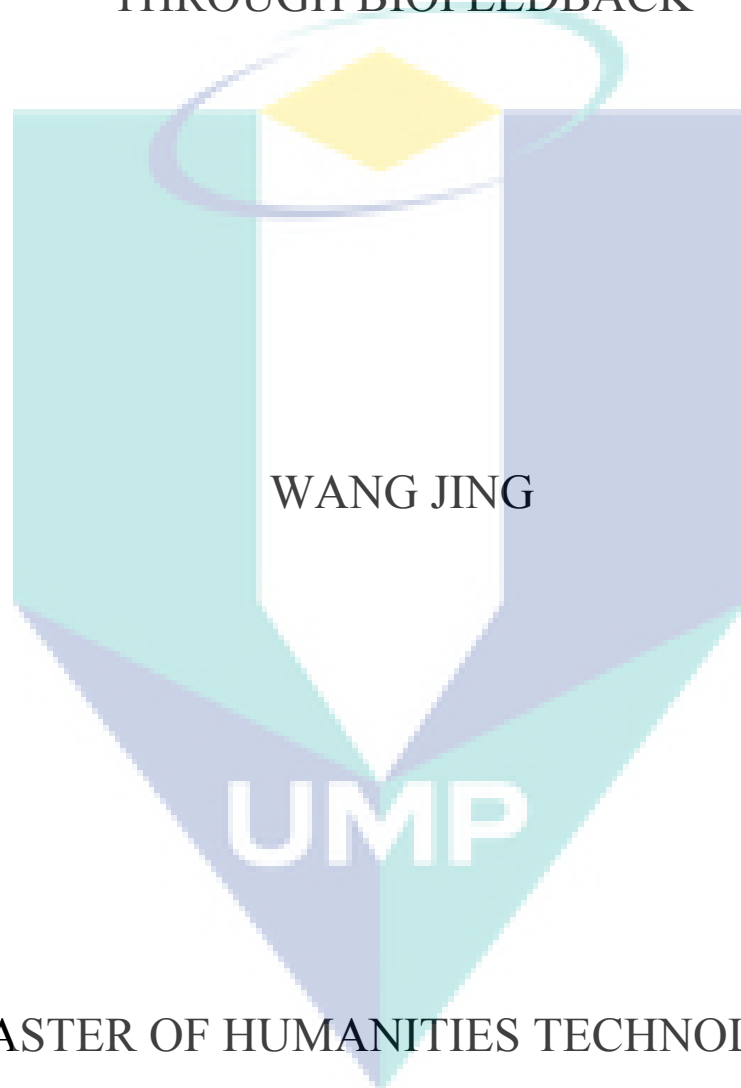# AN INVESTIGATION ON DEVOUTNESS ISLAMIC PRAYER AMONG FEMALE COLLEGE STUDENTS THROUGH BIOFEEDBACK

WANG JING

MASTER OF HUMANITIES TECHNOLOGY

(Human Performance System)

UNIVERSITY MALAYSIA PAHANG

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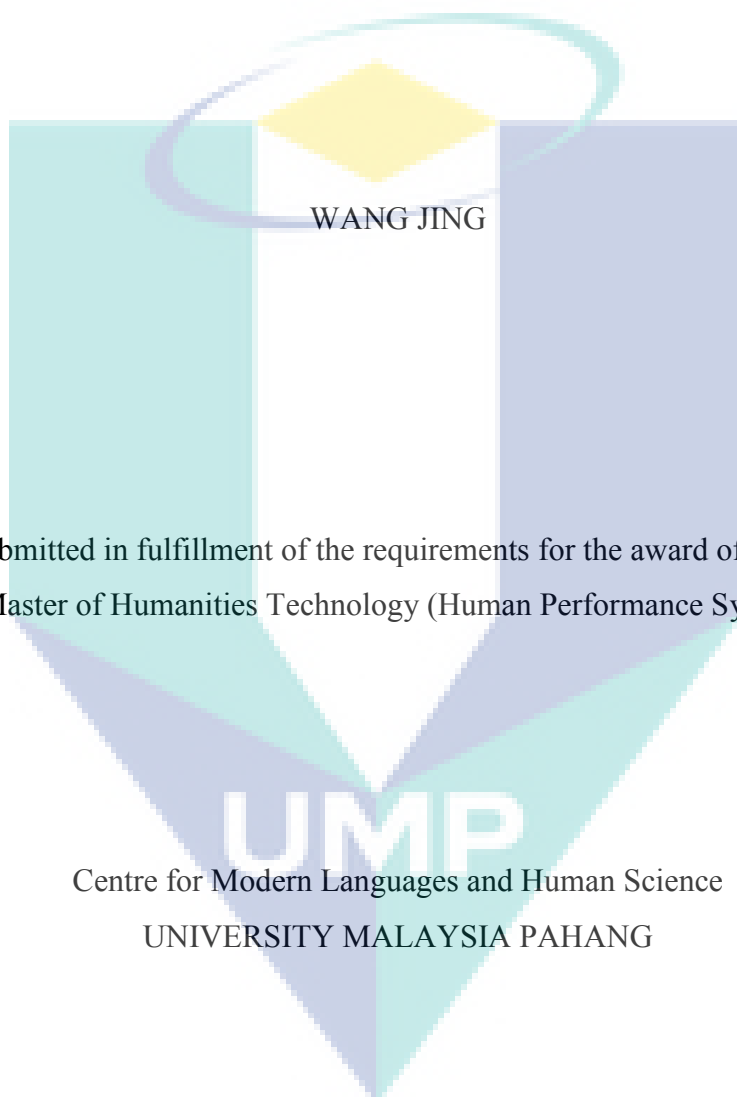New IC / Passport Number   Name of Supervisor
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AN INVESTIGATION ON DEVOUTNESS ISLAMIC PRAYER AMONG
FEMALE COLLEGE STUDENTS THROUGH BIOFEEDBACK

WANG JING

Thesis submitted in fulfillment of the requirements for the award of the degree of
Master of Humanities Technology (Human Performance System)

Centre for Modern Languages and Human Science
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Thesis submitted in fulfillment of the requirements for the award of the degree of
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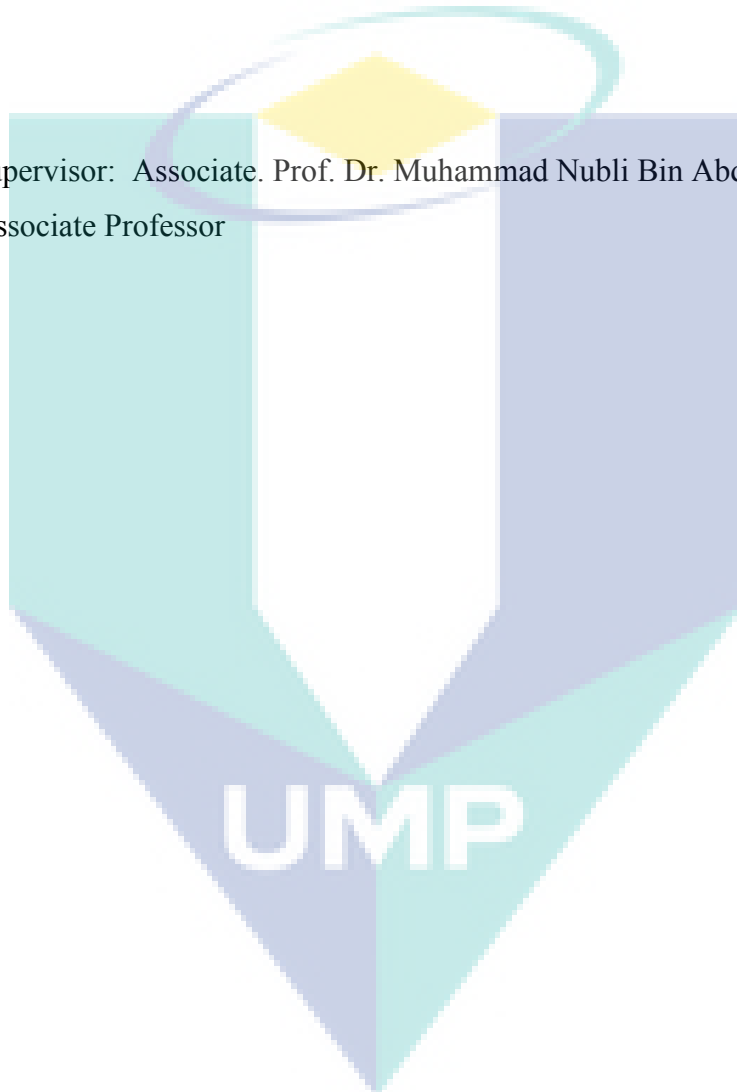
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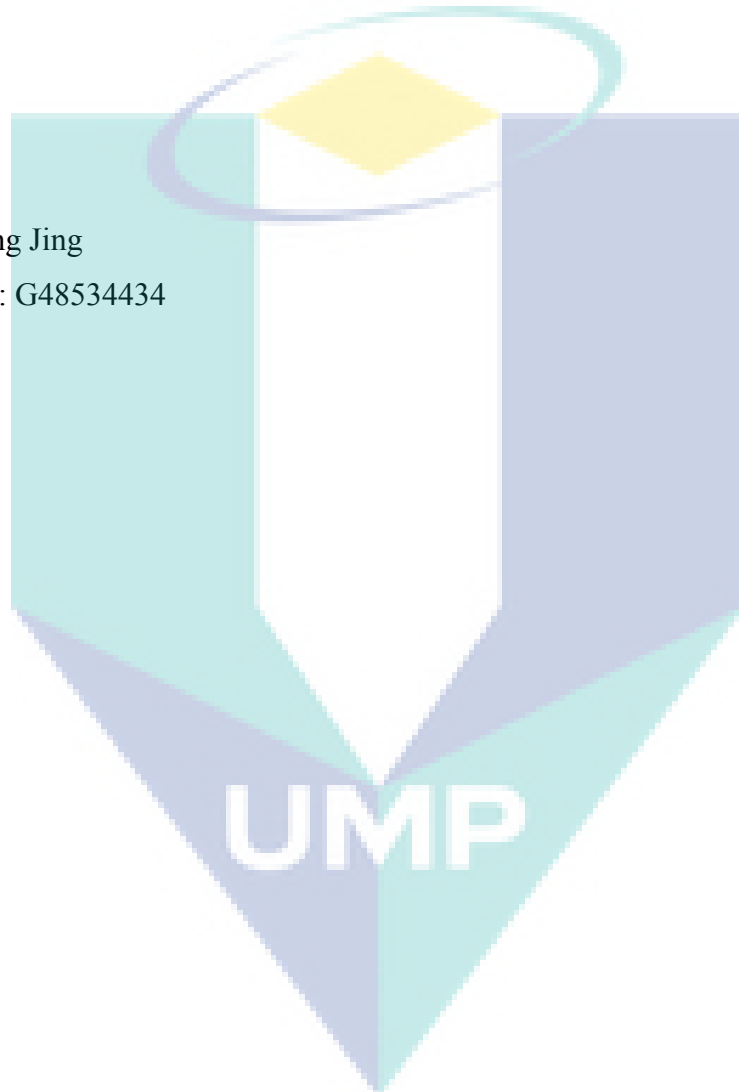
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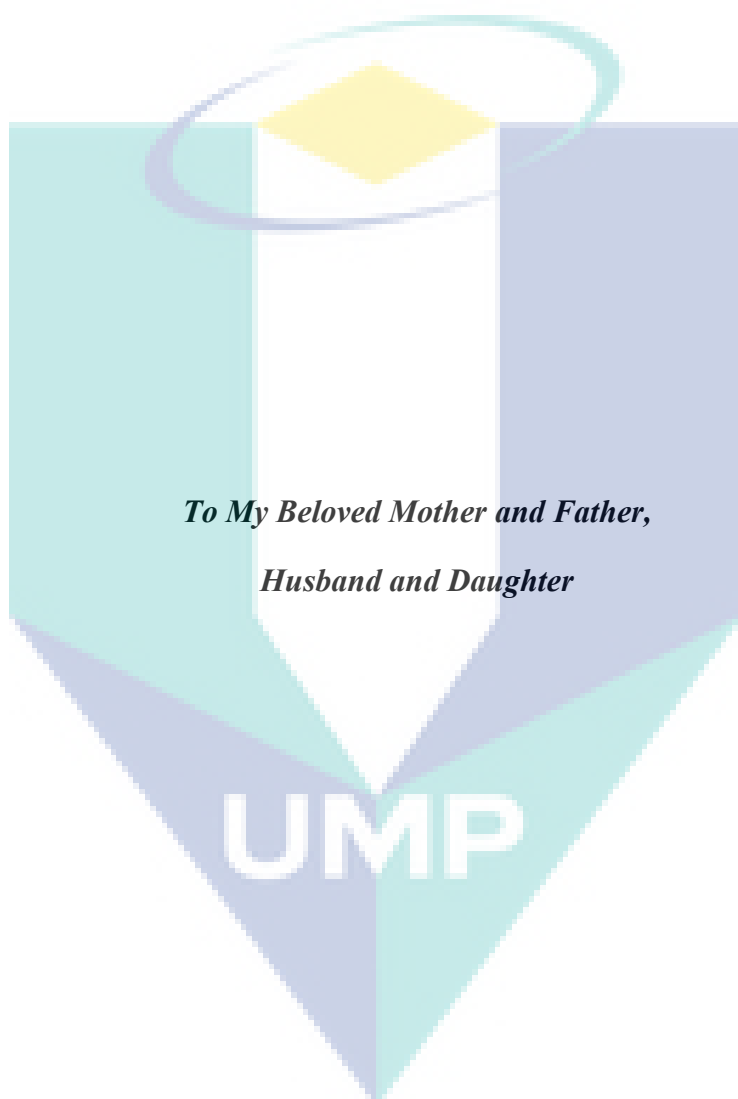
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To My Beloved Mother and Father,

Husband and Daughter

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In the name of Allah, the Most Benevolent, the most Merciful. First of all I wish to record immeasurable gratitude and thankfulness to the One and The Almighty Creator, the Lord and Sustainer of the universe, and the Mankind in particular. It is only through His mercy and help that this work could be completed and it is ardently desired that this little effort be accepted by Him to be of some service to the cause of humanity.

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A final note of thanks goes to all my friends for the nice moments I spent with them, providing many amazing ideas and insights. Most importantly, my beloved mother, father and my husband and my lovely daughter, should receive my greatest appreciation for their enormous love and confidence for always giving me their tremendous support over years.

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ABSTRACT

Salah is the practice of formal prayer in Islam. Its supreme importance for Muslims is indicated by its status as one of the Five Pillars of Islam including positions of standing bowing prostrating and sitting. Salah is known to improve psychological, musculoskeletal and cerebral effects and gain significant health benefits healthy students. However, the psychophysiological analysis of devoutness-based Salah is scarce and often lack meticulous description to indicate positive effects of Salah. This study explored the experience of devoutness-based Salah training for female college students in Salah samples and compared them with respective controls. During the processes of performing Salah, The indexes of Heart Rate Variability (HRV), Electromyography (EMG), Skin Conductance Responses (SCR) and Phalange temperature (PT) were investigated. Four indexes were explored for the analysis of measured psychophysiological signals and for the analysis of procedures to performing Salah were explored. Psychophysiologically-driven instruments and data displays were built for analysis the devoutness-based Salah effects on improving autonomic nervous system response, assessing the health of muscles and mitigating stress, anxiety and depression symptoms. Furthermore, a group of subjects who practiced devoutness-based Salah for 22 days showed more pronounced improvement of the four indexes on day 22 compared to day 1. The control group did not show the evidence of a significant difference between day 1 and day 22. The results show that participation in performing devoutness-based Salah program can lead to significant reduction in levels of stress, anxiety and depression among female college students who had symptoms of stress, anxiety and depression. Furthermore, by evaluating the HRV, EMG, SCR and PT, this study demonstrates that the protocol is an opportunity to spend a little time in performing devoutness-based Salah, as well as achieves effectively autonomic nervous system balance, muscle relaxation, alleviation effects of normal daily stress and relaxation response occurs in association with the anxiety and depression. The results demonstrated that devoutness-based Salah may have clinical application in stress, anxiety and depression-related symptoms or it will alleviate the adverse effects of normal daily stress.

ABSTRAK

Solat merujuk kepada sembahyang dalam agama Islam. Solat fardhu merupakan amalan wajib bagi setiap umat Islam dan menjadi rukun Islam yang kedua daripada lima rukun Islam. Solat bagi umat Islam memberi pelbagai manfaat kepada kesihatan melalui pergerakan tubuh dan posisi badan seperti berdiri, tunduk, sujud dan duduk. Kajian sains mendapati bahawa pergerakan tubuh dalam solat dapat meningkatkan kesan psikologi, regangan otot skeletal dan fungsi serebrum yang memberi kesan positif kepada kesihatan badan manusia. Walau bagaimanapun, menurut analisis psikologikal, solat yang kurang dari segi penghayatan dan ketelitian menunjukkan kesan positif yang terhad. Kajian ini meneroka pengalaman berasaskan amalan solat khusyuk bagi pelajar-pelajar siswa kolej dan perbandingan pengamalan serta penjagaan solat. Semasa proses melaksanakan Solat, Indeks Kepelbagaian Kadar Jantung (HRV), Electromyography (EMG), Respons konduktans Kulit (SCR) dan suhu ruas (PT) telah disiasat. Tambahan pula, kumpulan subjek yang mengamalkan solat khusyuk selama 22 hari menunjukkan peningkatan empat indeks yang lebih ketara dalam masa 22 hari berbanding sehari. Kumpulan kawalan ini tidak menunjukkan bukti perbezaan yang ketara antara hari pertama dan hari yang ke 22. Empat indeks bagi menganalisis isyarat dan prosedur perlaksanaan solat telah diterokai. Psikologikal didorong oleh instrumen dan paparan data yang telah dibina untuk analisis kesan solat khusyuk kepada peningkatan tindak balas sistem saraf autonomik, menilai kesihatan otot dan mengurangkan tekanan, kebimbangan, dan gejala kemurungan. Kajian menunjukkan penyertaan dalam melaksanakan program solat khusyuk boleh membawa kepada pengurangan ketara dalam tahap tekanan, kebimbangan dan kemurungan di kalangan pelajar siswa kolej yang mempunyai gejala-gejala tekanan, kebimbangan dan kemurungan. Selain itu , dengan menilai HRV, EMG, SCR dan PT, kajian ini menunjukkan bahawa protokol ini adalah satu peluang untuk menghabiskan sedikit masa dalam melaksanakan solat yang khusyuk, serta mencapai autonomi sistem saraf, pengenduran otot, mengimbangkan tahap tekanan normal setiap hari dan mengurangkan tindak balas kebimbangan dan kemurungan yang berlaku. Hasil kajian telah menunjukkan bahawa Solat khusyuk mempunyai aplikasi klinikal dalam mengurangkan kesan buruk terhadap gejala kebimbangan dan kemurungan di dalam tekanan kehidupan seharian.

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LIST OF ABBREVIATIONS

ANS	Autonomic nervous system
BVP	Blood volume pulse
CBT	Cognitive behavioral therapy
EDR	Electro-dermal
EEG	Electroencephalo-graph
EFT	Emotional freedom technique
EKG	Electrocardiogram
EMG	Electromyography
GSR	Galvanic skin response
HF	High frequency
HR	Heart rate
HRV	Heart rate variability
KEMG	Kinesiologic EMG
LF	Low frequency
MUAP	Motor unit action potential
PPG	Photoplethysmography
PSS	Perceived stress scale
PT	Peripheral temperature
RSA	Respiratory sinus arrhythmia
SC	Skin conductance
SCR	Skin conductance responses

SCRs   Skin conductivity startle response

SEFT   Self-emotional freedom technique

SEMG   Surface electromyography

SNS   Nervous system

STAI   State-Trait Anxiety Inventory

VMPFC   Ventromedial prefrontal cortex
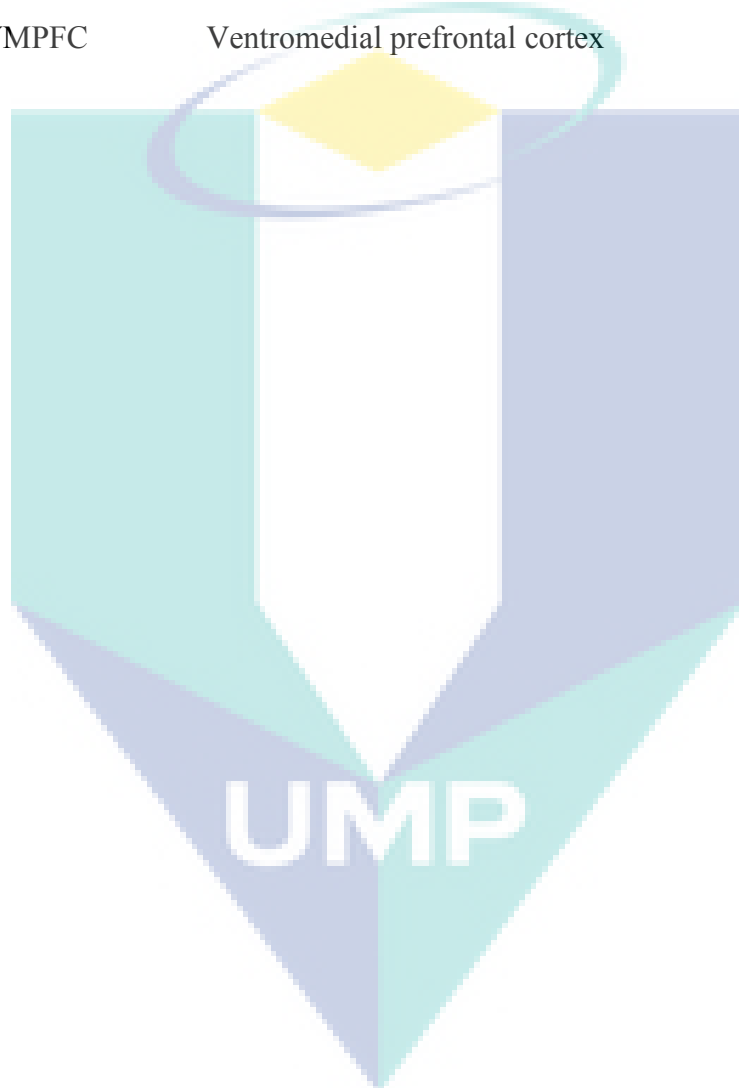
CHAPTER 1

INTRODUCTION

1.1   INTRODUCTION

The importance of belief is that, for the individual, it frames the life. It gives structure and boundaries. But the belief also influences how people view and interpret world events and situations around them, the picture that is surrounded by the frame. People then make a judgment based on the frame about another's belief and how they lived their life (Lewis, 2003). Islam is not only a world religion, claiming about a fifth of the world's population, it is also a system of culture and politics. Muslims are found in most countries of the world, speaking most of the world's languages. There is no central authority that can speak for all Muslims, and there is no single way to be a Muslim. It is, like the other great religions of the world, diverse, dynamic, and difficult to define in only a few words, terms, and entries (Cyril, 1989).

