.0299	(0.8727, 0.9111)	0.0384	(0.8638, 0.9181)	0.0543
100	(0.8799, 0.9058)	0.0259	(0.8759, 0.9091)	0.0332	(0.8683, 0.9152)	0.0469
250	(0.8855, 0.9018)	0.0163	(0.8831, 0.9040)	0.0209	(0.8785, 0.9080)	0.0295

Table 7. Identical Random Independent Strength, $R_{1,2} = 0.800737$ and $\theta_1 = \theta_2 = 9000$.

n	$\hat{\theta}$	$\hat{R}_{1,2}$	$\hat{\sigma}^2$
5	9170	0.77027	0.00419
15	8917	0.78827	0.00120
25	9095	0.79528	0.00067
50	9008	0.79764	0.00033
75	9021	0.79896	0.00022
100	8991	0.79906	0.00016
250	9016	0.80040	0.00006

Table 8. Approximate C.I. for $R_{1,2}$ in case Identical Random Independent Strength

1- γ	0.90		0.95		0.99	
n	C. I.	D	C. I.	D	C. I.	D
5	(0.6687, 0.8719)	0.2032	(0.6496, 0.8909)	0.2413	(0.6114, 0.9291)	0.3177
15	(0.7323, 0.8443)	0.1120	(0.7217, 0.8548)	0.1331	(0.7007, 0.8758)	0.1751
25	(0.7530, 0.8375)	0.0845	(0.7451, 0.8455)	0.1004	(0.7292, 0.8614)	0.1322
50	(0.7679, 0.8273)	0.0594	(0.7624, 0.8329)	0.0705	(0.7512, 0.8441)	0.0929
75	(0.7748, 0.8231)	0.0483	(0.7703, 0.8276)	0.0573	(0.7612, 0.8366)	0.0754
100	(0.7782, 0.8199)	0.0417	(0.7742, 0.8238)	0.0496	(0.7664, 0.8317)	0.0653
250	(0.7873, 0.8136)	0.0263	(0.8812, 0.9061)	0.0249	(0.7799, 0.8210)	0.0411

Table 9. Exact C.I. for $R_{1,2}$ in case Identical Random Independent Strength

1- γ	0.90		0.95		0.99	
n	C. I.	D	C. I.	D	C. I.	D
5	(0.6639, 0.8789)	0.2150	(0.6275, 0.9004)	0.2729	(0.5585, 0.9339)	0.3754
15	(0.7274, 0.8489)	0.1215	(0.7077, 0.8632)	0.1555	(0.6695, 0.8877)	0.2182
25	(0.7491, 0.8412)	0.0921	(0.7344, 0.8525)	0.1181	(0.7062, 0.8725)	0.1663
50	(0.7651, 0.8300)	0.0649	(0.7551, 0.8384)	0.0833	(0.7358, 0.8534)	0.1176
75	(0.7724, 0.8253)	0.0529	(0.7644, 0.8322)	0.0678	(0.7490, 0.8448)	0.0958
100	(0.7761, 0.8219)	0.0458	(0.7692, 0.8280)	0.0588	(0.7560, 0.8390)	0.0830
250	(0.7859, 0.8148)	0.0289	(0.7817, 0.8187)	0.0370	(0.7736, 0.8259)	0.0523

Example 2. Real Data.

As an another example we choose the real data set proposed by Lawless [14] (1982, p. 185) and Nelson [15], referring to which the time breakdown of an insulating fluid between electrodes at a voltage of 36 kV (minutes), 32 kV (minutes) and 30 kV (minutes). The data shown below are breakdown times for 3 groups of specimens, each group involving a different voltage level.

Voltage Level (kV)	n	Breakdown Times
36	15	{1.97, 0.59, 2.58, 1.69, 2.71, 25.50, 0.35, 0.99, 3.99, 3.67, 2.07,0.96, 5.35, 2.90, 13.77}
32	15	{0.40, 82.85, 9.88, 89.29, 215.10, 2.75, 0.79, 15.93, 3.91, 0.27, 0.69,100.58, 27.80,13.95, 53.24};
30	11	{17.05, 22.66, 21.02, 175.88,139.07,144.12, 20.46, 43.40, 194.90, 47.30, 7.74}

A models suggested by engineering consideration are that, for a fixed voltage level, time to breakdown have a Weibull distributions. Furthermore, distributions corresponding to different voltage levels are thought to differ only with respect to their scale parameters, the shape parameter being the same for different levels.

The computations in this example are done with k=1, m=2, a= 0.01, $a_m = a.m$, p=3, $x_0 = 10$, θ_1= 10000,$\theta_2 = 8000$ and $\theta_0 = 9000$, $n_1 = n_2 = 15, n_0 = 11$, $R_{1,2} = 0.798516$ for Model I and $R_{1,2} = 0.894242$ for Model II.

The results are presented in Tables 10-12.