In a modern world that values activity, achievements and results, stress is an unavoidable part of an individual's working life (Cooper, 1988). Although stress can have positive qualities in that the individual may feel more excited than agitated and perceive the situation positively as a form of challenge, it is also described as posing a threat to the quality of life as well as physical and psychological wellbeing (Cox, 1978). Stress is a complex issue but generally it is defined as a physical, mental, or emotional reaction resulting from an individual's response to environmental tensions, conflicts, pressures, and similar stimuli (Fontana, 1993). Stress is often described as being associated with emotions such as anger, anxiety and depression (Cox, 1978), and there is evidence to suggest that it is also related to impoverished mental health (Cooper, 1988; Campbell & Moore, 2002). It is perhaps surprising that more people are turning to a growing concern about various religious activities such as Meditation, Yoga, Zen

and Salah. For all the activities of modern society, many still feel a fundamental need for silence, inner peace, and a moment of reflection.

There is no doubt that throughout the history, religious activities played pivotal role for human being psychology and physiology. Meditation is currently considered to be associated with increased awareness. Meditation is a self-regulatory, mind-body process used to help engage attention and awareness, and to produce a state of inner quiescence (Adam & Autumn, 2011). It has been used as a self-transformative practice for millennia, most notably in the Far East. Interest in meditation was evident in the United States in the late 19th century, and began to flourish during the early 1960s as Transcendental Meditation, Zen, and other traditions grew significantly in popularity. Yoga is a physical, mental, and spiritual discipline, originating in ancient India. Yoga has been a lifestyle practice for millennia for good physical and mental health as well as spiritual well-being. The goal of yoga, or of the person practicing yoga, is the attainment of a state of perfect spiritual insight and tranquility. The word is associated with meditative practices in Hinduism, Jainism and Buddhism (Nils, 2010). The word "yoga" has been used in a variety of senses. Yoga includes practicing moral code of conduct, cleansing techniques, physical postures, voluntarily regulated breathing, relaxation techniques, and meditation.

However, meditation-yoga is an integral part of the religion of Buddhism; the aim is to achieve oneness or unity with themselves and their idea of god. The names of all the positions are based on their beliefs; even the name yoga apparently means unity with their deity. It must be noted however, the meditation techniques involved in relaxation studies only required static posturing i.e. sitting or lying supine, while the Muslim prayer involved active physical movements. What is the point to it all, if it is to relax then people replacing something better (Qur'an and prescribed Dhikhr) with something inferior (chanting). If it is to keep fit then there are many forms of exercise that are not part and parcel of Buddhism-Hinduism (Nils, 2010). Especially, an authority on religious affairs in Malaysia has issued a fatwa saying Yoga is forbidden for Muslims. The fatwa, announced by the National Fatwa Agency on Saturday, deems Yoga incorporates physical movements, musical sounds, singings and adorations that are not in line with Islamic teachings. The agency said that the fatwa was not legally

binding and that it would only serve as a formal opinion representing members of Muslim community in Malaysia. According to the latest census report, currently there are about 17 million Muslims in the country or about two-third of the total population. Considerable effort has gone into conveying this recommendation to young people in Malaysia, however little attention has been paid to how well young people understand, and more importantly, recognize their level of intensity during physical activity. Therefore, the interpretation, analysis and researches of Islamic activities attend to young people instant needs in Malaysia (Mohd et al., 2011).

1.2 PROBLEM BACKGROUD

Nowadays, the pressing public health priorities and goals are the mitigation of the incidence and effects of chronic diseases such as cardiovascular disease, cancer, diabetes, obesity, and arthritis (Ryan-Wenger et al. 2005). Priorities for adolescents and children include the reduction of substance use, decreased suicide, and increased safety. Stress may affect the magnitude of these chronic conditions. The initial physiologic neuroendocrine response to stress (allostasis) serves an adaptive purpose to maintain homeostasis. However, the prolonged and persistent stress reaction has a cumulative cost to the body (allostatic load) that produces proinflammatory and metabolic states (McEwen, 2005) which are associated with many of the diseases cited by the Healthy People 2010 priorities. The physical activity associated with mindful movement is necessary for childhood health and well being and prevention of overweight and obesity.

Many of the existing studies of college students' stress and coping have concentrated on describing stressors or coping strategies and further defining a conceptual model of stress and coping. These descriptive studies include boys and girls together (Ryan-Wenger et al., 2005; Sharrer & Ryan-Wenger, 2002; Skybo, 2005), despite evidence suggesting fundamental gender differences in appraisal and coping, such as maladaptive coping (Hampel & Peterman, 2006). Mind-body therapies focus on engaging the power of thoughts and emotions which may positively affect physical health and may help children enhance feelings of control (McClafferty, 2007). A recent systematic review of 16 empiric studies of sitting mediation for young people suggests sitting meditation as a possible effective intervention for physical and behavioral issues

that warrants further investigation (Doug et al., 2008; Black et al., 2009). The possible role of contemplative practices within public school settings is also gaining attention as part of young people development that may enhance learning (Jennings, 2008). However, evidence-based interventions for stress in college female student are scant, contributing to missed opportunities for preventing illness and promoting physical and mental health. This presents an ideal opportunity to investigate the devoutness-based Salah skills and develop psychophysiological analysis tools necessary to effectively deal with inevitable stressful life experiences.

The lessons learned from studies contribute to psychophysiological analysis of Salah and expand understanding of devoutness-based Salah and psychophysiological signals of stress situation, until now, has been poorly understood and ineffectively treated. Salah can gradually refresh a person's overall health and social functioning; and, by increasing people knowledge of the integrative nature of healthy and complementary and alternative medical treatment, such as Salah (Mohd et al., 2011).

The Qur'an and prophetic traditions and sayings of Mohammad were religious, spiritual, scientific and influenced medical and anatomical texts. Researchers have published findings that Salah help people relax and reduce stress and anxiety; but, it can also give people a lot more. These are some of the benefits that daily Salah can give people. Most of these published ones were discussed using qualitative evaluation(Ellen et al., 2009; Steven, 2009).

Ellen (2009) has compared differences in use of prayer between breast cancer survivors from different ethnic groups and examine how use of prayer is related to mood and quality of life. There seems to be few differences in terms of standardized measures of quality of life, social support, and mood between those who prayed and those who did not, the interviews showed that certain ethnic minority groups seem to find more comfort in prayer, felt closer to God, and felt more compassion and forgiveness than Caucasian women Nooraini (2011).

According to (Badsha & Paul, 2008), the patient with ankylosing spondylitis markedly increased his spinal mobility after just one month of intensive Islamic prayers

in the month of Ramadan. Whether the associated fasting had any added role to play in his improvement is not known. In the Middle East lifestyles have changed and people tend to exercise less due to the heat, and have a tendency to stay indoors. Muslim patients with spondyloarthritis can be easily motivated to perform regular prayers, and also more intensive prayers, lasting for longer hours, such as in the month of Ramadan. Intensive Islamic prayers combined with the specific therapy for such patients may contribute to increase in spinal mobility, and a proper study on this subject is warranted.

Spirituality and religion have been seen as beneficial and irrelevant to health. (Linda et al., 2000) examined the recent research on this topic. The authors focus on (a) defining spirituality and religion both conceptually and operationally; (b) the relationships between spirituality/religion and health; and (c) priorities and goals for future research. Although the effect sizes are moderate, there typically are links between religious practices and reduced onset of physical and mental illnesses, reduced mortality, and likelihood of recovery from or adjustment to physical and mental illness. In the three mechanisms, the underlying these relationships involve religions increasing healthy behaviors, social support, and a sense of coherence or meaning. This research is based on religion measures, however, and it should be emphasized that spirituality may be different.

However, published researches are scarce and often lack meticulous description to indicate positive effects of Salah using psychophysiological analysis. It is very important to discover effects of Salah by using psychophysiological analysis. The current research was just fouced on the effect EEG (Haider et al., 2010), but it was rare findings about others psychophysiological analysis such HRV, EMG, SCR and PT. Psychophysiological analysis of behaviors and activities is the psychophysiological form of the experimental analysis of behaviors and activities. It represents behavioral research using psychophysiological models of behaviors and activities. The parameters in the models hopefully have theoretical meaning beyond being used to fit models to data. Furthermore, psychophysiological analysis can be done for a number of reasons such as measurement, performance evaluation or valuation of sensors, for example, biofeedback instruments which can also be used to capture psychophysiological signals and measure their variants inside body.

1.3   PROBLEM STATEMENT

Ideally, Islamic prayer has been convinced having long term health benefits in both physical and mental perspectives. However, the devoutness of the prayer which plays an important role is hardly to evaluate and improve. Published researches are scarce and often lack detailed description to indicate positive effects of Salah using psychophysiological analysis. This study is to propose the devoutness-based Salah Protocol to investigate effects of Salah by psychophysiological analysis through biofeedback among female students in Malaysia College.

1.4   OBJECTIVES OF THE RESEARCH

The primary purpose of this study was to explore the experience of female students, who will undergo devoutness-based Salah training and respective controls. This study provides an interesting insight about the role of devoutness-based Salah in female college students, when female college students are facing stress, anxiety and depression, explaining how it might contribute to mitigating negative emotions and improving health. The objectives of research are:

    i.   To develop a devoutness-based Salah protocol;

    ii.   To investigate the effects of Salah for female college students using HRV, EMG,SCR and PT;

    iii.   To examine the effects of devoutness-based Salah used by Salah group comparing with control group;

    iv.   To investigate the effects of devoutness-based Salah for a long period.

The proposed scale protocol can be easily learned and provides an opportunity to share psychophysiological information and introduce mind-body perspectives on health promotion.

1.5 RESEARCH QUESTIONS

The main research questions and hypotheses are:

i.   What is the devoutness-based Salah protocol?

ii.   How do the participants' psychophysiological signals change using devoutness-based Salah protocol?

iii. Does devoutness-based Salah protocol benefit female college students by psychophysiological analysis comparing between Salah group and the control group over a 22-day period?

iv.   After receiving devoutness-based Salah training in long-term duration, do the worshipers have stably benefits from the protocol compared between Salah group and the control group?

1.6 HYPOTHESES

i.   Null hypothesis (H_{1O}): There is no improvement in Salah group measured by psychophysiological analysis.

ii.   Null hypothesis (H_{2O}): The samples have unstable benefits by psychophysiological analysis after receiving devoutness-based Salah training in long-term duration.

1.7 SIGNIFICANCE OF THE STUDY

The spirituality and religion activities have intimate relation with physical and mental health. Claims about religion, spirituality, and health have recently appeared with increasing frequency, in both the popular media and professional journals. It is indeed true that in the literature, at least the literature available through Medline, there are numerous articles in which variables measuring religion or religious activity and health appear together. This trend is based in part on evidence that patients want to consider broad alternatives to conventional medical practice and on published studies linking religion and health outcomes. Regarding the latter, it has been asserted frequently that there have been a great many studies in the literature that have examined relations between religious involvement and health outcomes and that the majority of them have shown that religious people are healthier (Ellison & Levin, 1998; Koenig, 2000).

This research aimed to assess the devoutness-based Salah performance of psychophysiological analysis strategy on stress, anxiety and depression reduction. Numerous studies found that healthy enhancement is affected with stress rather than other risk factors (Lazarus et al., 1984; Stevens et al 1984; Deckro et al., 2002; Heaman 1995). The adverse medical consequences of chronic stress and tension are well-known and amply documented, including an increased incidence of many chronic medical illnesses to a more guarded prognosis in those cases which are compounded by ongoing and unrelieved stressful life conditions. The research results may be a state of chronic and unresolved tension and stress affecting both the physical and emotional well-being of the person.

Furthermore, female college students' issues are becoming a popular concern for more and more researchers. In (Christina & Edward 2007), the study examined body dissatisfaction and negative affect in understanding the link between perfectionism and dieting and bulimic symptoms in a sample of 307 female college students. In (Stice 2002), perfectionism, or the tendency to hold very high expectations for the self, has been frequently found to be a significant predictor of eating pathology in females. In (Eitel & Martin, 2009), the purposes of this study were to identify the financial literacy

needs of first-generation female college students and determine how they relate to persistence and degree completion. In the study, the psychophysiological signals of female college students were used for testing samples because the gender diffences caused the special interval or vacation without prayering for female Musilm. The study results will develop a religious method to improve beneficially the health of female college students according to psychophysiological signals.

Finally, sample size determination is the act of choosing the number of observations to include in a statistical sample. The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample. Many effects have been missed due to the lack of planning a rigorous study and thus having a too low sample size. Also, there is nothing wrong with having a too big sample size, but often much money and efforts are required to increase the sample size, and it could prove to be unnecessary. In this study, moderate sample size (Jacalyn et al., 2004) with 23 will used for evaluating the effectiveness of devoutness-based Salah. This results could be an alternative conclusion of the benefit of performing devoutness-based Salah from psychophysiological and science perspective.

1.8   RESEARCH SCOPE

An important developmental task for college students is learning to manage excess or unnecessary stress while actively engaging with healthy, age-appropriate challenges that promote growth. However, the psychophysiological evaluation of the effectiveness on devoutness-based Salah intervention for reducing stress and enhancing well-being among college populations is inadequate. Therefore in this current study the assessment of relaxation performance before and after devoutness-based Salah training was also carried out. To capture the data easily and capture the psychophysiological alteration, the psychophysiological signals of a optional prayer were sampled once each two-day for every sample which is required to perform formal prayers with five times and practice paced-breathing training according to the guidances of informed consent agreement. The heart rate variability (HRV), Electromyography (EMG), Skin Conductance Responses (SCR) and Peripheral temperature (PT) and procom infiniti software are used for measuring psychophysiological signals as strategies of several

stress reduction benefits. In addition, HRV is used for detecting the influencing the autonomic nervous system. EMG is used for measuring the tension in muscles. SCR and PT are used to detect stress, anxiety and depression levels. Especially, Islamic prayer of female is different in many ways from prayer of male by menstrual cycle(2010). The study is suitable to detect individually psychophysiological signals for female students. Female college students were used for testing samples because the gender diffences caused the special interval or vacation without prayering for female Musilm, as well as the physiological difference was considerd for obtaining the female related results. Therefore, female prayer is considered as samples in this study for the gender difference from the end of the menstrual cycle to the beginning of the next one. Furthermore, Muslim's mind should always be occupied with the remembrance of Allah and their tongues be busy with utterances of praise and glory of Him. Besides the Fardh Salah, there are a number of occasions where Salah is strongly recommended by Prophet Muhammad. In this study, the nufl Salah with two cycles is used to training samples. The reason is that this type Salah is not a burdensome and laborious task compared with Dhur Salah, as well as the particients can easily perform this type Salah and pay attention to the versions according to the holy Quran and Hadith during Salah. It is expected that devoutness-based Salah mediate stress reduction together with psychophysiological analysis in close association.

1.9   DEFINITION OF TERMINOLOGY

1.9.1 Psychophysiology

Psychophysiology is the branch of psychology that is concerned with the physiological bases of psychological processes. While psychophysiology was a general broad field of research in the 1960s and 1970s, it has now become quite specialized, and has branched into subspecializations, for example, social psychophysiology, cardiovascular psychophysiology, cognitive psychophysiology and cognitive neuroscience. Many measures are part of modern psychophysiology including measures of brain activity such as electroencephalography (EEG), measures of skin conductance (skin conductance response, SCR; galvanic skin response, GSR), cardiovascular measures (heart rate, HR; beats per minute, BPM; heart rate variability, HRV;

vasomotor activity), muscle activity (electromyography, EMG), changes in pupil diameter with thought and emotion (pupillometry) and eye movements, recorded via the electro-oculogram (EOG) and direction-of-gaze methods.

1.9.2 Heart Rate Variability

Heart rate variability (HRV) has been identified as an effective and non-invasive way of influencing the autonomic nervous system. Heart rate variability (HRV) refers to alterations in the interbeat interval – the time elapsed from one heartbeat to the next. The degree of variability of the heart rate reflects the extent to which the body, and the cardiovascular system in particular, are capable of responding to changing situational demands. HRV analysis is used in both treatment and research as an accurate reflection and predictive index of psychophysiological condition, including cardiovascular and other forms of physiological, psychological, and autonomic function (Task Force of the European Society of Cardiology the North American Society of Pacing Electrophysiology, 1996). High levels of HRV are associated with good health, whereas decreased HRV is typically acknowledged to be a sign of impaired cardiovascular regulation, aging, respiratory dysfunction, and other forms of autonomic dysregulation. Psychophysiologists suggest that by training the heart and autonomic nervous system to be even more adaptive, which can be used to a range of both short and long-term health benefits.

1.9.3 Electromyography

Electromyography (EMG) is a technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using an instrument called an electromyography, to produce a record called an Electromyogram. An electromyography detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analyzed to detect medical abnormalities, activation level, and recruitment order or to analyze the biomechanics of human movement. Also known as electromyography biofeedback, this form of biofeedback measures the tension in muscles. Typically, sensors are placed over the forehead or the neck muscles although any group of muscles can be tested. The

sensors determine muscle tension, which is displayed on the computer screen. The goal of EMG biofeedback is to help patients not only realize the level of stress/tension they are carrying in their muscles, but also learn how to relax and get rid of the stress.

1.9.4 Skin Conductance Responses

The skin conductivity startle response is one of the most robust and well studied physiological responses. It is caused by sympathetic nervous system activation, which changes the levels of sweat in the eccrine sweat glands and has been shown to be linked to measures of emotion, arousal, and attention. Moreover, SCRs have been shown to be reliable measures of autonomic expressions of emotions. For instance, in both visual (affective picture such as a beautiful landscape) and auditory (naturally occurring sounds such as crying baby) modalities, SCRs proved to be modulated by valence and to increase with rated arousal (Bradley and Lang, 2000 and Lang et al., 1998).

1.9.5 Peripheral Temperature

Finger temperature is widely used as a measure of tension/relaxation. As participants' hands get cooler, participants' tension level goes down, which is a super tool for therapists to see true feelings and thoughts. Skin temperature mainly reflects arteriole diameter. Hand-warming and hand-cooling are produced by separate mechanisms, and their regulation involves different skills. The thermometer is gently attached to the hand, foot or other clinically indicated site with a small piece of tape in order to measure peripheral skin temperature. It has the advantage of giving participants a specific number value for stress levels that can be compared over time to check improvement and for degrees of reactions to different stressful events temperature sensor is usually provided from fingers. It is based on analogue feedback method. Analogue feedback provides continuous information about the changes in the physiological changes. It is based on the fact that in an altered physiological state (tension/anxiety/hyperactive state), the skin temperature decreases. So, the most common instructions to the patient are to 'cool the hands' or decrease the skin temperature.

1.10   THESIS ORGANIZATION

In order to provide background underlying the thesis, the first section of Chapter 1 explained the introduction of this study. A problem statement then was formulated and was followed by description of objectives of the research. The last section pertained to the significance of the study and scope of research.

Chapter 2 provides a review of the literature which is divided into five sections. The first section describes stress-coping models of health risk behaviors and a review of literatures on evaluating the relationship between stress and health risk behaviors. The second section discusses the in various relaxation movements for college students. This section also covers well-being improvement through spiritual practices and strategies used to deal with stress. The third section presents the description of research documenting the relationship between stress and relaxation. The fourth section discusses psychophysiological analysis techniques literature documenting the application of various aspects for detection of psychophysiological signals. Finally, the fifth section presents the strategies incorporated in the study.

Chapter 3 is presented in four major sections. The first section restates the research questions and research hypotheses. The second section covers the methods involved in the study. The selection of subjects is described along with the apparatus and experimental tasks employed in the study. This section also includes the experimental procedure and the training protocol applied in subjects. In the third section, the development of training strategy module is presented. Last section pertains to design and analysis of the study.

Chapter 4 presents the statistical analyses for each hypothesis. The results of the data and interpretation of the findings are discussed and displayed either in table or figure.

Chapter 5 consists of four major parts. First, a summary of finding, second, a discussion of the results and how the findings are consistent or inconsistent with the

literature review. Then, work implication and limitation of the study as well as recommendation for future research are offered. Finally, a conclusion is provided.
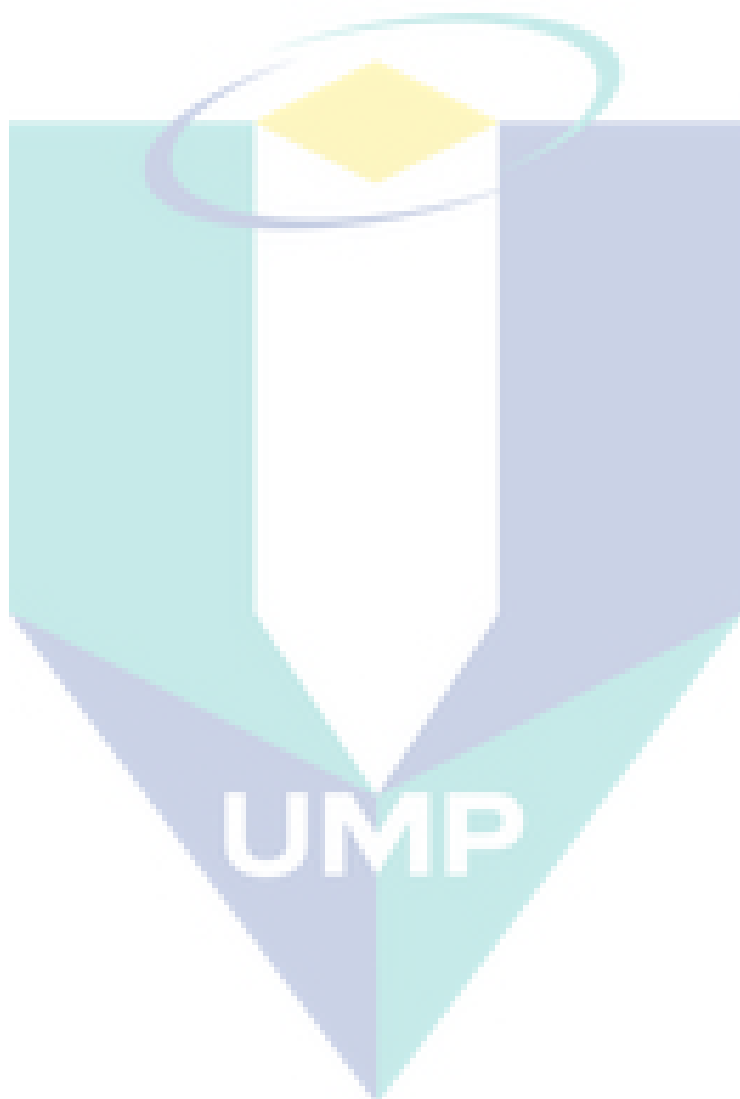
CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In general this chapter will discuss the importance of relaxation approaches for stress and the methods of psychophysiological analysis for biological signals measurement. First discussion will be emphasized on the description of stress-coping models of health risk behaviors and review previous studies for evaluating the relationship between stress and health risk behaviors. As completing the task, a description of various relaxation activties for college students will be elaborated in section two as well as well-being improvement through spiritual practices. The third section will reveal the relationship between negative emotions and coping strategies in Islamic activities. Furthermore, human physical and mental activity measured from biological signals that are known as psychophysiological analysis techniques will be presented thoroughly in section four. Previous literatures investigating the various applications for psychophysiological analysis and results will be also reviewed. The fifth and last section will summarize the bulk of this chapter.

2.2 RELATIONSHIP OF STRESS AND HEALTH

Stress management is a clear candidate for a gateway behavior to multiple behavior change. Stress-coping models of health risk behavior are based on the proposition that poor stress management promotes certain risky behaviors that provide temporary relief from an uncomfortable emotional state (Zillmann & Bryant, 1985). In this context, stress is defined as a transactional process that involves cognitive interpretations of an event as wearing on one's psychological or emotional resources

such that one's well-being is threatened (Lazarus & Folkman, 1984). Stress management is defined as practicing coping strategies that allow an individual to deal effectively with the cognitive and physical symptoms associated with stress (Murphy 1996).

There is a substantial body of empirical research evaluating the link between stress and what call the big four health risk behaviors: smoking, risky drinking, sedentary lifestyle, and unhealthy diet (Pronk & Goldstein, 2004). The vast majority of this research focuses on links between stress and individual health risk behaviors. Key findings are that psychological stress shows strong associations with initiation for smoking, enhanced frequency for behaviors such as eating unhealthy foods and excessive alcohol use, and reduced exercise frequency (Devine et al., 2006; Martyn-Nemeth et al., 2009; Nishitani et al., 2009; and Schnohr et al., 2004). Still more research supports the contention that stress is a barrier for moving from at risk to not a risk for the same set of behaviors (Ensel and Lin, 2004 ; Oginska-Bulik, 2005).

Studies that take a more comprehensive approach to evaluating the relationship between stress and health risk behaviors, however, are limited. A handful of studies have evaluated the co-occurrence between stress and clusters of health risk behaviors. These studies seem to conclude that heightened stress frequently co-occurs with behaviors such as poor diet, failure to meet exercise guidelines, smoking, and to some extent unhealthy alcohol use found that individuals with high levels of mental distress were twice as likely to exhibit three or four health risk behaviors versus zero or one (Heslop et al., 2001; Ng & Jeffery, 2003 ; Fine et al., 2004).

A small group of studies have begun to evaluate a causal pathway by examining the ways that stress may vary alongside health behavior profiles. For example, in a naturalistic assessment of health behavior changes during high stress weeks, (Steptoe et al, 1998) found that stressful periods were associated with greater depression levels, increased alcohol consumption, and greater unhealthy food intake than less stressful periods. In other words, as stress got worse so did health risk behaviors. (Lindquist et al. 1997) found that although work stress had no direct effect on blood pressure, the ways in which individuals reported coping with their work stress (i.e., drinking, inactivity,

and poor diet) were associated with elevated blood pressure. These studies indicate that stress often occurs alongside multiple health risk behaviors and that heightened stress may increase reliance on health risk behaviors.

Studies have shown that students who have social support and some type of spiritual practice (i.e. prayer, meditation) seem to feel less stress than peers who do not (Zaleski & Schiaffino, 1998). According to a study done on religion (Rosmarin et al., 2009), general religiousness, religious practices and positive core religious beliefs predicted lower levels of anxiety, worry and depression. When trained in relaxation techniques and meditation, students reported higher levels of well-being and lower levels of stress (Travis et al., 2009). Many of the articles reviewed dealt with types of coping mechanisms that college students use when dealing with stressful events and daily life. Humor, prayer and interaction with their social group all predicted lower levels of mental and physical illness and an overall greater feeling of well-being amongst students using these coping strategies (Iwaski, 2003). Spirituality also appears to be a buffer between stress and self-image. College students who defined themselves as highly spiritual had higher self-esteem than peers (Hayman et al., 2007). All of these studies encouraged a belief that spirituality, practiced in one form or another, may have an effect on student's stress levels and the importance of understanding healthy way in which to handle stress.

In sum, current literature provides evidence for a link between stress and single health risk behaviors. To a lesser extent, it provides support for an association between stress and co-morbid health risk behaviors. A small number of studies suggest that stress and reliance on health risk behaviors seem to vary together. Existing literature does not, however, address whether effective stress management is associated with having fewer behavioral health risks or if intervening on stress has inadvertent effects on an individual's health risk profile.

2.3 TRENDS OF STUDENTS HEALTH AND EXERCISES

Researchers have documented the benefits of regular movement for a healthy life. Regular movement reduces hypertension, heart disease, diabetes, and some cancers

(Allender et al., 2008). Engaging in regular movement improves psychosocial health and decreases stress. This is particularly important for college freshman, who are at increased risk for developing unhealthy behaviors with the transition into a new environment. Common stressors that create unhealthy behaviors and physical inactivity for college students include chronic illnesses, academic load, social life, campus residence, and family events (Economos et al., 2008).

College students between the ages of 18 and 25 have the lowest amount of regular movement compared to other adults. On average they engage in less than the recommended daily 30 minutes of moderate to vigorous exercises in Movement Guidelines of 2010. One study that evaluated changes in the movement of female freshman found that in the transition from home to college, movement levels decreased (Butler, 2004). This is alarming particularly because research has shown that students develop their health behaviors in college. These health behaviors then become well established and are extended for long periods after graduation (Laska et al., 2009).

Freshmen college students who live on campus are often negatively affected by their new independence. They are left to make their own movement choices and their practice of regular exercise is circumvented by the distractions of college life. Movement is also affected by many other factors including race and ethnicity. Research has shown that race and ethnicity are highly correlated with movement intentions. One study of movement intentions of college students evaluated 238 African-American students and 197 Caucasian-American students (Blanchard, 2008). This study found that the African-American students exercised significantly less than their Caucasian-American counter-parts (Blanchard, 2008). The authors explained the lower movement level of African-Americans as being attributed to the theory of planned behaviors which suggest one's intentions control physical activity (McArthur & Raedeke, 2009).

Movement and Stress Management of College Students Stress directly affects health behaviors. Stress occurs when persons view a situation, demand, or challenge as exceeding their available coping resources. College students are vulnerable to several stress factors, including academic and social pressures and a new environment. A recent study that assessed 145 college students found that those with high levels of stress had

poorer eating habits and were less physically active (Nguyen-Michel, 2006). This study also found that females and student athletes were more likely than males who were not athletes to practice healthy behaviors, such as a regular daily exercise regimen (Nguyen-Michel, 2006). The authors explain that gender differences and stress have been well documented in previous literature, and students with higher levels of stress perceive themselves as less healthy and have lower self-esteem.

All of this contributes to poorer health habits (Nguyen-Michel, 2006). Stress and movement has been well studied in adults and children. However, for the college population there is still a need for research to understand the relationship between stress and physical activity. One study that evaluated a diverse sample of 841 students found that both males and females who engaged in regular movement had lower levels of stress at all ages (Ebert et al., 2004). Another study that assessed 232 college students found that those who were physically active were less likely to be stressed and also had better problem solving and coping skills (Largo-Wight et al., 2005).

Previous research has shown that high stress levels in college are also associated with depression, anxiety, and less overall life satisfaction (Weinstein & Laverghetta, 2009). A study of 188 male and 193 female undergraduate students found that those who exercised frequently were less likely to be depressed and also exhibited higher self-esteem (Ryan, 2008).

2.4   RELAXATION APPROACHES TOWARDS PSYCHOPHYSIOLOGY

The mind and the body are interrelated, interactive, or perhaps just different names for the same thing, is by now widely accepted and supposedly understood by most - at least in theory. But in practice, there is a strong persisting tendency to split the mind from the body and to devote to each an entirely separate approach and mode of understanding. Best results for all treatments of every kind of condition or illness, whether of the mind, the body, or of some unspecified mixture of both, follow from the balanced, comprehensive, nuanced attention to the total welfare of the person in his environment. The so-called holistic or biopsychosocial approach to illness and coping is perhaps still more honored in the breach than in the observance, but it is only common

sense that the overall condition and well-being of the individual ought to be kept in mind and enhanced as a fundamental basis for any particular treatment of a specific condition.

2.4.1 Islamic Relaxation

Islamic relaxation refers to the use of original or modified Islamic methods of relaxation, which soothes and relaxes an individual so as to calm psychological problems, such as anxiety (Azhar, 1994; Mardiyono, 2007; Razali, 2002), depression (Azhar & Varma, 1995b), bereavement (Azhar & Varma, 1995a), insomnia (Purwanto & Zulaekah, 2007), as well as balance physiological outcomes, including blood pressure, heart rate, respiratory, and oxygen consumption (Moser et al., 2003).

Islamic relaxation is a well-known religious relaxation technique practiced by Muslims. Islamic relaxation is a method of relaxation that incorporates the Islamic tenets of prayer, recitation of the holy Qur'an and Zikr, or remembrance of Allah, to elicit a relaxation response of calmness and mindfulness (Syed, 2003). Relaxation is achieved due to a combination of one's physiological, psychological, cognitive, and social response to the relaxation technique. The psychological responses may include anxiety, depression, insomnia, phobias, and hallucinations. The most commonly observed physiological responses are characterized as decreased: heart rate, respiratory rate, oxygen consumption, muscle tension and metabolic rate (Moser et al., 2003).

As a component of religious cognitive therapy, Islamic relaxation techniques have been used in the treatment of anxiety (Azhar et al., 1994), bereavement (Azhar & Varma, 1995a), and depression (Azhar & Varma, 1995b) as well as in conjunction with psychotherapy in the treatment of anxiety (Razali et al., 2002). Zikr therapy also has been found to be effective in reducing preoperative anxiety (Mardiyono & Dyah, 2007), insomnia (Purwanto & Zulaekah, 2007), and physical and psychological distress (Damarhuda, 2005). In addition, Islamic relaxation has been used with: Muslim religiosity, in the treatment of anxiety and depression (Vasegh & Mohammadi, 2007), night prayer, to enhance immune (Sholeh, 2004), religiosity, to facilitate coping (Rezaei et al., 2008), and, spiritual emotional freedom technique (SEFT), in the treatment of

phobia and stress (Zainuddin, 2007). Analysis of Islamic relaxation and its outcomes have attempted to identify the most effective type of Islamic relaxation to use to overcome psychological difficulties (Mardiyono et al., 2007) and balance physiological outcomes (Zainuddin, 2007). Although Muslims are known to practice Islamic relaxation, on a regular basis, the methods used, as well as the effectiveness of the various methods, remain less recognized in nursing practice. As a result, this paper has sought to identify the techniques, methods, and psychological and physiological outcomes of Islamic relaxation and discuss implication for nursing care and future researches.

The relaxation interventions involved either original or modified Islamic relaxation techniques. Original Islamic relaxation includes prayer (Sholeh, 2004; Vasegh & Mohammadi, 2007), zikr therapy (Damarhuda, 2005; Mardiyono et al., 2007), religious relaxation (Purwanto & Zulaekah, 2007), and religiosity (Rezaei et al., 2008). Modified Islamic relaxation, on the other hand, incorporates Islamic tenets in religious modified psychotherapy (Azhar & Varma, 1995a, b; Azhar et al., 1994; Razali et al., 2002), religious cognitive behavioral therapy (Azhar and Varma, 2000; Wahass and Kent, 1997), and spiritual emotional freedom technique (SEFT) (Zainuddin, 2007).

Methods of conducting Islamic relaxation methods have been classified as either modified or original Islamic relaxation. Cognitive behavioral therapy (CBT) developed by (Beck, 1993) was modified by using deep acceptance in Islamic tenet (Hodge and Nadir, 2008). The main difference from original CBT was self-statement replaced by deep acceptance and relying on God (Allah) within 9 steps (Hodge and Nadir, 2008). The use of modified cognitive therapy with Islamic tenets has been applied in the treatment of anxiety, distress, depression, bereavement patients (Azhar & Varma, 2000; Azhar & Varma, 1995a, b; Azhar et al., 1994; Razali et al., 2002), and auditory hallucination (Wahass & Kent, 1997).

2.4.2 Spiritual Emotional Freedom Techniques

Spiritual emotional freedom technique, regarded as Self-Emotional Freedom Technique (SEFT), is the other type of modified Islamic relaxation most frequently

used. SEFT consists of the main concepts of deep acceptance and tapping with Emotional Freedom Technique (EFT), which contains two types: short cut version and complete version. The short cut version composes three steps: the setup, the tune in, and the tapping. The complete version consists of four steps: the setup, the tune in, the tapping, and complete tapping (the tapping of basic meridians, the 9 gamut procedures, and reinforcement). The tapping at the meridian points includes peak head or karate chop, medial eyebrow, side eye, under eye, under nose, chin, collarbone, under arm, and under nipple. The 9 gamut procedures include: eyes closed, eyes opened, eyes hard down left while holding head steady, eyes hard downright while holding head steady, roll eyes in a circle through nose as center of a clock wise, roll eyes in a circle through nose as center of an anti clock wise, hum few seconds of happy song, count one to five, and hum again few seconds of a happy song (Craig, 1999; Zainuddin, 2007). As mentioned, deep acceptance, one of the basic tenets of Islam, is used for coping, if Muslims face the fact, weakness, or problems (Zainuddin, 2007).

Moreover, the procedure for SEFT consists of four steps and needs to be done for 3 to 20 minutes to overcome psychological trauma, addiction, phobia, anxiety, pain and emotional distress (Zainuddin, 2007). In addition, before starting and after performing the procedure of SEFT, the problem, such as anxiety, pain, emotional distress, is measured with the Intensity Meter to evaluate the changes of problem level. Furthermore, the Intensity Meter is numerical analog scale ranged from 0 to 10, which the lowest score indicates the worst for negative evaluation, such anxiety, pain, distress and the highest score indicates the best for positive evaluation, such as motivation, happiness, and greatness for healthy (Craig, 1999; Zainuddin, 2007).

SEFT is an effective relaxation method, when used for 3 to 20 minutes, of dealing with psychological, physiological, and spiritual outcomes in adolescences, adults, and the elderly. Even though there is a lack of scientific evidence, positive outcomes have been note from practical experiences when SEFT has been used to deal with psychological outcomes: trauma, addiction, phobia, anxiety, pain, and emotional distress; and, physiological outcomes: smoking cessation, eyestrain, migraine (Craig, 1999; Zainuddin, 2007). SEFT also has been useful for motivation, happiness, and greatness for healthy people by inner self-motivation, self-statement, and self-

acceptance (Zainuddin, 2007). To evaluate the outcomes of SEFT, one common measure was the self report by using Intensity Meter, which ranges from 0 to 10 scales taken before and after performing SEFT (Craig, 1999).

2.4.3   Night Prayers Techniques

Prayer, according to Islamic belief, can be either a formal prayer, which one performs (recites) five times daily as compulsory, or an optional prayer, which is mainly performed before and after a formal prayers and night prayers in the very early morning as well as morning prayers after sunrise. Formal prayers are said for individuals undergoing chemotherapy for cancer, and is aimed to help one maintain his/her belief and recover physical health (Rezaei et al., 2008).Night prayers are recommended as optional prayers have been studied among high school students (Sholeh, 2004). Night prayers typically are performed between 11 to 23 "raka'at" units for 20 to 40 minutes, between 2 and 4 am, in the clean praying carpet. Thus, night prayers are at time when one can dialogue with Allah, and more easily expressed distress. During this time, one is better able to relax, sooth mind, peace spirit, and balance body functions. Therefore, peaceful body mind spirit promotes one's optimal harmonization, which enhances psychological, social, spiritual, and physical health status (Syed, 2003).

2.4.4   Religious Psychotherapy

Regarding to religious psychotherapy, the duration of one session intervention ranged from 20 to 30 minutes for 3-4 months. The frequency and total time of intervention varied from one study to others. The various outcomes were measured and followed within different periods ranged from 3 to 6 months. For the effectiveness of religious psychotherapy on anxiety, two studies were found of significant decreased anxiety within 3-4 months (Azhar et al., 1994; Razali et al., 2002). The depression (Azhar & Varma, 1995b) and bereavement (Azhar & Varma, 1995a) were also reduced before 6 months. However, the outcome of religious psychotherapy was inconsistent after 6 months. It shows that religious psychotherapy is effective approximately 5 months after giving intervention for 3-4 months.

2.4.5 Modified Cognitive Therapy

Another Islamic relaxation, modified cognitive therapy with Islamic tenets, was conducted in two studies with two group experimental design to evaluate on auditory hallucination (Wahass & Kent, 1997), bereavement and depression (Azhar & Varma, 2000). One study of measuring outcome of auditory hallucination was found not significant improvement throughout 3 and 9 months caused by the few number of sample size (n=6) (Wahass & Kent, 1997). The other studies on bereavement and depression were found significant improvement compared with the ones, who did not receive modified cognitive therapy for 4 months, but the effective was not significant different at 6 months (Azhar & Varma, 2000). In the two studies of modified cognitive therapy with Islamic tenets, physiological outcomes in adult subjects were not evaluated.

2.4.6 Zikr Therapy

Zikr therapy consists of sitting or lying comfortably, with eyes closed, remembrance of Allah wherever is convenient to perform it and in the morning and the evening for 20 and 25 minutes (Damarhuda, 2005; Mardiyono et al., 2007; Purwanto & Zulaekah, 2007; Syed, 2003). Two group experimental design (Mardiyono et al., 2007; Purwanto & Zulaekah, 2007) with Zikr therapy and one clinical evidence (Damarhuda, 2005) were reviewed. Original Islamic relaxation techniques utilize Zikr therapy and/or prayer. Zikr therapy is the remembrance of Allah, and requires one to sit or lie comfortably, with eyes closed, and practice remembrance of Allah through recitation of: "Subhanallah, alhamdulillah, allahu akbar" "Glorious is Allah, praise to Allah, Allah is the greatest" for 20 to 25 minutes (Damarhuda, 2005; Mardiyono et al., 2007; Purwanto & Zulaekah, 2007). In a regular basis, Zikr therapy is performed twice a day wherever it is convenient to perform either in the morning or the evening (Syed, 2003).

Zikr therapy has been shown to: reduce insomnia, when used on a daily basis for one month (Purwanto & Zulaekah, 2007); reduce preoperative anxiety, when used for 25 minutes (Mardiyono et al., 2007); and, produce spiritual outcomes as well as psychological outcomes, when used daily for 30 to 60 minutes (Damarhuda, 2005;

Syed, 2003). However, Zikr therapy was not effective to balance physiological outcomes: blood pressure, respiratory, heat rate, and temperature in preoperative patients (Mardiyono et al., 2007).

Furthermore, Zikr therapy as original Islamic relaxation has shown to deal with psychological problems, such as preoperative anxiety (Mardiyono et al., 2007), insomnia (Purwanto & Zulaekah, 2007), and spiritual outcomes (Damarhuda, 2005). However, it has not shown effective to balance physiological outcomes in terms of blood pressure, heart rate, respiratory rate, and temperature (Mardiyono et al., 2007). The extensive studies with advanced technique: repeated measurements, various populations, and length of zikr therapy are suggested. Similar results have been found in applying with modified Islamic relaxation: religious psychotherapy, modified cognitive therapy with Islamic tenets, and SEFT. Religious psychotherapy was effective to reduce anxiety (Azhar et al., 1994; Razali et al., 2002), depression (Azhar & Varma, 1995b), and enhance bereavement (Azhar & Varma, 1995a), but has not been researched for physiological outcomes.

As explained previously, SEFT is a new modified Islamic relaxation to overcome psychological and physiological problems. SEFT has shown to overcome psychological problems: psychological traumas, addiction, phobia, anxiety, pain, emotional distress; and, physiological problems: smoking cessation, eyestrain, migraine (Craig, 1999; Zainuddin, 2007).

Moreover, the interpretation of the previous studies should be considered carefully as a result of subjects' selection criteria, method use and outcome measurement in a long period. The proper methods of Islamic relaxation are necessary to provide a simple, an effective, and an efficient nursing intervention (Fridlund, 2007). Modification of Islamic relaxations by combining original and modified Islamic relaxation also may have synergic effects on psychological and physiological outcomes.

2.5   PSYCHOPHYSIOLOGICAL ANALYSIS

The automatic detection of human physical and mental activity is a vital aspect of prospective technical health support and intervention systems. In contrast to physical activity mental activity is not a directly observable physical phenomenon. It requires monitoring of physiological processes related to infer on the stimulus. The exploitation of the human biological signal (HRV, EMG, GSR and PT) has been proven to give an indication of the mental activation of a person. Surface electromyography (SEMG) sensors, which detect the electrical activity involved in muscle contraction, may be used for clients with chronic pain disorders or tension headaches. Temperature (Temp) biofeedback, in which a small thermistor monitors finger temperature, is used as a correlate of blood vessel constriction. This type of biofeedback is often used in clients with high blood pressure or migraines and is a good general indicator of overall relaxation. Skin conductance (SC) biofeedback, sometimes called galvanic skin response (GSR), is a measure of sweat gland activity on the palms. As sweat gland activity is highly correlated with thoughts and emotions, SC biofeedback is often used for anxiety disorders. Heart rate variability (HRV) is a measure of cardio-pulmonary resonance. When participants inhale, participants' heart beat increases slightly to assist participants' heart in pumping oxygenated blood; when participants exhale, participants' heart beat slows slightly to allow carbon dioxide to dilate participants blood vessels for more effective distribution. This healthy rise and fall in heart rate is the variability trained in HRV biofeedback. When participants' heart and breath work efficiently together, the parasympathetic branch of the autonomic nervous system is activated, creating the "relaxation response" (Benson, 1976) and allowing participants' body to access a restorative and regenerative state.

2.5.1   Heart Rate Variability

As described, changes in mental or emotional state result in changes to the Autonomic Nervous System (ANS) results, which in turn results in changes to the beat to beat heart rate rhythm. The goal of HRV analysis is thus to work in reverse and investigate a subjects affective state via the ANS by making inferences from a beat to beat time series of the heart rate pattern.