Table 10. $\hat{\theta}_1, \hat{\theta}_2, \hat{\theta}_0, \hat{R}_{k,m}$ and , $\hat{\sigma}^2_{\hat{R}_{k,m}}$ in case Non-Identical Random Independent Strength

$\hat{\theta}_1$	$\hat{\theta}_2$	$\hat{\theta}_0$	$\hat{R}_{1,2}$		$\hat{\sigma}^2$	
			Model I	Model II	Model I	Model II
1303	828701	170452	0.46360	0.99941	0.00844	0.0000003

Table 11. Approximate C.I. for $R_{1,2}$ in case Non-Identical Random Independent Strength

1- γ	0.90		0.95		0.99	
Model	C. I.	D	C. I.	D	C. I.	D
I	(0.3120, 0.6152)	0.3032	(0.2835, 0.6437)	0.3601	(0.2266, 0.7006)	0.4740
II	((0.9991, 0.9997)	0.0006	(0.9991, 0.9998)	0.0007	(0.9990, 0.9999)	0.0009

Table 12. Exact C.I. for $R_{1,2}$ in case Non-Identical Random Independent Strength

1- γ	0.90		0.95		0.99	
Model	C. I.	D	C. I.	D	C. I.	D
I	(0.3565, 0.5899)	0.2334	(0.3257, 0.6226)	0.2969	(0.2714, 0.6817)	0.4103
II	(0.9992, 0.9996)	0.0004	(0.9991, 0.9997)	0.0006	(0.9990, 0.9997)	0.0007

7. Conclusions

In this paper we presented the problem of determining the reliability of a series chain consisting of k identical likes. Our computational results were computed by using Mathematica 8.0. Our observation concerning the results are stated in the following points:

1- From Tables (1), (4) , (7) and (10), we see that $\hat{\sigma}^2_{\hat{R}_{k,m}}$ decreases as the sample size n increases, i.e. $\hat{R}_{k,m}$ is consistent estimator of $R_{k,m}$.

2- From another Tables, we see that the length of the C.I.s decreases by increasing the sample size.

3- We find that $\hat{R}_{1,2}$ under Model II is greater than that under Model I. This means that the value of reliability change by varying the type of strength.

Acknowledgements

This paper was funded by the Deanship of Scientific Research (DSR), King Abdulaziz University, Jeddah, under grant No. (512/363/1432). The authors, therefore, acknowledge with thanks DSR technical and financial support

References

[1] Church, J.D. and Harris, B. (1960). The estimation of reliability from stress –strength relationships. Technometrics, 12, 49-59.

[2] Downton, F. (1973). The estimation of P(Y < X) in the normal case. Technometrics, 15, 551-558.

[3] Reiser, B. and Guttman, I. (1986). Statistical Inference for P(Y < X) in the normal case. Technometrics, 28(3), 253-257.

[4] Owen, D.B., Craswell, K.J. and Hanson, D.L. (1964). Non parametric upper confidence bounds for P(Y < X) and confidence limits for P(Y < X) when X and Y are normal. JASA, 29, 906-924.

[5] Sath, Y. and Shah, S.P. (1981). On estimating P(X < Y) for the exponential distribution. Commun Statist. Theor. and Methods, 10(1), 39-47.

[6] Constantine, K. and Karson, M. (1986). Estimation of P(Y<X) in Gamma case. Commun Statist. Simula. and Computational, 15(2), 365-388.

[7] Awad, A.N. and Gharraf, M.K. (1986). Estimation of P(Y<X) in the Burr case: A comparative study. Commun Statist. Simula. and Computational, 15(2), 389- 403.

[8] Nassar, M.M., El Sayed, A.S. and Shawky, A. I. (1998). Confidence intervals for the stress- strength reliability model. Far East J. Theor. Stat., 2(2), 115-122.

[9] Kapur, K.C. and Lamberson L.R. (1977). Reliability in Engineering Design. John Wiley and Sons.

[10] Shaw, L., Shooman, M. and Schartz, R. (1973). Time dependent stress-strength models for non-electrical and electrical systems. Proceeding Reliability and Maintainability Symposium, 186-197.

[11] Schartz, R., Shooman, M. and Shaw, L. (1974). Application of time dependent stress- strength models of non-electrical and electrical systems. Proceeding Reliability and Maintainability Symposium, 540-547.

[12] Xue, J. and Yang, K. (1997). Upper and lower bounds of stress – strength interference reliability with random strength – degradation. IEEE Trans. Rel., 46(1), 142-145.

[13] Mokhles, N. and Khayar, A. (2000). Reliability of a series chain for time dependent stress- strength models. Egyptian Statistical Journal, 44, 171-184.

[14] Lawless, J.F. (1982). Statistical Models and Methods for Lifetime data. Wiley, New York.

[15] Nelson, W.B. (1982). Applied Life Data Analysis, Wiley, New York.

Life Science Journal

(Acta Zhengzhou University Overseas Edition)

Call for Papers

The academic journal "***Life Science Journal***" (ISSN: 1097-8135) is inviting you to publish your papers.

Life Science Journal, the Acta Zhengzhou University Oversea Version registered in the United States, is an international journal with the purpose to enhance our natural and scientific knowledge dissemination in the world under the free publication principle. The journal is calling for papers from all who are associated with Zhengzhou University-home and abroad. Any valuable papers or reports that are related to life science-in their broadest sense-are welcome. Other academic articles that are less relevant but are of high quality will also be considered and published. Papers submitted could be reviews, objective descriptions, research reports, opinions/debates, news, letters, and other types of writings. Let's work together to disseminate our research results and our opinions.

Please send your manuscript to editor@sciencepub.net.

Address:
Life Science Journal - Acta Zhengzhou University Overseas Edition
Marsland Press
PO Box 180432, Richmond Hill, New York 11418, USA
Telephone: (347) 321-7172
Emails: editor@sciencepub.net; sciencepub@gmail.com; lifesciencej@gmail.com;
Website: http://www.sciencepub.net; http://www.lifesciencesite.com

Volume 9, Number 3, (Cumulative No.30) Part 15 September 25, 2012 ISSN:1097-8135

Life Science Journal

Marsland Press

PO Box 180432, Richmond Hill, New York 11418, USA

Website:
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

Phone: (347) 321-7172

ISSN 1097-8135