A large number of specialized techniques for the analysis of HRV have been proposed by many researchers all over the world. Russian physiologist, Evgeny Vaschillo, began studying (HRV), the beat-to-beat change in heart rate, as a measure of autonomic function in the early 1980's. Initially, he used BFB to teach Cosmonauts to increase the amplitude of HRV at specific frequencies (Vaschillo et al., 1983). Vaschillo's experimental paradigm consisted of displaying a computer-produced sinus wave as a pacer and current heart rate on a computer screen, and instructing subjects (e.g. six male Cosmonauts) to replicate pacer oscillation with their own physiological activity (in heart rate). He varied the frequency of the pacer within the very low and low frequency heart bands. Beat-to-beat blood pressure and respiration were measured as well. A transfer function analysis of heart rate, blood pressure, and respiration rate at various frequencies was performed. What Vaschillo found was that subjects typically showed the highest-amplitude of HR oscillation within the low frequency range of ~0.075-0.11 Hz. Measurement of blood pressure variability in these subjects showed that the same frequency high-amplitude oscillation was imposed on blood pressure, although no direct BFB was provided for this measure. It was also discovered that the highest amplitude blood pressure oscillations generally occurred within the very low frequency range of ~0.02-0.04 Hz. As such, Vaschillo labeled the rates at which individuals produced the highest amplitude of heart rate and blood pressure as an individual's resonant frequencies. He theorized that because respiration strongly affects HR through respiratory sinus arrhythmia (RSA), HRV BFB training that taught individuals to breathe at their resonant frequency could produce high-amplitude oscillation in functions of the autonomic nervous system (ANS) and would strengthen the body's homeostatic control mechanisms including the baroreflexes (Vaschillo et al, 1983, 2006). To validate Vaschillo's findings, Alexander Smetankin manufactured a portable HRV BFB device and established a BFB clinic in St. Petersburg, Russia. At this site, Russian children with asthma were taught to breathe at their individual resonant frequency as a method to control asthma. Influenced by this Russian research, Paul Lehrer evaluated this method of BFB in the United States. In a small-randomized controlled trial among asthma patients, (Lehrer et al, 1997) found significantly greater decreases in respiratory resistance among those receiving HRV BFB than other groups. He also reported significant improvements in pulmonary function among 20 clinical

cases of pediatric asthma treated with BFB but no medication (Lehrer et al, 2000). The report, issued by (Lehrer et al, 2001) delineated a unique method for carrying out HRV BFB. The manual set forth a ten-session process for teaching individuals to breathe at a rate that was specifically adapted to the rhythms of his/her own systems to improve the baroreflex (e.g. the negative feedbacks system in which during inhalation, heart rate increases and blood pressure falls).

This report was thematically linked around the premises that (a) HRV BFB would be useful for treating hypertension, particularly because the problem is related to baroreflex dysfunction, (b) HRV BFB would be useful for tonic hypotension where individuals with low blood pressure are also said to suffer from baroreflex dysfunction, and (c) HRV BFB would be useful as a treatment for patients suffering from various anxiety related disorders. The report included comprehensive descriptions of HRV, a manual for carrying out HRV BFB, and called for an imperative need to conduct more extensive research to determine the effectiveness of the experimental protocol.

Given this context, several researchers implemented HRV BFB to treat disorders marked by autonomic dysregulation. In a large placebo-controlled trial with random assignments to treatments, (Lehrer et al, 2004) found that participants who underwent HRV BFB demonstrated clinically significant improvements in asthma (Lehrer et al, 2004). In specific, asthma patients who received HRV BFB benefited in several ways including better pulmonary function, fewer asthma symptoms, and consumption of less asthma medication. Further clinical demonstrations have been published, applying this method to treat fibromyalgia, major depression (Karavidas et al., 2007), hypertension (Herbs et al., 1995), and a variety of stress-related physical disorders (Chernigovskaya et al., 1990). HRV BFB has also been found to improve peak expiratory flow and baroreflex gain in healthy individuals (Lehrer et al., 2003). These results indicated that the benefits of HRV BFB extended beyond just influencing sympathetic or parasympathetic arousal. HRV BFB improved the modulatory function of reflexes that controlled the sympathetic and parasympathetic systems. The balance between the two systems became more tightly regulated, and, where autonomic dysfunction existed, the balance was restored. Such findings bear profound theoretical implications for treating disease as well as improving human performance (Lehrer et al., 2004).

2.5.2   Electromyography

In 1792, a publication entitled 'De Viribus Electricitatis in Motu Musculari Commentarius' appeared, written by A. Galvani, where the author showed that electricity could initiate muscle contractions. This paper marks the beginning of modern electrophysiology. Six decades later, in 1849, DuBois–Reymond discovered that it was also possible to record electrical activity during a voluntary muscle contraction. The first recording of this activity was made by Marey in 1890, who also introduced the term 'electromyography' (Clarys, 1994). With the invention of the De Forest's Audion electronic amplification of weak myoelectrical phenomena became possible and the performance of recording systems for EMG signals could be considerably improved. An early description of electromyograms and their origin was available at the end of the 1920s.

At present, the generally accepted picture of the origin of the EMG signal is as follows. The spinal cord accommodates so-called alpha-motorneurones, which are nerve cells having long axons which run, as part of a nerve, down to the skeletal muscle. Arriving there, each axon branches out and connects to a number of muscle fibers on their individual motor endplate, which are usually located somewhere in the middle of the fibre. In this way, each alpha-motorneuron can simultaneously innervate a group of individual muscle fibers. This structure of motorneuron and its associated muscle fibers is a basic functional unit in the process of muscle action and is called a motor unit. Depending on its size, a muscle may be composed of a number of motor units, anywhere between a dozen and many hundreds. When the central nervous system activates a motor unit, an electrical impulse travels down the axon and arrives at the motor endplates of the muscle fibers.

Upon arrival of the stimulus, neurotransmitters are released here which cause depolarisation waves to propagate along the muscle fibers towards both ends. Because the tissue around the muscle fibers is electrically conductive, this simultaneous depolarization of the fibers in the active motor unit will induce a noticeable electrical effect on an electrode in the vicinity. The signal observed on this electrode is called the motor unit action potential (MUAP). The depolarization waves also travel into the

interior of the fibers, where they release calcium ions which initiate the mechanical contraction in the fibers with gradually increasing force. Depending on the characteristics of the motor unit, the maximum force is reached after some 20–150 ms after the depolarization and then gradually declines. In this way, a single impulse from the motorneuron causes a so-called force twitch.

It rarely happens that a single force twitch of a motor unit in a muscle is sufficient in the control of a movement. Two mechanisms are available to control muscle force at higher levels. Firstly, the number of active motor units in the muscle can be changed. As outlined before, each active motor unit near the electrode induces a MUAP which appears each time this unit fires. When this electrode picks up MUAPs from more than one motor unit, the resultant EMG signal on the electrode will be the sum of the MUAPs induced by the individual active units. In this way, an increasing number of motor units recruited for the contraction will lead to a greater sum and hence a stronger EMG signal. Secondly, the firing frequency of the active motor units can be changed. Once recruited, the firing frequency of each motor unit rises with the produced force. It shows that if more MUAPs are generated per unit of time at increasing force levels, this will also yield a greater sum signal and consequently a greater magnitude of EMG signal. This short outline of the physiological processes involved in muscle activation shows that the EMG signal can be a valid indicator of the level of muscle activation, so that it can be used to study the coordination and control of movements.

In addition, it suggests that a certain connection may exist between the magnitude of the EMG signal and the exerted muscle force. Under certain conditions this connection can be as simple as a linear relation (Inman, 1947; Hof, 1977 and Fuglevand, 1993). This issue will be addressed in more detail later. It is easy to see that changes and abnormalities in both the central control of muscles and the anatomical and physiological properties of muscle fibers will reflect in the appearance of the EMG signal. Unfortunately, the measurement technique and experimental conditions can also affect the signal and it's properties.

A complete review of the field is not in the scope of the presented papers, but, for instance, it was shown how the observed MUAPs and associated EMG signals are

affected by electrode geometry (Fuglevand, 1992), distance between active fibers and electrode (Hermens, 1991) and the location on the muscle (Gydikov, 1973). The complexity of the signal generation process and the influence of experimental parameters make it very difficult to give a mathematically unambiguous description of the EMG signal generation process. Such a description is a valuable tool to help interpretation of the EMG signal in physiological terms. A number of models have been proposed which aggregate the results from a great number of studies into details of the EMG signal generation process (Fuglevand,1992; Hermens, 1992).

Despite these complexities, it is possible to detect changes in the EMG signal which result from changes in the neuromuscular system. Under sustained isometric constant force conditions, EMG signals show characteristic changes which have been explained as effects of muscle fatigue (Merletti, 1990 ; Merletti, 1991). This provides a means for noninvasive monitoring of fatigue of individual muscles, which has applications, for instance, in ergonomic studies. Similarly, neuromuscular diseases can induce typical changes in the central control or physiologic properties of muscle fibers which lead to characteristic modifications in the appearance of the EMG signal. Neurologists have successfully exploited this character in the diagnostic process, so that electromyography is now well established in clinical routine in almost every major hospital. When the foregoing has shown that traditional EMG recording has attained a certain grade of perfection, the question emerges why EMG measurements for the analysis of neuromuscular control of movement—which will be referred to as kinesiologic EMG (KEMG)—have been slow in being accepted, particularly for clinical purposes. The answer to this question may involve a number of elements which are outlined in the following.

2.5.3 Skin Conductance Responses

Galvanic skin response (GSR) measures electrical conductance in the skin, which is associated with the activity of the sweat glands. A very slight electrical current (unnoticeable to participants) is run through participants' skin. The machine measures changes in the salt and water in participants' sweat gland ducts. The more emotionally aroused participants are, the more active participants' sweat glands are and the greater

the electrical conductivity of participants' skin. GSR is effective in treating phobias, anxiety, excessive sweating, and, at times, stuttering since these emotions will affect participants' skin's conductivity (Lim et al., 1997).

The essence of psychophysiology is to infer psychological processes from measured physiological signals. Rendering such inference plausible rests on assumptions about how these signals are generated, albeit in many instances without a formal specification. For example, the amplitude of event-related skin conductance responses (SCR) is used to infer sympathetic arousal, where people know that SCRs are generated by sweat secretion initiated by distinct bursts of sudomotor nerve activity (Boucsein, 1992). These sudomotor firing bursts directly relate to autonomic arousal, but the amplitude of the ensuing SCRs is only informative if there is a (linear) mapping from sudomotor firing (and hence, arousal) to SCR amplitude. The most parsimonious biophysical system that produces such a mapping would generate SCRs that are scaled versions of a template. Also, when two responses overlap, it is frequently posited that if some baseline can be estimated for the second response, its amplitude is not affected by the preceding response (Boucsein, 1992; Barry et al., 1993; Lim et al., 1997 ; Alexander et al., 2005). This amounts to assuming that the compound response is simply the sum of two single responses.

In a prior study, Bechara et al. (1996) showed that healthy individuals develop anticipatory skin conductance responses before the selection of a disadvantageous choice, whereas this anticipatory response was absent in the ventromedial prefrontal cortex (VMPFC) patients. In contrast, healthy individuals and VMPFC patients both displayed skin conductance responses following loss, showing that the differences in performance cannot be due to an insensitivity of VMPFC patients to loss per sec.

Consistent with this interpretation, in a prior study, Crone (2004) reported that healthy adults show skin conductance responses, as well as heart rate slowing, before the selection of a disadvantageous decision, and this response is larger for those individuals who performed more advantageous on the task. In contrast, the autonomic reactions to the outcome of the choices (skin conductance rise and heart rate slowing

following loss relative to reward) did not differ between participants who performed mainly advantageous or mainly disadvantageous (Crone, 2004).

It should be noted that when the probabilities of winning and losing are reversed in such a way that the high-paying decks are advantageous in the long run, healthy individuals develop anticipatory skin conductance responses preceding advantageous decks (Tomb et al., 2002). In addition, electrodermal activity data were collected, measured as changes in skin conductance (SC) mediated by eccrine glands which are uniquely innervated by sympathetic processes (Venables, 1991). Intervals between breaths were quantified to provide both peak to trough fluctuations for RSA quantification and to ascertain maternal compliance to the relaxation task demands.

2.5.4   Peripheral Temperature

Medical and healthcare research has been striving to find relationships between core body temperature at female genitals and certain health conditions, such as ovulation period. A study presents some conclusions on the correlation between covert attentions and basal temperature changes during the menstrual cycle phase on 22 adult females proves the importance of basal (intra-vaginal) temperature (Beaudoin. et al., 2005). In this study, traditional way was used for temperature measurement. However, automatic measurements and analysis of intra-vaginal temperature readings in an unobtrusive and efficient way are desirable. Another study uses a radio pill created for astronaut use, to access internal body temperature on athletes, and take measures to cool them down, avoiding excessive fatigue (Jones, 2006).

However, such pill-based solution introduces issues on pill elimination, and the biosensor cannot be reused again. Other medical studies, developing integrated systems to acquire and monitor physiological parameters, including body temperature (Anliker, 2004; DuoFertility, 2009). These systems only measure the skin temperature. From(Campbella, 2008), it can be seen that skin temperature cannot reflect the basal body temperature as it varies depending on the ambient temperature.

The AMON research team included a temperature sensor on their wearable system (AMON) (Anliker, 2004) to study a possible correlation between the temperature readings taken at skin by the sensor and the core body temperature. They concluded that skin temperature could be influenced by the environment conditions. Therefore, they could not show any correlation between skin temperature and core body temperature. DuoFertility project (DuoFertility, 2009) created a system to predict women fertile period. This system bases its prediction on the measurement of skin temperature. During fertile period, the variation of women core body temperature occurs around 10-14 days of menstrual cycle. It only changes about 0.5 degree Celsius (Ngalamou, 2002).

2.6   PACED BREATHING RELAXATION

Breathing often reflects people state of relaxation or excitation. When at rest, breathing is usually slow and rhythmic, (such as when asleep). When tense, breathing may be erratic, or we may hold participants breath. Controlling breathing may help participants become aware of participants' state so participants can stay relaxed. Breathing techniques are helpful to many women in labor. The most basic way to practice paced breathing is simply to be aware of the breaths participants are taking so that participants may then gradually let them become deeper to the point where participants' lungs are filled to capacity. When participants breathe in, participants' abdomen should expand as well as participants' chest. Hold the deep breath for a second or two and then let it out slowly. Anxiety disorders are associated with respiratory abnormalities. Breathing training aimed at reversing these abnormalities may also alter the anxiogenic effects of biological challenges. Qigong was considered as a series of health and wellness techniques based on breathing exercises and body positions. For paced breathing of Qigong, a general slow breathing technique is to make one in-and-out breath last one minute. Inhale for 20 seconds, then pause and retain the breath for 20 seconds and finally let the breath out in a long exhalation lasting 20 seconds (Cohen, 1997; Carvalho et al., 2009, Lopes et al., 2011; Eileen et al., 2011). In this study, the controlled group is trained by the method in (Cohen, 1997). The paced breathing relaxation is described with inhaling for 20 seconds, then pausing and retaining the breath for 20 seconds and finally breathing out in a long exhalation lasting 20 seconds.

Paced breathing is a deeper, slower way of breathing. It involves filling the lungs to full capacity when inhaling and then pushing out as much air as possible when exhaling. In addition to getting more oxygen to the blood, this form of breathing has other added health benefits in the long term, such as lower blood pressure.

2.7   DEVOUTNESS-BASED SALAH

Taqwa is one of those unique words in the Arabic language that cannot simply be translated into a word or two in English. As a result, many translators struggle to bring out the real meaning of the word taqwa. Literally, taqwa means to protect and could be that one protects himself from the Wrath of Allah by protecting himself from indulging in things that Allah forbids. In the Shariah, taqwa as used in the Quran repeatedly, signifies the obedience to the Rules of Islam while avoiding Haraam, and additionally abstaining from unsuitable things in life.

Although Islam stresses equality, one attribute that distinguishes individuals and provides a legitimate basis for hierarchy is the degree of piety and fear of God (Taqwa) that one possesses. Taqwa is a constant consciousness of the existence of the Almighty Allah that ensures that all Muslims follow the path of righteousness. The consciousness that Taqwa implies is a reverential consciousness. The state of alertness when one is in awe and admiration of something or somebody. Imagine participants met their lifelong role model, how attentive to their every need would participants be? Participants would notice all their little quirks and nuances, their body language, behavior, what irks them, and what makes them happy. If they indicated that they want something, participants would rush to get it done in the best manner possible and do it in a way that would make them most happy. participants would suppress any internal resistance inside you that would keep participants from doing the best job. Participants would be 'fearful' in becoming complacent to their need and not doing participants' best for their satisfaction. A parallel example is if participants were in the company of someone you deeply and intensely loved. Participants would anticipate and plan ahead to make them feel as comfortable and at ease as possible. Participants' will always be alert and vigilant and will think ahead so as to avoid any situations or scenarios that would make them even remotely unhappy. All participants' efforts will be focused in keeping them happy and

comfortable as humanely as possibly. If they called upon participants, they would drop everything their would be doing to attend to their need immediately. Also, participants would be so conscious of the surroundings and especially vigilant to how participants act, what participants say or do in their presence, so that they don't get turned off in any way.

Religious meditations (devoutness) and prayers have been found to possibly promote relaxation, as well as a healthier, more balanced condition to the human mind and body (Lee et al., 2007). In (Hazem et al., 2012), the results showed that a significantly higher alpha wave activity was recorded during the prostration position of the Muslim prayer. Although the sample size was comparably small, the findings were in accordance with previously published results on recorded EEG that confirmed the correlation between high alpha wave activity with a relaxed state of mind (Lee et al., 2007). Nor (2011) discussed the meaning of stress, symptoms and methods of dealing with stress from the perspective of psychology, science, and the Islamic perspective specifically on the benefits of prayer. In (Mohd et al., 2011), the analysis of the acquired EEG signal is done by comparing the samples of EEG signal between the activities after Salah and after listening to the music using Principal Component Analysis and Fast Fourier Transform method. The highest amplitude of the power spectrum distribution was observed in the gamma band on EEG compared to other bands (delta, theta, alpha and beta) for both activities. It shows that these five subjects have a high gamma band after Salah compared to after listening to music. It is suggested that when Muslim perform Salah, they tend to forget all the worldly matters and thinks they are standing in front of the 'Allah'. This eventually help them to break their stress for a few times, hence reducing its intensity to facing the worlds' matter after Salah.

Moreover, Nooraini (2011) was to develop and validate a psychological instrument founded upon Al-Quran and As-Sunnah to measure and assess Muslim personality from the perspective of Islam. In this effort, the present researcher combines psychological and spiritual elements in developing the items for each proposed construct and their dimensions. In this study, It was also observed that the prostration in the acted Salah experienced a higher value of the mean alpha relative power when compared to the corresponding position in the actual Salah.

In this investigation, Taqwa is expressed in the processes of Islamic prayer, called devoutness-based Salah. The pillars of Islam are important to follow first and foremost before doing any other act of worship. Not only performing the Salah make people believe in Allah, but also performing devoutly and as perfectly as possible, in accordance with the Sunnah is imperative. In conclusion, the devoutness emphasize the importance of this particular Islamic tradition of living one's life with a full consciousness of God, especially in the processes of Islamic prayer. However, this study will surveys effects of devoutness-based Salah by using psychophysiological analysis techniques.

2.8   SUMMARY

The bulk of this chapter is devoted to an extensive literature search exploring the ways in which various relaxation methods and psychophysiological analysis approaches. First, the chapter provides a definition and description of ways of managing various stress-related ailments. Second, trends in relaxation and religious activates for college students are explored. Third, the chapter discusses research documenting about Islamic approaches effects towards psychophysiology. Fourth, the chapter surveys psychophysiological analysis techniques literature for comments on aspects of the application relationship. Fifth, the definition of devoutness-Based Salah is presented. Finally, the chapter presents the need for a study further exploring this topic.

CHAPTER 3

RESEARCH METHODOLOGY

3.1   INTRODUCTION

The primary aim of this study was to estimate the effects of a 22-day program of devoutness-based Salah practice on female college students. It was hypothesized that, as compared with a group of samples who did not have important change psychophysiological signals (i.e., control group), samples who practiced devoutness-based Salah would report improvements in their autonomic nervous system and relaxation of tension in muscles. Secondary aims were to explore the effects of devoutness-based Salah on the mitigation stress, anxiety and depression symptoms. In the chapter, the procedures of devoutness-based Salah are discussed in the detail. The first section states the devoutness-based Salah evaluation form. The second section covers the methods involved in the study. The selection of subjects is described along with the apparatus and experimental tasks employed in the study. This section also includes the experimental procedure and the training protocol applied in subjects. In the third section, the development of training strategy module is presented. Last section pertains to design and analysis of the study.

3.2   DEVOUTNESS-BASED SALAH EVALUATION

A repeated-measure, within-subject research design was incorporated using a mixed-methodology approach. Each consenting participant met with researcher four times per week for approximately 50 minutes of intervention training using instructions of researchers. The participants were also encouraged and reminded to independently rehearse five times devoutness-based Salah techniques throughout the whole day using

instructions of researchers. The goal of the intervention was to assist the participant in using the Salah relaxation techniques at will without increasing stress during daily study and life activities. This treatment intervention aligns with Devoutness-based Salah evaluation with several steps approach as a component of self-evaluation to Salah training. This evaluation form is built according to the suggestions of Islamic researchers and is revised repeatedly in order to be a correspondent with these Islamic researchers. The Devoutness-based Salah evaluation form is shown as follows.

The questions in this scale ask participants about their devoutness evaluation during Salah. In each case, please indicate with a check how much were participants conscious of all of these things while making Salah?

1. When participants stated the Salah, how much were participants conscious and aware of the particular intention of performing Salah?___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

2. When participants stood for reciting the holy Quran, how much did participants concentrate on general meaning explanation of verses? ___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

3. When participants stood for reciting the holy Quran, how much did participants understand further meaning explanation of verses and backgrounds? ___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

4. When participants recited the holy Quran and Hadith as well as the writings, how much were participants familiar with the standard way?___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

5. When participants bowed down in Ruku' and stated the posture of Salah, how much were participants aware that this bowing down is an act of humility: participants are abasing themselves before Allah (SWT)? ___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

6. When participants stated in Sujud, placing participants foreheads on the ground, participants were lowering themselves before Allah (swt): it showed that participants acknowledged that He is the High One, the Exalted while participants are lowly and insignificant before Him. How much did participants realize that it is a position of humility? ___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

7. How much did participants make gentle movements and recitation while participants performing Salah? ___0=never ___1=almost never ___2=sometimes ___3=fairly ___4=very much

The Devoutness-based Salah evaluation form is a 7-item self report questionnaire that measures persons' evaluation of the Devoutness-based Salah of the situations during their praying. The items are easy to understand and the response alternatives are simple to grasp. Moreover, the questions are quite general in nature and hence relatively free of content specific to any sub-population group. Scores can range from 0 to 28, with higher scores indicating more devoutness. The Devoutness-based Salah evaluation is not a diagnostic instrument, so there are no cut-offs. There are only comparisons between people in a given sample.

3.3   TARGET POPULATION

The target population of participants was recruited through the Student union, advertisements on the website and recommendations from Islamic scholars in the University Malaysia Pahang. Respondents underwent a structured telephone interview and filled in forms to ensure they met the criteria of irregular Salah performances for female Muslim and were then randomly assigned to an intervention or control group. The subject was asked about age, nationality and physical situation. Questionnaires were administered to applicants who fulfilled in the standard perceived stress scale (PSS) form (Cohen et al., 1988), which provides an idea of her general stress state and State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983), which is provided a state or trait of anxiety and depression.

This ongoing analysis continued with interview data thus organized into different sets of working charts. Two participant themes emerged while transcribing the recorded interviews and were verified using researcher reflections and the individual and collective organizing charts. Through this process, it became apparent to the researcher that self-care and community constituted participant-emergent themes which participants appeared to find compelling. After the interview document was finalized and approved by the dissertation director and prior to collecting data, approval to proceed with the study was sought from the center for modern language and human science of proposed student and faculty research at the university where the researcher was a graduate student. An overview of the study, research questions, and all data collection documents, as described herein, were submitted to the center for modern language and human science for approval, which was granted before participants were contacted to participate and before all data collection.

3.4   SELECTION OF PARTICIPANTS

From a total of 50 female volunteers with over 25 scores on the PSS forms and with over 50 scores on the STAI forms, 23 eligible subjects were included in the study. The samples consisted of 23 healthy subjects, 16 female undergraduate students and 7 female graduate students (13 students with migration backgrounds, mean age 22.5 years (SD = 2.2); range 18–28), mean height = 156.0 cm (SD =5.2) and mean weight = 55.2 kg (SD =3.4). People who met to pray for the prayer group were given just the names of the subjects and very preliminary information on their physical condition. Potential participants will call a research assistant who then screens them for eligibility as well as collecting basic demographic information. Demographic characteristics will be collected during initial screening, including country of birth, language spoken in the campus, level of education, immigration background, regular menstrual cycle, praying frequency, if any Government pensions/benefits are received, living situation, and total time spent in a car as a driver or passenger each week. All subjects, belonging to either of the groups, signed a consent form, informing them of the possibility that they might or might not get Salah training. So none of the patients knew whether she actually got Salah training and at the same time, every one stood an equal chance. Throughout, protecting the research participants' identities and privacy was of utmost importance.

Based on their screening process, they have good healthy conditions without Salah performance at least 7 days before training of the first session. To meet study inclusion/exclusion criteria for participation, the participants had no history of heart disease and musculoskeletal disorders, and were asked to avoid hard physical activity the day before the day of measurement, and the subjects were trained by their job task which is keyboard typewriting practice programs (Erik et al., 2003). The subjects were trained in order to work up their typing speed to over fifty words a minute after the whole week training. Inclusion criteria were: age between 19 and 28 years and had the good physical conditions, observed for at least 20 days. All subjects were informed of the study aim and the details of the academic and experimental examinations. Before participation, subjects gave their written informed consent, the study was approved by center for modern languages and human science at University Malaysia Pahang.

3.5   DATA COLLECTION

The investigated constructs in this research included devoutness-based Salah relaxation performance, stressful, anxious and depressive situations, and psychophysiological analysis for biological signals. The psychophysiological parameters were measured by the various psychophysiological indicators that were implemented for all consenting participants over 22-day period. The measurement of psychophysiological signals was evaluated by BioGraph Infiniti's HRV, EMG, SCR and PT. The devoutness-based Salah evaluation form was defined as the levels of the devoutness. The levels of stressful, anxious and depressive situation were evaluated by using modified perceived stress scale and STAI. Relaxation performance was defined as the individual evaluating of modified PSS and STAI by each sample. These relaxations training included the following: sitting in the comfortable armchair with paced breathing practicing and devoutness-based Salah training. Salah training is considered a comprehensive method as the sample attempts to improve devoutness for the Quran and other contents inside Salah.

The effectiveness of devoutness-based Salah for individual analysis was conducted by comparing reference tests before the intervention (baseline setting), during the relaxation performance, after the intervention (post-recovery), the

devoutness-based stability performance in immediate term (post-baseline) and the devoutness-based stability performance in long term (follow-up session). This provided a cause and effect relationship between the Salah interventions and paced breathing relaxation performance. Biological signals with the performance of relaxation were saved at four specific times during each session in two groups. The first three-minute data gathering occurred at the initiation of each session. This data provided a baseline stressful situation reduction consistence in the performance of relaxation, reflecting shifts in autonomic nervous system balance and mental and psychosocial stress. Afterwards, the second three-minute data gathering occurred at Salah practicing period. The third three-minute data gathering occurred at the completion of Salah intervention while the participant was practicing Salah self-evaluation with feedback. This data provided an independent post-recovery relaxation demonstrating the performance of devoutness-based Salah intervention. The fourth three-minute data gathering occurred at the concluding operation of each session. This data provided an independent post-baseline relaxation demonstrating the performance of devoutness-based stability performance in immediate term. After four-week, data gathering in two groups are occurred at the further stage relaxation after the completion of the training session while the participant was practicing devoutness-based Salah and sitting armchair relaxation. This data provided the further relaxation effectiveness of devoutness-based stability performance in long term.

The study is designed follow-up session about one month after 22-days training. The follow-up session is used for tracing the long-term alteration and further revising the protocol. Each of the participants was traced with by way of a phone call. They were reminded that the process should sustain the training according to the agreement. As much as possible the researchers (for example me) validated emotions and explored whether it is possible to reframe any frustration as care, disappointment as commitment, and anxiety as courage. It is an important part of the process for encouraging each sample to persist in the training exercises. In this way, the follow-up session can be confirmed with the correction and effectiveness.

3.6   APPARATUS PREPARATION

3.6.1   ProComp Infiniti System

The ProComp Infiniti is an 8 channels, biofeedback and neurofeedback system with the power needed for real-time data acquisition in any clinical or educational setting. This device has 8 protected pin sensor inputs with two channels sampled at 2048 samples per second and six channels sampled at 256 samples per second. The ProComp Infiniti encoder is able to render a wide and comprehensive range of objective Physiological signs used in clinical observation and biofeedback. The first two sensor channels of the Infiniti encoder provide ultimate signal fidelity (2048 samples per second) for viewing raw EEG, EMG and EKG signals. The remaining six channels (256 samples/sec) can be used with any combination of sensors, including EEG, EKG, RMS EMG, skin conductance, heart rate, blood volume pulse, respiration, goniometry, force, and voltage input. ProComp Infiniti offers internal, user-activated calibration to ensure that participants can always obtain the highest quality signal, without the costly downtime associated with factory re-calibration. In short, the ProComp Infiniti covers the full range of objective physiological signals used in clinical observation and biofeedback. Housed in an ergonomically designed case and requiring only a USB port, ProComp Infiniti can be used with any IBM-compatible laptop or desktop PC. Whats more, ProComp Infiniti can capture data in real time by connecting directly to the PC via fiber-optic cable, or it can store data on a Compact Flash memory card for uploading later to the PC.

Figure 3.1: ProComp Infiniti systems

BioGraph Infiniti Software is shown in Figure 3.2, which is the core of all current and future Thought Technology Biofeedback and Psychophysiology products. It is created in a modular fashion to ensure participants get only what participants need and do not fill participants' computer's memory with unwanted software. It provides a multimedia rich graphical experience, while capturing and analyzing raw data. It includes all the features and functions required to run participants specialized application Suites and offers the ability to customize their own screens and suites using the Developer Tools.
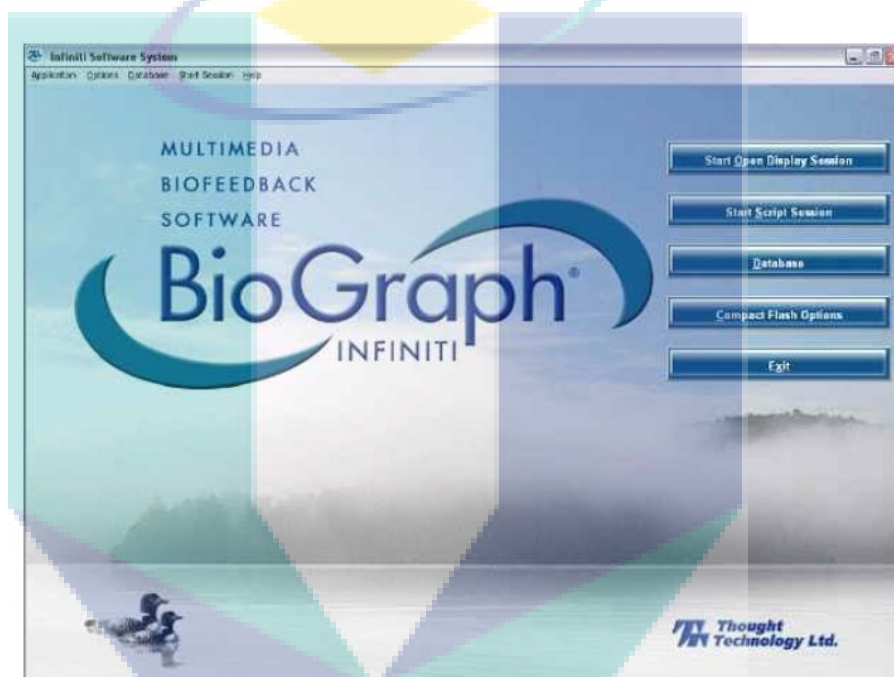
Figure 3.2: BioGraph Infiniti software

3.6.2 Blood Volume Pulse Sensor

ProComp Infiniti Heart Rate/BVP (SA9308M) sensor & cable is 48 inches (122.5 cm) in length and is terminated in a small plastic enclosure which houses both the Photodetector and LED. Used with Thought Technology ProComp Plus, ProComp Infiniti, ProComp 2, Procomp5, or Flexcomp series systems. BVP, Blood Volume Pulse sensor or photoplethysmograph, bounces infra-red light against a skin surface and measures the amount of reflected light. Heart Rate Variability can also be calculated with the BVP.

The Operating Principle of BVP is that Photoplethysmography (PPG) is the process of applying a light source and light sensor to an appendage, such as a finger or a tow, and measuring the light that is reflected by the skin. At each contraction of the heart, blood is forced through the peripheral vessels producing engorgement of the vessels under the light source, there by modifying the amount of light reflected to the photo sensor. Since vasomotor activity is controlled by the sympathetic Nervous System (SNS), the Blood Volume Pulse (BVP) measurements can display changes in sympathetic arousal. An increase in BVP amplitude indicates decreased sympathetic arousal and greater blood flow to the peripheral vessels. Using the hook and loop fastener strap, fasten the sensor enclosure to the pad of a finger. Make sure the placement particients are using is clear of any scar tissue, abrasions or anything that might impede a light source form penetrating through the tissue. Make sure both openings on the enclosure are covered by the placement. Any outside light allowed to get under the enclosure will cause artifact and readings that will be suspect. The BVP signal is a relative measure. It does not have a standard unit.

From the BVP signal, the ProComp Infiniti software can usually calculate heart rate and inter-beat interval. The amplitude of the BVP deviation can also be a useful measure. The BVP sensor is held pressed against the palmar surface of a fingertip with an elastic strap (not tight so as to cut off blood blow) or a small length of adhesive tape. There should be a little movement as possible and the hand should be relaxed. The sensor is very movement sensitive. Although the sensor is not designed for such placement, some users will tape it to an ear lobe with double sided adhesive tape or to other parts of the body where an artery is sufficient for the infra-red light to detect pulsing blood. The resulting BVP signal shows a typical strong rise with the systolic contraction, followed by a somewhat slower fall. On some people, the signal will also show a bump in the falling signal (dicrotic notch), which corresponds with the pulse of the diastolic contraction. The peak-to-peak amplitude of the signal will increase and decrease with changes in sympathetic arousal.
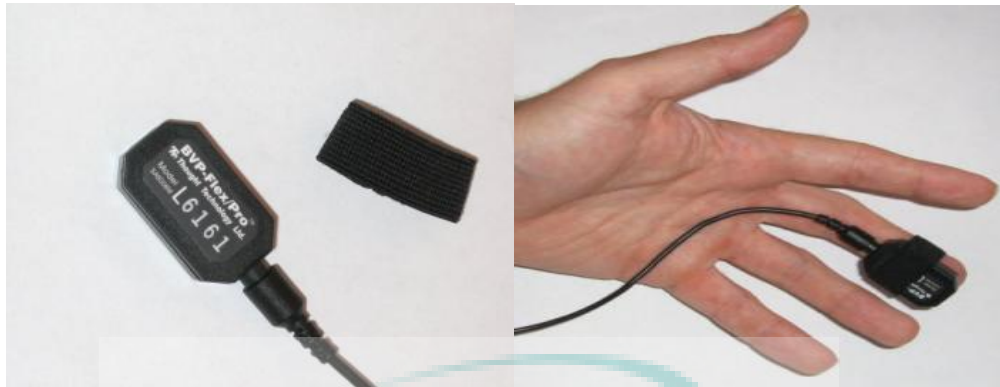
Figure 3.3: Blood Volume Pulse sensors

3.6.3   EMG Sensors

The Myoscan-Pro (SA9401M-60) surface EMG sensor consists of 3 snap style receptacles - 2 active (positive & negative) and 1 reference (ground). This EMG sensor kit (T9401M-60) is for use with Thought Technology ProComp Plus, ProComp Infiniti, ProComp2 and Procomp5. It includes cable that connects the Sensor Head to the ProComp Infiniti encoder and snap lead cable. It is operated in 60Hz environment.

The Surface Electromyography (sEMG) has a positive, a negative and a ground sensor. The signal is measured between the positive and negative. The ground acts as a reference point, and is used in filtering out electrical "noise" that is picked up from all three sensors. Whenever possible, participants recommend the use of disposable sensors. The sEMG measures muscle activity by detecting and amplifying the tiny electrical impulses that are generated by muscle fibers when they contract. Since all the muscle fibers within the viewing and recording area of the sensor contract at different rates, the signal detected by the sensor is a constantly varying difference of potential between its positive and negative sensors. The number of muscle fibers that are recruited during any given contraction depends on the force required to perform the movement. Because of this, the intensity (amplitude) of the resulting electrical signal is in proportional to the strength of contraction.

When placing the sEMG sensor on the muscle site, the best reading are obtained when the sensor is placed on the muscle belly and its positive and negative sensors are parallel to the muscle fibers. When using the extender cable, though, the direction of the

fibers becomes irrelevant since the electrodes are frequently placed on different muscle groups. The positive and negative sensors should still be placed on the muscle bellies. The reference electrode is best placed on a relatively neutral site, like a bony prominence, preferably at an equal distance from the other two sensors.

Figure 3.4: EMG sensors

3.6.4   Skin Conductance Sensor

Skin Conductance sensor (SA9309M) for use with Thought Technology ProComp Plus, ProComp Infiniti, ProComp 2 or 5, or FlexPro series systems. The fingertip skin conductance sensor has two snap leads for easy connection to disposable snap sensors or reusable snap sensors with finger bands. ProComp using SCR assembly is made up of two pieces. The SA9309P cable is approximately 48 inches (122.5 cm) in length and is terminated with two snap receptacles. Two SE35 hook and loop fastener (AgAgCL button) style finger sensors simply snap into the cable. The button sensor, approximately 8mm in diameter, is embedded into the hook and loop fastener band and secured around the finger by connecting the hook and loop fastener. The standard measurement unit for conductance is Siemens.

Skin Conductance is measured in micro-Siemens. These two measures, uS and um, are equivalent. Normal reading, for skin conductance, in a relaxed state is around 2uS, but reading can vary greatly with environmental factors and skin type. Skin conductance is a measure of the skin's ability to conduct electricity by using the forefinger and the ring finger. A tiny electrical voltage is applied through two sensors,

usually strapped to two fingers of one hand, in order to establish an electric circuit where the body becomes a variable resistor. The real-time variation of conductance, which is the inverse of the resistance, is calculated. Skin Conductance increases or decreases proportionally. Skin conductance, galvanic skin response and electro-dermal (EDR) are different terms for similar physiological measures. Skin Conductance is considered to be a function of sweat gland activity and skin pore size, both of which are controlled by the sympathetic nervous system. Sweat glands are activated when the sympathetic nervous system is aroused in response to stress or anxiety. As sweat is produced, the skin's capacity to conduct current is enhanced and the measured conductance is increased. The skin conductance sensor has two short leads that extend from the circuit box. At the end of each lead is a sensor snap similar to those on the extender cables.

The GSR sensor uses two replaceable sensors that are sewn inside a hook and loop style straps. The sensor strap must be fastened around the finger tightly enough so the sensor surface is in contact with the finger pad but not so tightly that it limits blood circulation. No conductive paste should be used on the sensors. Remember to clean the sensors with an alcohol wipe between clients. The Ag/AG/CL sensor snaps should be replaced after about 50 uses or when wear is apparent. Wear is apparent when the dark gray finish shows signs of a silvery color, like a well used silver coin.

Figure 3.5: Skin Conductance sensors

3.6.5 Temperature Sensor

ProComp Infiniti (SA9310M) Temperature Sensor has a bead tip and is a Protected Pin style with a 4 pin barrel connector which slides into a receptacle located on a Thought Technology Encoder. The SA9310M temperature sensor is a 0.125 inch bead thermistor that can detect the temperature of the tissue (skin) on which it is applied. This temperature sensor is for use with Thought Technology ProComp Plus, ProComp Infiniti, ProComp 2, Procomp5, or Flexcomp series systems. The temperature sensor is called a thermistor. This device converts changes in temperature to changes in an electrical current. The body's peripheral temperature, as measured on its extremities, will vary according to the amount of blood perfusing the skin. This, in turn, is dependent on the state of sympathetic arousal. As a person gets stressed, their fingers tend to get colder. Relaxation training involves learning to voluntarily increase the finger temperature. Peripheral temperatures changes are fairly slow and do not have much amplitude. The temperature sensor can be attached to the dorsal or palmar side of the forefinger. If the thermistor is to be used on various parts of the body or among various people, remember to clean the thermistor with an alcohol wipe. Temperature changes as a function of the amount of blood per fusing the tissue. The arterioles supply blood to the tissue are surrounded by smooth muscle fibers that innervated by the sympathetic nervous system (SNS). When sympathetically aroused, the muscles contract causing vasoconstriction and reducing the blood flow to the skin and producing a decrease in tissue temperature. For psychophysiological monitoring, the temperature sensor is usually placed on a finger or toe pad and held lightly in place by a hook and loop fastener ring. The thermistor cable is then slid between the hook and loop fastener and skin so that the bead tip extends about 1/8 inch beyond the hook and loop fastener.

Figure 3.6: Temperature sensor

3.6.6   Perceived Stress Scale

The Perceived Stress Scale is a 10-item self report questionnaire that measures persons' evaluation of the stressfulness of the situations in the past month of their lives. The citation for the 10-item scale is (Cohen and Williamson, 1988). The PSS was designed for use with community samples with at least a junior high school education. The items are easy to understand and the response alternatives are simple to grasp. Moreover, the questions are quite general in nature and hence relatively free of content specific to any sub-population group. There are many different aspects of stress, including (a) actual environmental experiences, (b) subjective evaluations of the stressfulness of a situation, and (c) the affective, behavioral, or biological responses to environmental experiences or their subjective evaluations. The Perceived Stress Scale measures subjective evaluations of the stressfulness of a situation. These are referred to as appraisals or perceptions of stress. This psychological perspective on stress places emphasis on the organism's perception and evaluation of the potential harm posed by stimuli (stressors or events). The perception of threat arises when the demands imposed upon an individual are perceived to exceed his or her felt ability to cope with those demands. This imbalance gives rise to labeling oneself as being stressed and to a concomitant negative emotional response. It is important to emphasize that psychological stress is defined not solely in terms of the stimulus condition or the response variables, but rather in terms of the transaction between the person and the environment. Psychological stress involves interpretation of the meaning of an event and the interpretation of the adequacy of coping resources. In short, the psychological perspective on stress assumes that stress arises totally out of persons' perceptions (whether accurate or inaccurate) of their relationship to their environment" (Cohen et al., 1997).

10-item scale of PSS scores are obtained by reversing the scores on the four positive items, e.g., 0=4, 1=3, 2=2, etc. and then summing across all 10 items. Items 4, 5, 7, and 8 are the positively stated items. Scores can range from 0 to 40, with higher scores indicating greater stress. The PSS is not a diagnostic instrument, so there are no cut-offs. There are only comparisons between people in a given sample.

3.6.7 The State-Trait Anxiety Inventory

The STAI, or State-Trait Anxiety Inventory (STAI) is an instrument that quantifies adult anxiety (a children's version is also available). This particular instrument is used to simplify the separation between state anxiety and trait anxiety, feelings of anxiety and depression. The STAI includes a 40 question response taking approximately 10-20 minutes for completion and the test is given in tens of different languages worldwide. This test is split into the S-Anxiety scale and the T-Anxiety scale, each having 20 items. These tests are answered on the basis of a 1-4 scale, with the focused areas including: worry, tension, apprehension, and nervousness. The current edition is Form Y (STAI Form Y).

The State-Trait Anxiety Inventory (STAI) is a commonly used measure of trait and state anxiety (Spielberger et al., 1983). It can be used in clinical settings to diagnose anxiety and to distinguish it from depressive syndromes. It also is often used in research as an indicator of caregiver distress.

Form Y, its most popular version, has 20 items for assessing trait anxiety and 20 for state anxiety. State anxiety items include: "I am tense; I am worried" and "I feel calm; I feel secure." Trait anxiety items include: "I worry too much over something that really doesn't matter" and "I am content; I am a steady person." All items are rated on a 4-point scale (e.g., from "Not at all" to "Very much so"). Higher scores indicate greater anxiety. The STAI is appropriate for those who have at least a sixth-grade reading level.

Internal consistency coefficients for the scale have ranged from .86 to .95; test-retest reliability coefficients have ranged from .65 to .75 over a 2-month interval (Spielberger et al., 1983). Test-retest coefficients for this measure in the present study ranged from .69 to .89. Considerable evidence attests to the construct and concurrent validity of the scale (Spielberger, 1989).

Studies also have shown that it is a sensitive predictor of caregiver distress over time, and that it can vary with changes in support systems, health, and other individual characteristics (Elliott et al., 1998).

3.7   PROCEDURES

First, an explanation of the evaluation of devoutness-based Salah study using heart rate variability, Electromyography, Galvanic skin response, Phalange temperature and perceived stress scale evaluation were discussed. Second, the psychophysiological indicators devices were demonstrated on the trainer so the samples could visualize biometric indicators on the PC screen. Subsequently, the coach was excused from the room. Third, a list of the exclusion criterion previously mentioned and a one-page consent form (Appendix B) were administered to all 23 samples.

The researcher proceeded to read both forms with the potential participants. At the completion, the participants were given the opportunity to ask any questions. After all questions and concerns were addressed, the samples met individually with the researcher to avoid any peer pressure. If the samples desired to participate, she was requested to sign the consent form and a copy of the form was available to her at her first Salah training session. If any of the exclusion criteria applied to her, the participant simply stated that she was not able to participate without having to identify the reason. If she chose not to participate, the cause for her decision was not inquired. Once the participants were identified and the consent forms signed, an appointment was made with each individual for her first session. Ideally, two-day Salah sessions would be administered over the duration of 20 days. However, considering the busy schedules of student, the protocol allowed for 10 Salah sessions within a 22-day period. The Training description and Protocol is provided in the following subsection.

3.7.1   Protocol Description

The class will introduce students to a variety of techniques by which the anxiety and stress endemic in a fast-paced competitive culture can be both reduced, as well as worked with constructively. Students will engage in both experiential and initiative learning. They will practice and apply techniques of well-being improvement through devoutness-based Salah-the steady, intentional gathering of a non-judgmental awareness into the present moment in various activities.

3.7.2   Protocol Objectives

1. Demonstrate an understanding of current medical-scientific thinking on the anxiety and stress response. 2. Demonstrate an understanding of the physiological and psychological origins of stress in living beings, especially in primates and homosapiens. 3. Demonstrate an understanding of the impact of stress on physical and emotional health. 4. Develop through regular practice both in and out of class the ability to reduce anxiety and stress in their lives through mastery of the following mind-body techniques: devout awareness of the state of the resting physical body through Salah performing; devout awareness of movements and postures in performing Salah; devout awareness of general meaning explanation of writings during Salah; devout awareness of the body, breath, emotions, and thoughts in devout Salah; 5. Develop the ability to wipe out meaningless rituals in Salah and move devout awareness into the ordinary activities of the importance of Salah, the further meaning and background of verse in Quran and Hadith as well as the writings inside Salah, the standard way of Quran recitation, the gentle of movement and reciting writings, the exercise of breathing paralleled with Quran and writings recitation and inspiring imaginations for the further meaning of recitation and practicing the devoutness in daily Salah. 6. Engage in appropriate group discussions and activities in order to share with and support each other as they master devout ideas and practices.

3.7.3   Protocol Requirements And Assignments

i.   Attend training regularly.

ii.   Complete the required readings each day.

iii.   Practicing the devoutness-based Salah assigned five times each day.

iv.   Submit at each class a journal containing brief descriptions of experiences arising in each of the assigned devout practices, and one or two pages of thoughtful responses to assigned questions or issues relating to the readings. These will often be shared with the class.

v.   Submit three formal three-page critiques that connect the intellectual with the experiential dimensions of devoutness practice.

3.7.4   Protocol Session Training Schedule

There will be two classes within 2 hours, as well as a fifteen-minute class session scheduled at the end of every session.

 i. Session 1 Definition of the devoutness during Islamic activities; relevance to stress and health; introduction to assigned texts; in-class writing in which students describe their hopes for and concerns about the course; practice Salah; handouts for the next week's practical work: readings, journal, and learning and practicing Salah using online material of the introduction to Salah.

 ii. Session 2 Present detailed procedures during performing Salah; conduct a detailed discussion about movements, postures and general meaning explanation of writings during Salah (Appendix C).

 iii. Session 3 Paying attention to the importance of intention and discuss the importance and healthy benefits of Salah; It is not necessary to say the intention with the tongue as long as a firm intention has been made in the heart. However, the explicit verbalization of this intention is not required, though it can be helpful. The person should think his prayer to be the last Prayer so that he may perform the best he can. When making intention especially for Salah, one must state the Salah that one is making intention for Salah. Muslims need to pay attention to the intentions for worship; introduce the evidence in the holy Quran and Hadith; introduce focus on pleasant moments; introduce some papers which present the healthy benefits when people adopt Salah; introduce focus on painful moments and discuss coping with both emotional and physical pain.

 iv. Session 4 introduce the further meaning and background of verse in Quran and Hadith as well as the writings inside Salah the focus on these during Salah for devoutness training.

 v. Session 5 Introduce the standard way of Quran recitation and correct the basic faults during reciting. To be beneficial to relaxation with breathing, the standard reciting way is instructed to recite of Quran but alert the long tone having a comparatively great duration in order to benefit for breathing.

vi.   Session 6 Present the gentle of movements and reciting writings.

vii.   Session 7 Do the exercise of breathing paralleled with Quran and writings recitation.

viii.   Session 8 Introduce basically inspiring imaginations for the further meaning of recitation.

ix.   Session 9 Use interactive explanation for improving the performance of devoutness in Salah.

x.   Session 10 introduce and discuss interrelationship of stress and the immune systems; encourage them to performing devout Salah in every cycle during Salah.

3.7.5 Protocol Evaluation Of Assignments

The journals will be assigned full points if the student turns in work on time, meets expectations for length, answers the specific questions posed, and demonstrates a mind at work seeking and practicing intellectual understanding of the nature of devoutness-based Salah experience in general and her prayer experience in particular. The formal critiques will be evaluated as would any piece of academic writing. An excellent critique will be turned in on time, meet expectations for length, demonstrate that the student has mastered the relevant reading and lecture materials, and address the critique assignment in correct, well-organized, and thoughtful college English.

Due to the particularity of Salah for female Muslim, the whole experimental duration is a recurring cycle (beginning at the menarche and ending at the menopause for each sample) within 29 days for each sample. The menstruation of all participants ware requested to report individually. For samples performing Salah easily in the Salah intervention group, samples were trained by detailed procedures during performing Salah (Appendix c) in devoutness-based Salah protocol met over a period of two days before the beginning of experiments, one time per day for 50 minutes in a group setting, as well as over a period of 22-day during experiments, one time after the one session for 15 minutes session training in a group setting.

3.7.6 Devoutness-based Salah Protocol

Throughout the course, participants were guided through standard and basic Salah procedure performing and devoutness training. In the first part, a detailed procedure of performing Salah was introduced including movements, postures and general meaning explanation of writings during Salah. Afterwards, in the second part, the way of performing devout Salah is introduced by Islamic coach including the importance of intention, the importance of Salah, the further meaning and background of verse in Quran and Hadith as well as the writings inside Salah, the standard way of Quran recitation, the gentle of movement and reciting writings, the exercise of breathing paralleled with Quran and writings recitation and inspiring imaginations for the further meaning of recitation.

In detail, participants were taught standard Salah procedure, which is 45-minute exercise in which participants bring attention to different movements and postures by themselves and observe the sensations in those parts of the body, while trying to understanding general meaning explanation of writings during performing Salah. The importance of intention is also a focal point of devoutness-based Salah training, which refers to the firm intent of the heart. Participants were instructed to understand the further meaning and background of verse in Quran and Hadith as well as the writings, and focus on the meaning inside Salah. Participants were instructed to recite of Quran by the standard way but alert the long tone having a comparatively great duration in order to benefit for breathing. When a person recites the holy Quran and writings in the fast ways other than the gentle and standard methods, she is asked to gently recite and exercise breathing way paralleled with Quran and writings recitation due to the standard recitation way producing the natural way for breathing training.

Finally, participants were guided through inspiring imaginations for the further meaning of recitation which emphasize gentle paying attention to the literal meaning and then in-depth interpretation and allow participants to focus on the sensations in the body while performing Salah. The instructor encouraged participants to eventually wean themselves off the compact disc recordings and guideline books through continued practice. Participants were asked to practice outside of group sessions for 5 times Salah per day in the whole week. In the group meetings, participants had the opportunity to

discuss their personal practice of devoutness-based Salah. The syllabus for the devoutness-based Salah for the reduction stressful situation course is included as Appendix C.

3.7.7 Training Processes

The procedures were described in Figure 3.7. The keyboard typewriting practice program was designed to induce both mental and psychosocial stress. The results of stress tests were done after the experiments, which were presented by using the scores of modified PSS form. The order of the test was randomized among the subjects to minimize crossover effects. In addition, the participants were asked to avoid hard physical activities the day before the day of measurement. For measuring HRV, EMG, GSR and PT, during the lunch time but before the second time Salah (Zuhur), subjects were trained by their job task which is keyboard typewriting practice programs. The subjects were enrolled, if they worked up her typing speed to over fifty words a minute after the whole week training. Before the keyboard typewriting practice test started, the subject was told that if he finished the test within a certain amount of time, he would get a reward. If he would not manage to finish within this amount of time, he would be punished. After finishing the present-winning test, the subject was told that he had completed the task well enough to receive the present.

During the subjects being tested, a sitting static trial was collected prior to the test conditions for later determination of periods of muscle activation. They were instructed to keep their stomach in, chest out, shoulder back and head out, in the same time, keep their eyes wide open with a fixed gaze on the screen. This test functioned as a reference test to induce mental and psychosocial stress. The test was done under time pressure. The subject had 20 min to complete 1000 words length keyboard typewriting programs. When an error was made, a red screen appeared, a buzzer sounded and the subject had to typewrite again. A countdown timer was running while the subject was performing the test. The color of the timer bar faded from yellow to red. Beeps sounded at 10:00, 15:00 and 18:00 min. When time was almost up, the program started beeping every two seconds from 19:00 to 19:40 min and it beeped every second during the last 20 seconds.

Although many researchers have quantified muscle fatigue with EMG recorded during dynamic contractions, little was done about continuous typing. Lundervold was one of the pioneers to investigate muscular activities through EMG during typewriting (Lundervold A., 1958). He recorded increasing muscular activities not only in the shoulder and upper arm muscles, but also in the forearm muscles. Some studies have examined the effects of typing on finger flexors and extensors by EMG. But most of these studies included only a few subjects, and the typing was of short duration (Rempel D., et al. 1997).Some authors used EMG as a tool to evaluate the posture resulting from space constraints of the VDT workstations or to find out the appropriate typing force on keyboard to reduce the physical loading during typing (Marklin R.W., Simoneau G.C., 2001). Previous results (Wijsman J., et al. 2010) indicated that these tests successfully induced stress, which resulted in changes in EMG signals of the trapezius muscle. In this study, all the subjects used keyboard typewriting programs to type and their average typing speed and accuracy, determined by the five-time typing tests were 50 words per minute (WPM) and 85%, respectively. Four 5-min typing tests were performed before the start of this experiment to ensure that their typing speed and accuracy qualified for in the present study.
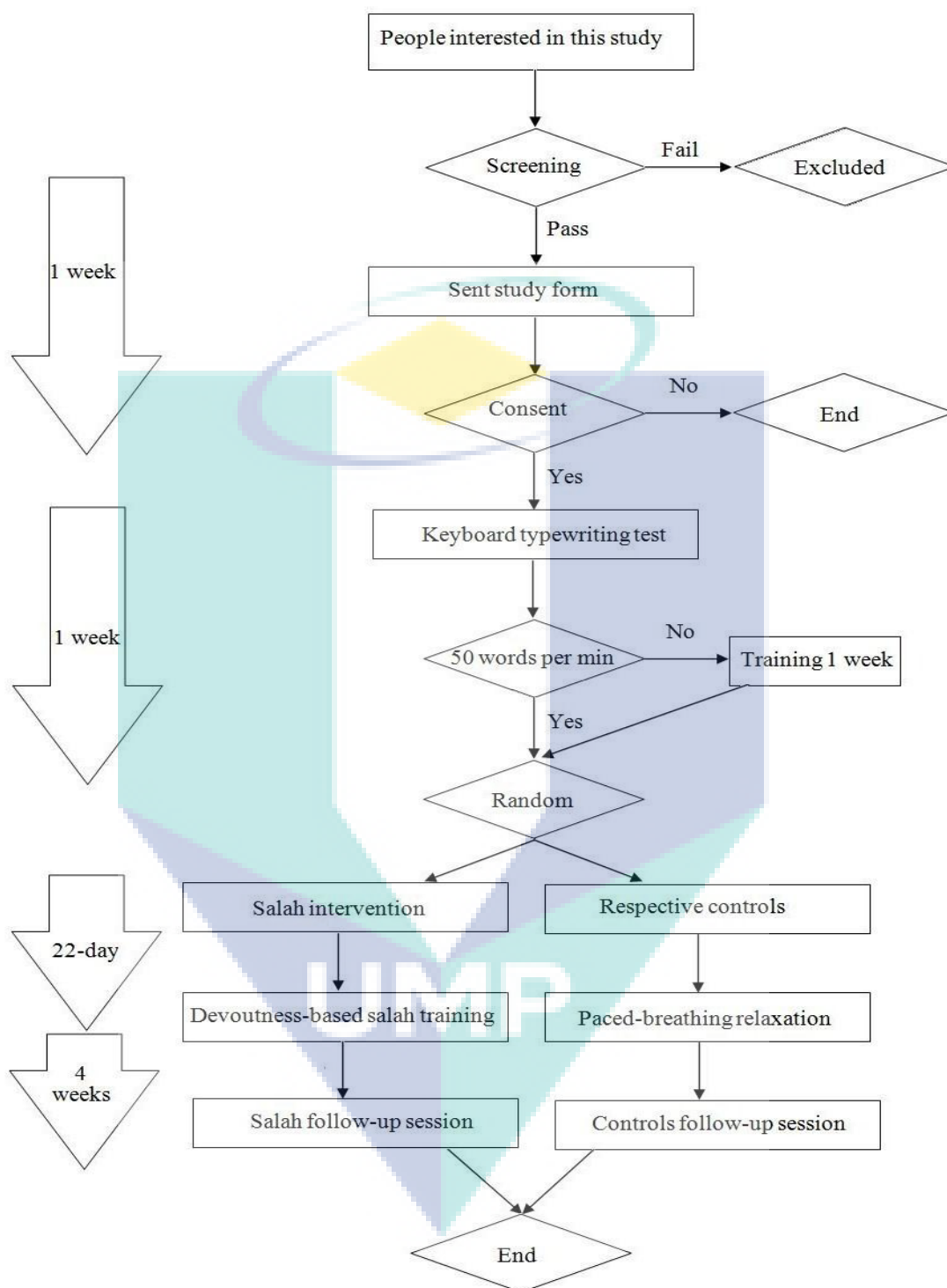
Figure 3.7: Research Procedure
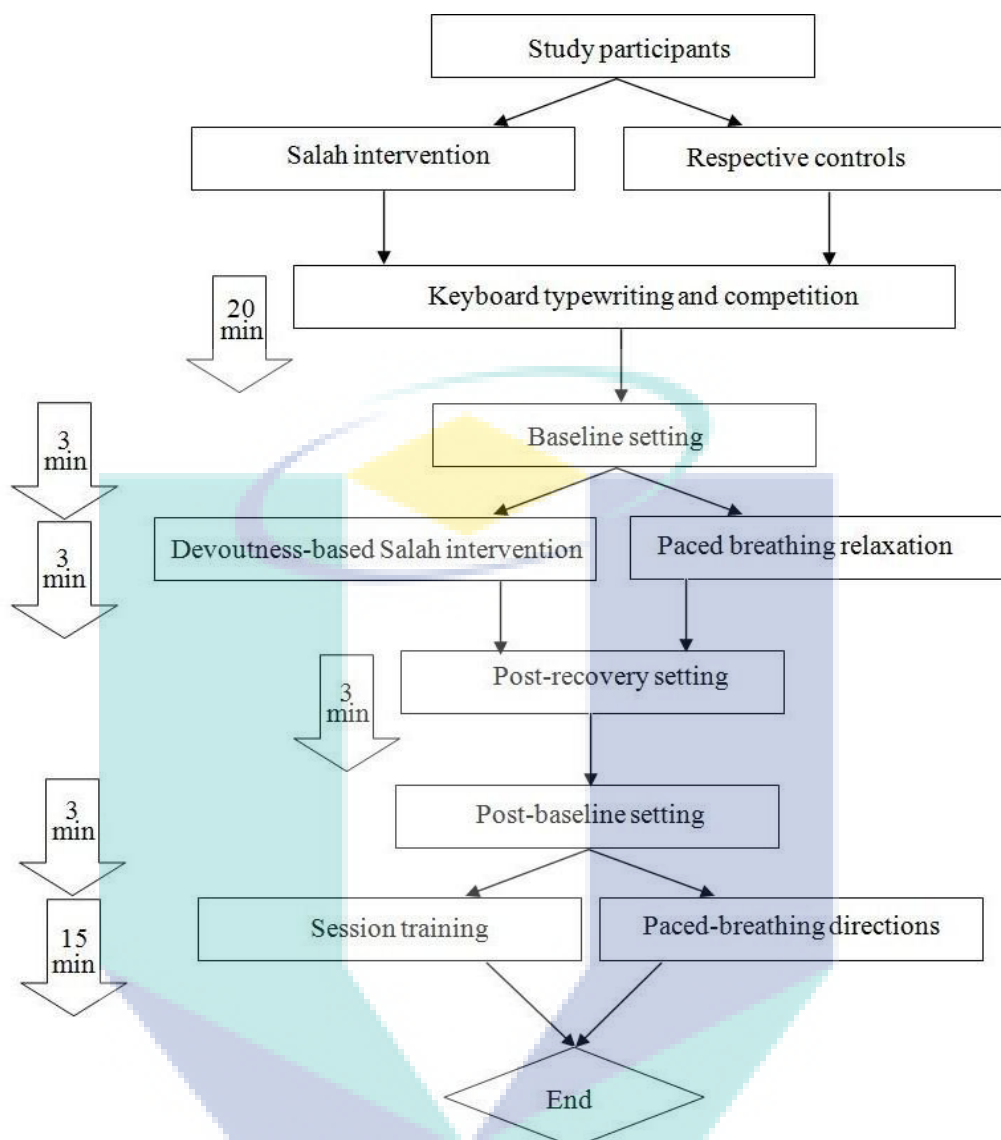
Figure 3.8: Research procedures in one session

Afterwards, continuous HRV, EMG, GSR and PT recordings were made using BioGraph Infiniti Software. For Salah intervention group, the experiments are designated by four periods of baseline, Salah performing, post-recovery and post-baseline each as measuring periods. The periods were defined as follows: baseline (3 min into the baseline period), performing nufl Salah with two cycles (within 3 min, preparing ablution before stress tests), post-recovery (sitting on a comfortable armchair with 3 min after performing Salah) and post-baseline (3 min after post-recovery). For the control group, the samples are instructed by instructor for 12 min relaxation with sitting on a comfortable armchair with paced breathing. It is suggestd that deep breathing into their abdomen to get as much oxygen as possible. Deep breathing can be

practiced anywhere and is a foundation for stress relief. Begin by sitting with their back straight and their legs in a comfortable cross-legged position. Place one hand on their belly and one on their chest. Inhale deeply through their nose into their belly and notice their hand moving. Their chest hand should not move very much. Exhale through their mouth fully, again with their belly hand moving and chest hand not moving much. Continue to inhale through their nose and out through their mouth. Pace themselves slowly, breathing in and out in equal amounts. In this study, the controlled group is trained by the method in (Cohen, 1997). The paced breathing relaxation is described with inhaling for 20 seconds, then pausing and retaining the breath for 20 seconds and finally breathing out in a long exhalation lasting 20 seconds. In this group, biometric indicators (HRV, EMG, GSR and PT) are measured by the same periods as the Salah intervention group. The follow-up session is designed by measuring the long-term effects of two groups. The measures were administered four weeks after the last treatment session.

The experimental groups completed the stress tests. The modified PSS forms and STAI are filled out after each stress test and stress test in the follow-up session. Research procedures in one session are described by Figure 3.8. Therefore, the follow-up measures functioned as a pretest as well for these participants. The study calculated mean HRV (HF, LF, LF/HF, and HR), EMG, GSR and PT for each measuring period for compare the effectiveness of two groups. To be suitable for the designation model, the modified PSS (Appendix A) form and STAI (Appendix D) are used for evaluating the stress, anxiety and depress of samples every two days. Perceived stress and state-trait anxiety inventory questionnaires had to be filled out before the baseline period. The answers in modified PSS had to be given on a five-point scale with scores ranging from zero (not at all) to four (very much), and The answers in STAI had to be given on a four-point scale with scores ranging from one to four.

3.8   DATA ANALYSIS

The values, which were used in the analysis, were based on mean values measured during the whole period of experiments. Differences for the level of stressful situation reduction using modified PSS and STAI, as well as the performance of mental

and psychosocial relaxation (dependent variables), before and after the devoutness-based Salah intervention and paced breathing relaxation of psychophysiological analysis in two groups, were analyzed the comparison of any differences between the two groups and variations over time for biological signals. the Statistical Package for the Social Sciences (IBM©, SPSS Version 19.0) is applied for data analysis. Data will be presented as the mean ± standard deviation or median and range, as appropriate. Confidence intervals will be used to express group differences. A p value of < 0.05 will be considered indicative of statistical significance; clinical significance will be interpreted in light of the meaningfulness and magnitude of the adaptations observed. All psychophysiological signals were recorded by ProComp Infiniti systems using database storage to document each participant's experimental data, which provided a verifiable data trail and thus trustworthiness for both the participant and researcher.

Selected sample was used to address the Null hypothesis (H_{1O}): There is no improvement in samples' performance with the incorporation of Salah training for women collegiate students over a 22-day period as measured by psychophysiological signals. Alternate hypothesis (H_{11}): samples' performance improves as measured by measured by psychophysiological signals with the incorporation of Salah training for women collegiate students. The mean scores, from the evaluation rubric implemented in each period before the intervention, were compared with mean scores from each period during and after the intervention. Excel was used to calculate the data, for analyzing individual scores. A repeated-measure was used to address the two hypotheses relating to psychological and mental changes. Null hypothesis (H_{2O}): The worshiper' psychophysiological signals and the level of negative emotion vary unstably after receiving devoutness-based Salah training in long-term duration. Alternate hypothesis (H_{21}): The worshiper' psychophysiological signals and the level of negative emotion improve stably after receiving devoutness-based Salah training in long-term duration.

3.9   SUMMARY

The purpose of this study was to implement a 22-day Islamic prayer training protocol encompassing modified perceived stress scale and STAI as mental health evaluation techniques with 23 female Muslims. The effects of this devoutness-based

Salah were investigated on psychophysiological signals using biofeedback indicators via stressful, anxious and depressed situation reducing. In this chapter, the methods of the whole study were introduced in detail. The heart rate variability, Electromyography, Galvanic skin response, Phalange temperature STAI and perceived stress scale evaluation were discussed. The procedures was presented step by step. The values, which were used in the data analysis, were based on mean values and standard deviation measured during the whole period of experiments.
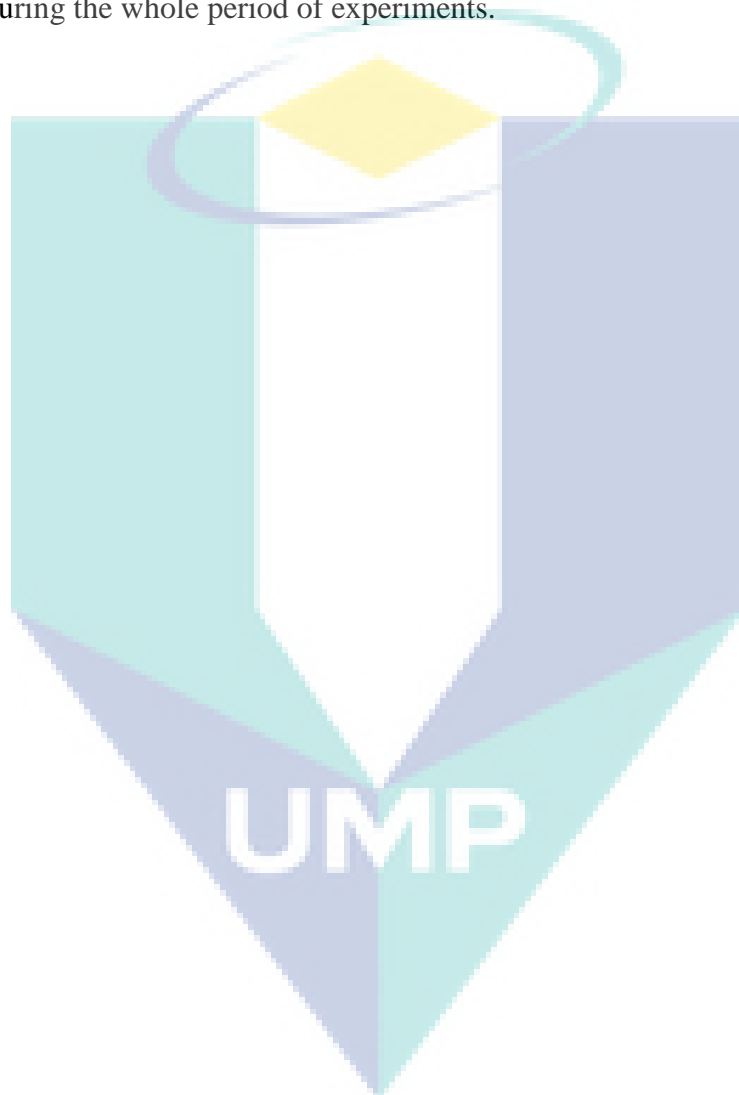
CHAPTER 4

RESULTS

4.1   INTRODUCTION

The purpose of this research was to examine the positive psychological functioning during practitioners' devoutness-based Salah. Specifically, the research investigated the impacts of the quality of Salah devoutness on the individual's psychological well-being, through their biological signals (HRV, EMG, GSR and PT) detected by ProComp Infiniti systems. The capter discussed results and alalysis for various factors used in this research such as HRV, EMG, GSR and PT, and in association with PSS, STAI and the devoutness-based Salah evaluation.

4.2   FACTORS SETTING OF PSYCHOPHYSIOLOGICAL ANALYSIS

Religious activities have become increasingly popular in the whole of this world as a method for coping with stress. For Muslims there are religious obligations, such as prayer, that place postural demands on the human body. Prayer is the second most important essential observances known as the five pillars of Islam and must be adhered to on a daily basis. For Muslims, prayer must be performed at least five times per day and consists of a number of cycles. Every cycle contains a sequence of movements and postures that must be done in a specific order, from upright stance to bowed posture and then completed with prostration (Khan 1993 and Matraji 1993). However, little is known about the physiological and psychological effects through psychophysiological analysis of Islamic prayer.

In this study, physiological parameters (HRV, EMG, GSR and PT) were measured in a devoutness-based Salah practicing group and a control group of young female volunteers sitting in a comfortable position during the experimental period. Generally, the results show that there were no substantial differences in the beginning between the groups concerning heart rate parameters; but after the Salah practice, the Salah group had a decrease of heart rate parameters. Significant differences between both groups were found in psychological parameters using modified PSS and STAI scales. In the Salah group, parameters showed markedly higher scores in devoutness evaluation in comparison with the first session and lower scores in modified PSS and STAI. In biological signals, significant differences of the Salah group could also be observed concerning coping with stress, anxiety and depression at the end of stress test. The Salah group had significant lower scores in modified PSS and STAI. More detailed results and analysis are provided in the following.

4.3   PHYSIOLOGICAL RESULTS OF BVP

4.3.1 Heart Rate

People's resting heart rate is a significant predictor of future heart attacks. How fast participants' heart goes at rest is a sign of participants' fitness, participants' stress levels, no matter whether participants' heart is under pressure from high blood pressure or all sorts of other things. It's not that there's a particular cut-off, it's just the faster participants' heart goes, the worse off participants are. Female with faster resting pulses were more likely to be obese, to be older and to have coronary risk factors like high blood pressure and high cholesterol. But even when participants removed those factors, resting pulse rate was still a factor in its own right. Female with a pulse rate of over 76 beats per minute were 26 per cent more likely to die of heart disease or have a heart attack than women whose resting pulse was under 62 per minute.

(a) Baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow w-up
Baseline CL group	79.17	82.26	80.27	79.02	82.55	79.72	82.6	80.7	79.2	80.73	82.02
Baseline SL group	85.93	83.85	81.42	84.4	80.37	78.53	75.97	73.92	72.64	67.26	68.37

(b) During Training

Session	1	2	3	4	5	6	7	8	9	10	Follow w-up
During training CL group	79.02	80.4	79.38	80.95	80.48	79.18	80.23	79.4	78.04	79.36	80.44
During training SL group	95.1	86.71	91.52	88.62	95.25	87.3	84.28	93.93	82.25	81.62	86.32

(c) Post-recovery

Session	1	2	3	4	5	6	7	8	9	10	Follow w-up
Post-recovery CL group	79.01	81.83	81.08	80.37	79.68	79.13	80.12	82.63	79.47	79.54	82.38
Post-recovery SL group	86.83	80.03	79.22	77.71	83.82	77.23	75.43	84.89	70.09	68.57	69.2

Post-baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-baseline CL group	79.92	80.87	82.63	79.78	80.13	82.39	79.96	80.88	81.27	80.94	84.35
Post-baseline SL group	84.69	78.93	78.18	76.65	79.04	76.64	74.04	76.27	69.77	66.93	68.82

(d) Post-baseline

Figure 4.1: Heart rate results

Figure 4.1 illustrates the HR relaxation effect evaluation results between two groups of CL and SL, during 10 sessions with 22-day of baseline, training, post-recovery, post-baseline and follow-up. In the first session, the baseline, post-recovery and post-baseline of two intervention groups showed insensible changes in heart rate. Heart rates in the post-baseline of the second session however, indicated the decrease between the two groups over the intervention relaxation period with heart rates in the devoutness-based Salah group decreasing, in contrast to the control group where heart rates had no difference. From the third session, this decrease in heart rate was essentially maintained throughout the subsequent sessions of treatment and follow-up.

From Figure 4.1, when comparing the variations in heart rate across sessions in baseline and post-baseline, the evident change was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased heart rate in the baseline and the post-baseline of the 22-day training period as well as the follow-up session. However, the increased trend disappeared in the fourth session and the eighth session. In contrast, heart rates of the control group were irregularly unstable in baseline and post-baseline with no evident gradual change occurring over the 22-day. From the whole training, this decrease in heart rates was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with the last two sessions. Moreover, the follow-up session showed that in

baseline and post-baseline of the control group, the psychophysiological values of heart rates were conservatively unvarying compared with the baseline of the first session.

To compare the HR in Salah group and the respective control group, the interval expression of Figure 4.1 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) in training sessions and the follow-up session. The Figure 4.1, presented in a interval expression, shows the general trend in heart rate. According to the Figure 4.1, these show the changes in the number of heart rate over the interval from 0 to 90 times. In the Salah group, in the post-baseline section, over the interval, from the first session to the fifth session the heart rate remained level. After the fifth session, the curve shows the a little fluctuation of reducing the heart rate. After the eighth session, the curve shows the great changes of reducing the heart rate. Furthermore, in the follow-up session, according to Figure 4.1, the interval expression provides changes in heart rate data which can be kept the decreasing trend and have not back the same interval of the first session. The similar changes in during training and post-recovery sections, it is apparent from the Figure 4.1, and the baseline section always keeps distinctly decreased.

In another hand, in the control group, in the post-baseline section, over the interval, from the first session to the last session the heart rate remained the same interval level and increased distinctly. From Table 4.1, the comparison of both groups did not show any statistically significant difference between the groups before trainnig. Mean HR in the experimental group before Salah was 85.93. This decreased to 66.93 after Salah intervention. Furthermore, this decrease was statistically significant (p value=0.07). Mean HR in the control group was 79.17 at the beginning and 80.94 after training sessions, but these were also not significantly different (p value=0.95). Moreover, in the follow-up session, the interval expression provides changes in heart rate data which cannot be kept the decreasing trend. Mean HR in the experimental group was 68.82, which indicated statistically stable changes. Mean HR in the control group was 84.53, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group and the control group. Therefore, the second null hypothesis of the research

question 4 was rejected.The similar changes in during training and post-recovery sections, it is apparent from the Figure 4.1. Moreover, the baseline section always keeps distinctly unchanged.

4.3.2   Low Frequency

The results of this study suggest that devoutness-based Salah may be an effective technique to employ while training samples with stress, anxiety and depression. In this study, samples underwent 22-day of training, where they received intervention with the assistance in solving stress, anxiety and depression problems. Figure 4.2 illustrates the Low Frequency in HRV evaluation between two groups during 10 sessions with 22-day of baseline, treatment, post-recovery, post-baseline and follow-up. In the first session, the baseline, post-recovery and post-baseline of intervention and control groups showed no evident difference in Low Frequency. Low Frequency in the post-baseline of the third session however, indicated evidently different between the two groups over the intervention relaxation period with Low Frequency in the devoutness-based Salah group reducing, in contrast to the control group where Low Frequency had not the evident differences. From the third session, this decrease in Low Frequency was essentially maintained throughout the subsequent sessions of treatment and follow-up.

From Figure 4.2, when comparing the variations in Low Frequency across sessions in baseline and post-baseline, a evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased Low Frequency in the baseline and the post-baseline of the 22-day training period as well as follow-up session. In contrast, Low Frequency of the control group were unstable irregularly behavior in baseline and post-baseline with no evident gradually change occurring over the 22-day. From the whole training, this decrease in Low Frequency was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with last two session. Moreover, the follow-up session shown that in baseline and post-baseline of the control group, the psychophysiological values of Low Frequency of conservatively were unvarying compared with the baseline of the first session.

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
baseline CL group	45.97	43.52	45.77	44.2	43.16	40.33	41.9	42.25	42.14	42	44.59
baseline SL group	47	30.76	37.92	22.03	28.7	29.03	18.4	20.18	20.52	16.19	19.86

(a) Baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
During training CL group	60.67	43.18	49.69	56.39	45.33	50.09	46.83	53.74	48.37	50.94	49.77
During training SL group	25.55	44.86	28.7	45.87	36.3	41.33	36.1	39.66	45.3	23.77	33.32

(b) During Training

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-recovery CL group	47.55	40.17	43.53	52.71	47.31	50.81	49.34	47.11	43	45.76	50.21
Post-recovery SL group	29.88	26.25	23.22	24.4	20.81	19.45	19.25	17.06	16.48	17.94	20.24

(c) Post-recovery

(d) Post-baseline

Figure 4.2 Low Frequency results

To compare the LF in Salah group and the respective control group, the interval expression of Figure 4.2 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) in training sessions and the follow-up session. The Figure 4.2, presented in a interval expression, shows the general trend in low frequency. Refering to Figure 4.2, these show the changes in the number of low frequency over the interval from 0 to 70 uv. In the Salah group, in the post-baseline section, over the interval, from the first session to the fourth session the low frequency remained level. After the fourth session, the curve shows a little fluctuation of reducing the low frequency. After the seventh session, the curve shows the great changes of reducing the low frequency. Furthermore, in the follow-up session, based on Figure 4.2, the interval expression provides changes in low frequency data which can be kept the decreasing trend and have not back the same interval of the first session. The similar changes during training and post-recovery sections, it is apparent from Figure 4.2. From Table 4.2, the comparison of both groups did not show any statistically significant difference between the groups before trainnig. Mean LF in the experimental group before Salah was 47.00. This decreased to 11.82 after Salah intervention. Furthermore, this decrease was statistically significant (p value =0.01). Mean LF in the control group was 45.97 at the beginning and 44.17 after training sessions, but these were also not significantly different (p value=0.97). The devoutness-based Salah protocol benefited female college students by psychophysiological analysis

compared between Salah group and the control group over a 22-day period. Therefore, the first null hypothesis of the research question 3 was rejected. Moreover, in the follow-up session, the interval expression provides changes in heart rate data which cannot be kept the decreasing trend. Mean LF in the experimental group was 16.04, which indicated statistically stable changes. Mean LF in the control group was 47.29, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group and the control group. Therefore, the second null hypothesis of the research question 4 was rejected. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.2. Moreover, the baseline section always keeps distinctly unchanged.

4.3.3   High Frequency

Spectral analysis of heart rate variability (HRV) provides a noninvasive measure of cardiac autonomic function. For two decades, the high-frequency (HF) component of HRV, which corresponds to respiratory sinus arrhythmia (RSA), was commonly used to assess changes in cardiac vagal control. Figure 4.3 illustrates the High Frequency evaluation between two groups during 10 sessions with 22-day of baseline, treatment, post-recovery, post-baseline and follow-up. In the first session, the baseline, post-recovery and post-baseline of two intervention groups showed no evident difference in High Frequency. High Frequency in the post-baseline of the fifth session however, indicated evidently different between the two groups over the intervention relaxation period with the mean value of High Frequency in the devoutness-based Salah group increasing, in contrast to the control group where High Frequency had not the evident differences. From the fifth session, this increase in High Frequency was essentially maintained throughout the subsequent sessions of treatment and follow-up.
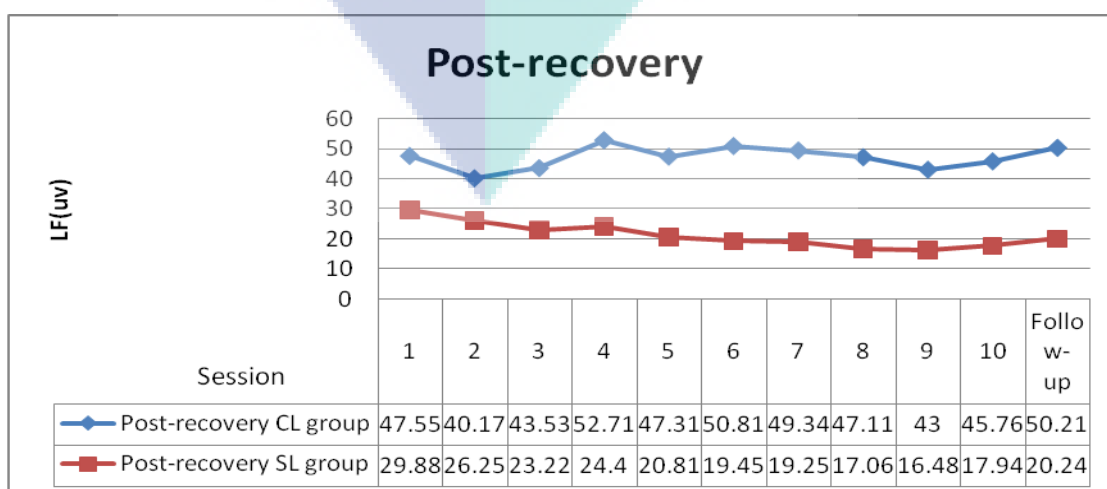
From Figure 4.3, when comparing the variations of High Frequency across sessions in baseline and post-baseline, a evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively increased mean value of High Frequency in the baseline and the post-baseline of the 22-day training period as well as follow-up session. In contrast, mean value of High Frequency of the

control group were unstable irregularly behavior in baseline and post-baseline with no evident gradually change occurring over the 22-day. From the whole training, this increase in mean value of High Frequency was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with last two session. Moreover, from Table 4.1, the follow-up session is shown that in baseline and post-baseline of the control group, the psychophysiological values of High Frequency of conservatively were unvarying compared with the baseline of the first session.

To compare the HF in Salah group and the respective control group, the interval expression of Figure 4.3 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) in training sessions and the follow-up session. Figure 4.3, presented in an interval expression, show the general trend in high frequency. According to Figure 4.3, these show the changes in the number of high frequency over the interval from 0 to 70 uv. In the Salah group, in the post-baseline section, over the interval, from the first session to the fourth session the high frequency remained level. After the fourth session, the curve shows the a little fluctuation of increasing the high frequency. After the seventh session, the curve shows the great changes of increasing the high frequency. Furthermore, in the follow-up session, according to Figure 4.3, the interval expression provides changes in high frequency data which can be kept the increasing trend and have not back the same interval of the first session. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.3.

From Table 4.1, the comparison of both groups did not show any statistically significant difference between the groups before trainnig. Mean HF in the experimental group before Salah was 27.57. This increased to 58.47 after Salah intervention. Furthermore, this increase was statistically significant (p value =0.03). Mean HF in the control group was 30.93 at the beginning and 34.72 after training sessions, but these were also not significantly different (p value=0.84). The devoutness-based Salah protocol benefited female college students by psychophysiological analysis compared between Salah group and the control group over a 22-day period. Therefore, the first null hypothesis of the research question 3 was rejected. Moreover, in the follow-up

session, the interval expression provides changes in heart rate data which cannot be kept the increasing trend. Mean HF in the experimental group was 50.21, which indicated statistically stable changes. Mean HF in the control group was 28.04, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group and the control group. Therefore, the second null hypothesis of the research question 4 was rejected.The similar changes in during training and post-recovery sections, it is apparent from Figure 4.3. Moreover, the baseline section always keeps distinctly unchanged.

Baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
baseline CL group	30.93	25.75	31.04	31.75	32.07	30.35	31.59	32.71	31.7	33.61	24.4
baseline SL group	27.57	21.69	30.78	35.15	40.04	41.48	48.15	46.33	44.77	50.64	47

(a) Baseline

During training

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
During training CL group	32.09	27.95	32.33	32.21	32.87	31.28	33.16	34.62	33.75	34.47	28.55
During training SL group	20.24	27.01	20.91	41.81	28.29	33.26	22.16	17.81	35.63	29.89	22.55

(b)During Training

(c)Post-recovery

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-recovery CL group	33.55	30.94	32.25	33.28	34.55	33.03	34.36	35.22	34.26	35.12	29.84
Post-recovery SL group	37.37	43.37	32.96	43.19	40.55	40.4	53.17	37.28	38.89	55.89	29.88

(d)Post-baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-baseline CL group	32.7	33.77	34.01	33.25	36.3	35.78	35.26	35.33	35.34	34.72	28.04
Post-baseline SL group	42.62	50.89	45.53	47.16	48.29	47.22	55.56	62.32	48.99	58.47	50.21

Figure 4.3 High Frequency results

4.3.4   LF/HF Ratio

Figure 4.4 illustrates the LF/HF ratio in HRV evaluation between two groups during 10 sessions with 22-day of baseline, treatment, post-recovery, post-baseline and follow-up. In the first session, the baseline, post-recovery and post-baseline of two intervention groups showed no evident difference in LF/HF ratio. LF/HF ratio in the post-baseline of the fourth session however, indicated evidently different between the two groups over the intervention relaxation period with LF/HF ratio in the devoutness-based Salah group reducing, in contrast to the control group where LF/HF ratio had not

the evident differences. From the fourth session, this decrease in LF/HF ratio was essentially maintained throughout the subsequent sessions of treatment and follow-up.

From Figure 4.4, when comparing the variations in LF/HF ratio across sessions in baseline and post-baseline, a evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased LF/HF ratio in the baseline and the post-baseline of the 22-day training period as well as follow-up session. In contrast, LF/HF ratio of the control group were unstable irregularly behavior in baseline and post-baseline with no evident gradually change occurring over the 22-day. From the whole training, this decrease in LF/HF ratio was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with last two session. Moreover, the follow-up session shown that in baseline and post-baseline of the control group, the psychophysiological values of LF/HF ratio of conservatively were unvarying compared with the baseline of the first session.

To compare the LF/HF ratio in Salah group and the respective control group, the interval expression of Figure 4.4 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) in training sessions and the follow-up session. The two figures, presented in a interval expression, shows the general trend in LF/HF ratio. According to the two figures, these show the changes in the number of LF/HF ratio over the interval from 0 to 7. For the Salah group, in the post-baseline section, over the interval, from the first session to the fifth session the LF/HF ratio remained level. After the fifth session, the curve shows a little fluctuation of reducing the LF/HF ratio. After the eighth session, the curve shows the great changes of reducing the LF/HF ratio. Furthermore, in the follow-up session, according to Figure 4.4, the interval expression provides changes in LF/HF ratio data which can be kept the decreasing trend and have not kept the same interval of the first session. The similar changes during training and post-recovery sesson, it is apparent from Figure 4.4. From Table 4.1, the comparison of both groups did not show any statistically significant difference between the groups before trainnig. Mean LF/HF in the experimental group before Salah was 6.11. This decreased to 0.68 after Salah intervention. Furthermore, this decrease was statistically significant (p value =0.05). Mean LF/HF in the control group was 3.01 at the beginning and 3.05 after training

sessions, but these were also not significantly different (p value=0.77). The devoutness-based Salah protocol benefited female college students by psychophysiological analysis compared between Salah group and the control group over a 22-day period. Therefore, the first null hypothesis of the research question 3 was rejected. Moreover, in the follow-up session, the interval expression provides changes in heart rate data which cannot be kept the decreasing trend. Mean LF/HF in the experimental group was 0.58, which indicated statistically stable changes. Mean LF/HF in the control group was 2.66, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the samples have stably benefits from the protocol compared between Salah group the control group. Therefore, the second null hypothesis of the research question 4 was rejected. The similar changes in during training and post-recovery sessions, it is apparent from Figure 4.4. Moreover, the baseline section always keeps distinctly unchanged.

Baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
baseline CL group	3.01	2.89	3.04	2.21	2.77	1.97	2.31	3.17	2.25	2.54	3.09
baseline SL group	6.11	4.45	5.51	4.8	4.59	4.11	3.07	5.3	4.42	3.8	4.48

(a) Baseline

During Training

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
During training CL group	2.82	3.15	3.48	2.57	2.81	2.01	2.54	2.83	3.11	2.77	3.22
During training SL group	5.23	3.38	4.55	3.28	4.07	2.59	1.31	4.4	1.53	2.72	2.96

(b)During Training

Post-recovery

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-recovery CL group	3.35	3.26	3.41	3.07	2.49	3.07	2.69	3.14	3.34	2.98	2.02
Post-recovery SL group	3.12	1.83	2.95	2.68	2.22	1.47	1.17	1.52	1.01	1.26	2.07

(c)Post-recovery

Post-baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-baseline CL group	3.27	3.31	3.04	2.81	3.12	2.83	3.01	2.44	3.24	3.05	2.66
Post-baseline SL group	0.51	0.71	0.57	0.56	0.94	0.75	0.29	1.79	0.63	0.68	0.58

(d)Post-baseline

Figure 4.4 LF/HF ratio results

4.4   EMG RESULTS

Electromyography (EMG) is a diagnostic procedure to assess the activity of muscles and the nerve cells that control them (motor neurons). Motor neurons transmit electrical signals that cause muscles to contract. An EMG translates these signals into graphs, sounds or numerical values that a specialist interprets.

Figure 4.5 illustrates the EMG relaxation effect evaluation between two groups during 10 sessions with 22-day of baseline, treatment, post-recovery, post-baseline and

follow-up. In the first session, the baseline, post-recovery and post-baseline of two intervention groups showed no evident difference in EMG. EMG in the post-baseline of the fourth session however, indicated evidently different between the two groups over the intervention relaxation period with EMG in the devoutness-based Salah group decreasing, in contrast to the control group where EMG had not the evident differences. From the fourth session, this decrease in EMG was essentially maintained throughout the subsequent sessions of treatment and follow-up.

From Figure 4.5, when comparing the variations in EMG across sessions in baseline and post-baseline, a evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased EMG in the baseline and the post-baseline of the 22-day training period as well as follow-up session, however, this decreased trend disappeared in the sixth session and eight session. In contrast, EMG of the control group were unstable irregularly behavior in baseline and post-baseline with no evident gradually change occurring 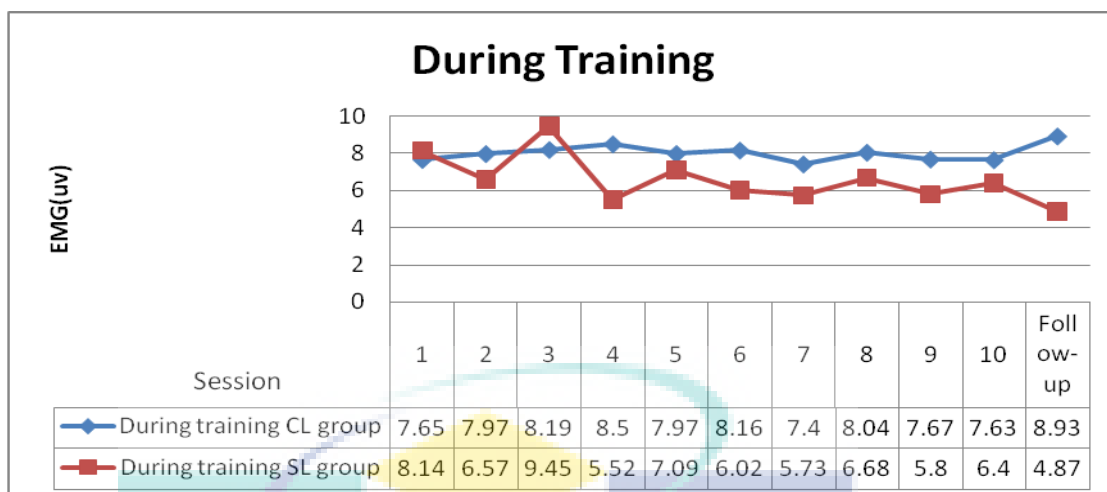over the 22-day. From the whole training, this decrease in EMG was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with last two session. Moreover, the follow-up session shown that in baseline and post-baseline of the control group, the psychophysiological values of EMG of conservatively were unvarying compared with the baseline of the first session.

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
baseline CL group	11.97	11.39	10.54	10.11	10	10.32	11.75	10.66	10.9	10.65	12.32
baseline SL group	12.61	11.93	11.22	10.84	9.03	11.17	8.39	9.45	8.22	8.36	7.97

(a)Baseline

During Training

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
During training CL group	7.65	7.97	8.19	8.5	7.97	8.16	7.4	8.04	7.67	7.63	8.93
During training SL group	8.14	6.57	9.45	5.52	7.09	6.02	5.73	6.68	5.8	6.4	4.87

(b) During Training

Post-recovery

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-recovery CL group	4.47	4.55	4.51	4.28	3.97	4.4	3.75	4.82	4.61	5.16	6.89
Post-recovery SL group	3.35	4.04	3.75	3.67	3.27	2.72	2.4	2.98	2	2.33	2.27

(c) Post-recovery

Post-baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-baseline CL group	4.24	4.58	4.38	4.07	3.66	4.25	3.57	4.31	4.19	4.83	4.91
Post-baseline SL group	2.9	2.85	3.32	3.06	2.72	2.6	2.38	2.33	1.7	2.18	1.91

(d)Post-baseline

Figure 4.5 EMG Results

To compare the EMG in Salah group and the respective control group, the interval value of Figure 4.5 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) in training sessions and the follow-up session. Figure 4.5, presented in a interval expression, shows the general trend in EMG. Based on Figure 4.5, these show the changes in the number of EMG over the interval from 0 to10 uv. In the Salah group, for the post-baseline section, from the first session to the fifth session the EMG remained stable. After the fifth session, the curve shows a little fluctuation of reducing the EMG. After the eighth session, the curve shows the great changes of reducing the EMG. Furthermore, in the follow-up session, according to Figure 4.5, the interval expression provides changes in EMG data which can be kept the decreasing trend and have not backed the same interval of the first session. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.5. From Table 4.1, the comparison of both groups did not show any statistically significant difference between the groups before trainnig. Mean EMG in the experimental group before Salah was 12.61. This decreased to 2.18 after Salah intervention. Furthermore, this decrease was statistically significant (p value=0.04). Mean EMG in the control group was 11.97 at the beginning and 4.83 after training sessions, but these were also not significantly different (p value=0.21). The devoutness-based Salah protocol benefited female college students by psychophysiological analysis compared between Salah group and the control group over a 22-day period. Therefore, the first null hypothesis of the research question 3 was rejected. Mean EMG in the experimental group was 1.91, which indicated statistically stable changes. Mean EMG in the control group was 4.91, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group and the control group. Therefore, the second null hypothesis of the research question 4 was rejected. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.5. Moreover, the baseline section always keeps distinctly unchanged.
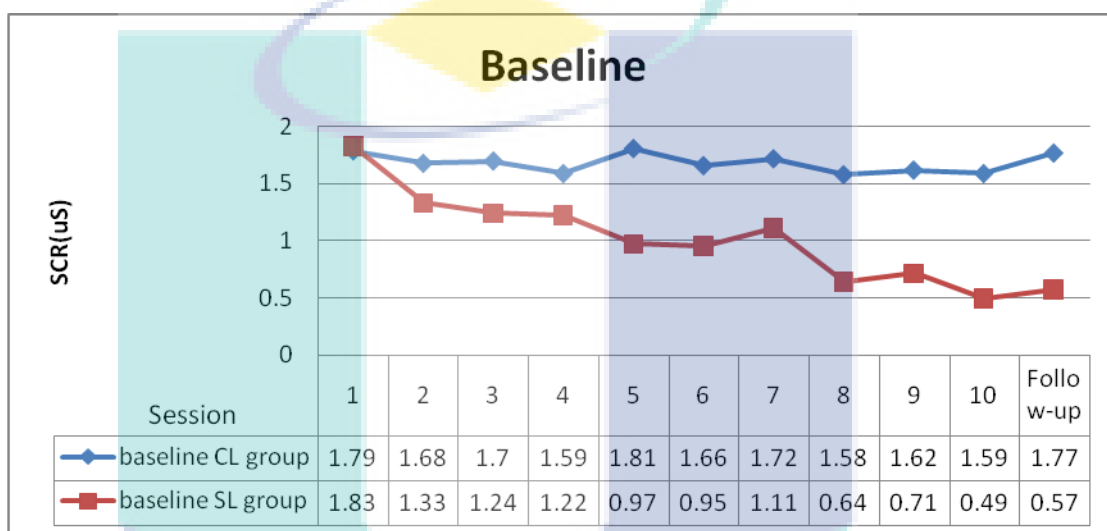
4.5   SKIN CONDUCTANCE RESPONSE RESULTS

The skin conductance response (SCR) is an indirect measure of sympathetic autonomic activity that is associated with both emotion and attention. In humans, the amplitude of SCRs is related to the level of arousal elicited by visual stimuli with either positive or negative emotional valence. Figure 4.6 illustrates the SCR in skin conductance response evaluation between two groups during 10 sessions with 22-day of baseline, treatment, post-recovery, post-baseline and follow-up. In the first session, the baseline, post-recovery and post-baseline of two intervention groups showed no evident difference in SC. SC in the post-baseline of the third session however, indicated evidently different between the two groups over the intervention relaxation period with SC in the devoutness-based Salah group reducing, in contrast to the control group where SC had not the evident differences. From the third session, this decrease in SC was essentially maintained throughout the subsequent sessions of treatment and follow-up.
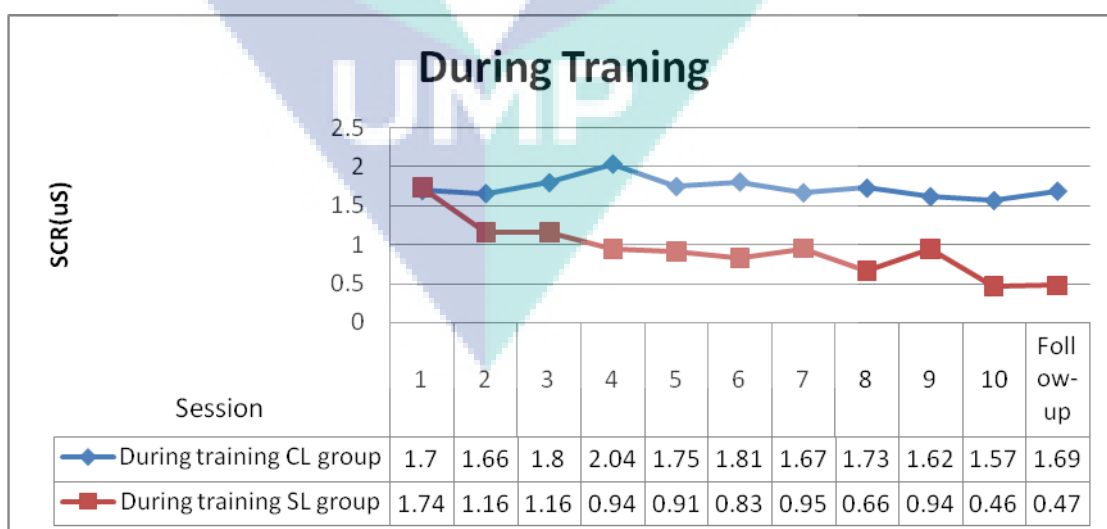
From Figure 4.6, when comparing the variations in SCR across sessions in baseline and post-baseline, an evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased SCR in the baseline and the post-baseline of the 22-day training period as well as follow-up session. In contrast, SCR of the control group were unstable irregularly behavior in baseline and post-baseline with no evident gradually change occurring over the 22-day. From the whole training, this decrease in SCR was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with last two session. Moreover, the follow-up session shown that in baseline and post-baseline of the control group, the psychophysiological values of SC were unchanged conservatively, compared with the baseline of the first session.

To compare the SCR in Salah group and the respective control group, the interval expression of Figure 4.6 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) for training sessions and the follow-up session. Figure 4.6, presented in a interval expression, shows the general trend in SCR. Based on Figure 4.6, these show the changes in the number of SCR over the interval from 0 to 2. In the Salah group, in the post-baseline section, over

the interval, from the first session to the third session the SCR remained stable. After the third session, the curve shows a little fluctuation of reducing the SCR. After the eighth session, the curve shows the great changes of reducing the SCR. Furthermore, in the follow-up session, according to Figure 4.6, the interval expression provides changes in SCR data which can be kept the decreasing trend and have not returned the same interval of the first session. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.6.

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
baseline CL group	1.79	1.68	1.7	1.59	1.81	1.66	1.72	1.58	1.62	1.59	1.77
baseline SL group	1.83	1.33	1.24	1.22	0.97	0.95	1.11	0.64	0.71	0.49	0.57

(a) Baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
During training CL group	1.7	1.66	1.8	2.04	1.75	1.81	1.67	1.73	1.62	1.57	1.69
During training SL group	1.74	1.16	1.16	0.94	0.91	0.83	0.95	0.66	0.94	0.46	0.47

(b)During Training

Post-recovery

SCR(uS)

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-recovery CL group	1.62	1.65	1.77	1.83	1.56	1.75	1.64	1.45	1.75	1.67	1.81
Post-recovery SL group	1.4	1.39	1.35	1.16	0.96	1.22	0.69	0.7	0.76	0.56	0.46

(c)Post-recovery

Post-baseline

SCR(uS)

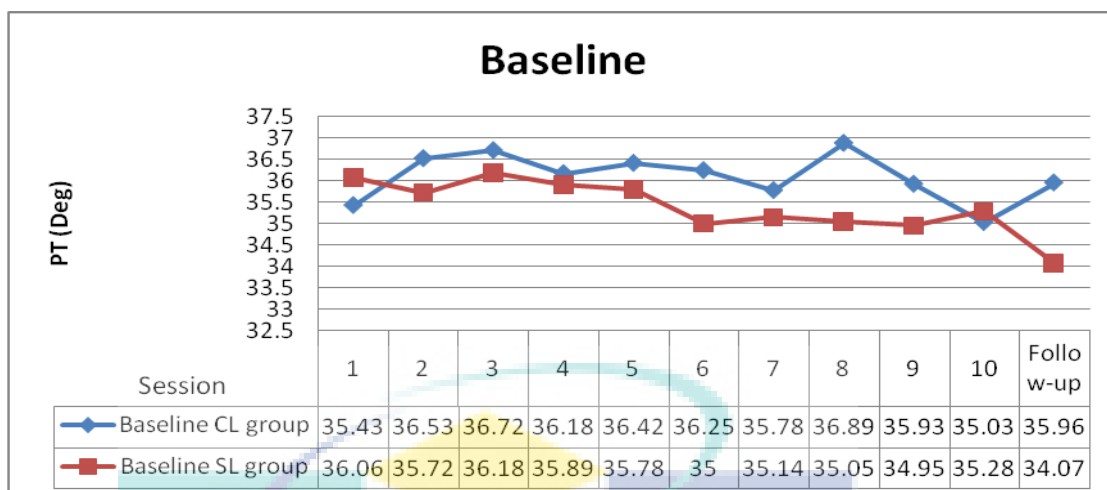| Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-baseline CL group	1.65	1.6	1.54	1.38	1.55	1.76	1.62	1.53	1.6	1.71	1.75
Post-baseline SL group	1.02	1.07	1.08	0.85	0.64	0.71	0.53	0.55	0.37	0.17	0.32

(d)Post-baseline

Figure 4.6 SCR Results

From Table 4.1, the comparison of both groups did not show any statistically significant difference between the groups before training. Mean SC in the experimental group before Salah was 1.83. This decreased to 0.17 after Salah intervention. Furthermore, this decrease was statistically significant (p value =0.03). Mean SC in the control group was 1.79 at the beginning and 1.71 after training sessions, but these were also not significantly different (p value=0.81). The devoutness-based Salah protocol benefited female college students by psychophysiological analysis compared between Salah group and the control group over a 22-day period. Therefore, the first null hypothesis of the research question 3 was rejected. Mean SCR in the experimental

group was 0.32, which indicated statistically stable changes. Mean SCR in the control group was 1.75, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group the control group. Therefore, the second null hypothesis of the research question 4 was rejected.The similar changes in during training and post-recovery sections, it is apparent from Figure 4.6. Moreover, the baseline section always keeps distinctly unchanged.
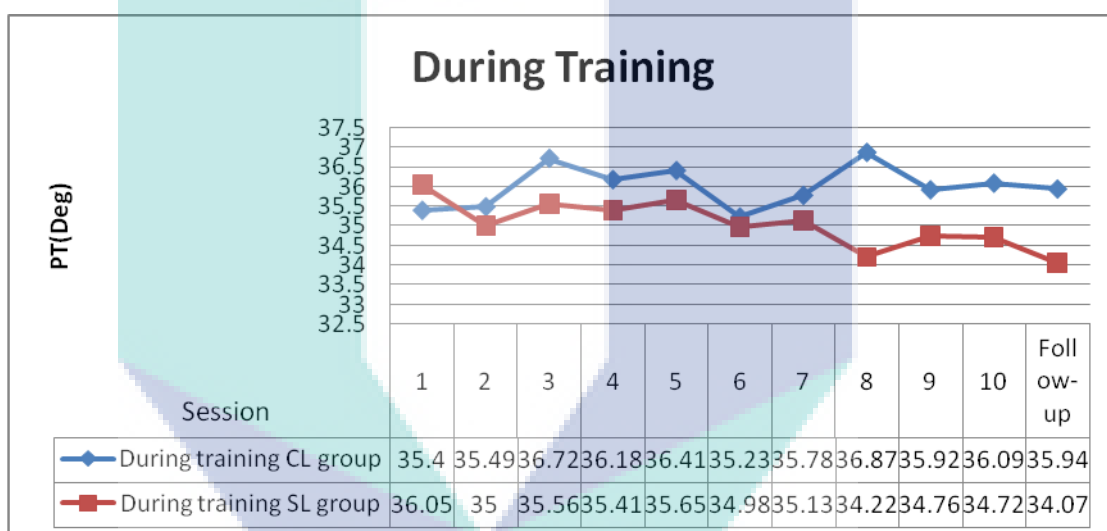
4.6   PERIPHERAL TEMPERATURE RESULTS

In devoutness-based Salah model, 23 female subjects participated in the study. The participants had not received any prior relaxation or other training. The training sessions were held 22-day in a laboratory. The room temperature was maintained at 23 ± 1 ℃. For the control group, the samples are instructed by instructor for 12 min relaxation with sitting on a comfortable armchair with paced breathing. In measuring sessions, skin temperature was detected for the Salah intervention group and the control group. There was no evidence of a evident difference in baseline characteristics of the two groups in terms of skin temperature.
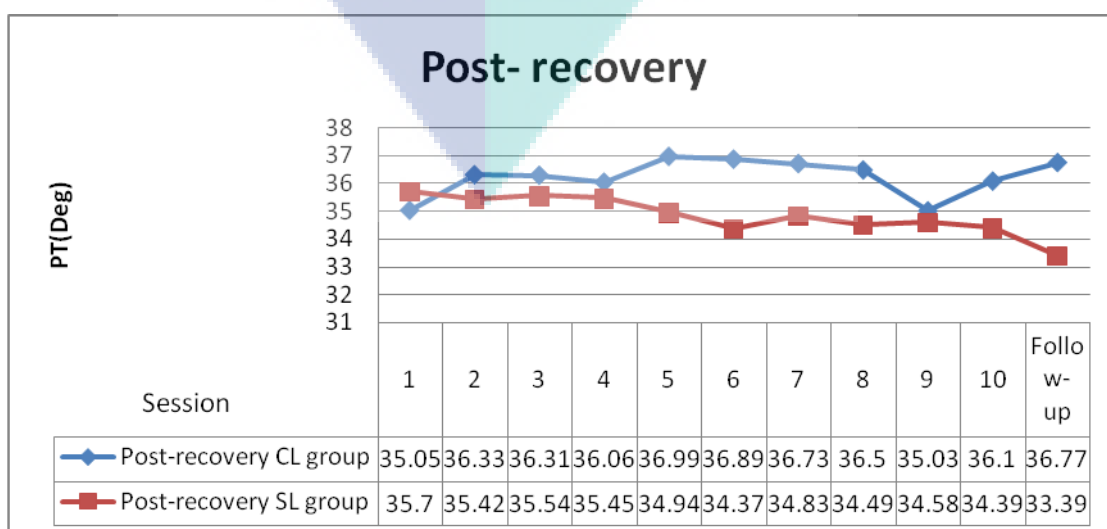
From Figure 4.7, during the post-recovery relaxation and post-baseline periods each session for Salah relaxation group, there were evident decreases of finger temperature from the first to the last session. Moreover, the decreasing results were stable and were not returned to baseline. However, results demonstrated that with the use of general relaxation using paced breathing in the control group there was not a evident difference between post-recovery and relaxation post-baseline each season. Compared with baseline, it seemed that there were some increasing results, but the tendency of change was unstable in the most results. The results analyses have been proven the alternate hypothesis in third research question. Samples' relaxation performance improves as measured by measured by biological signals with the incorporation of Salah training for women collegiate students over each session period.
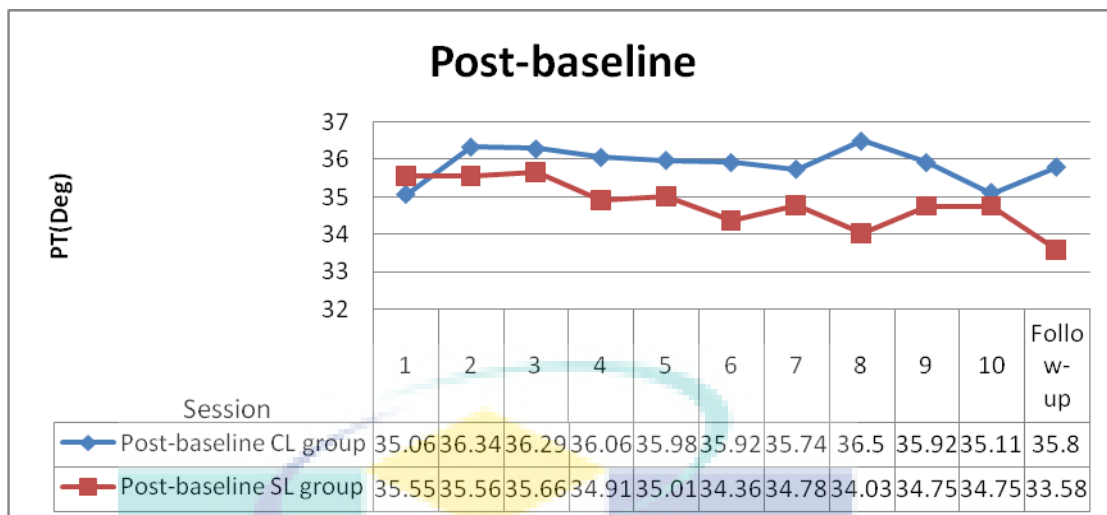
Baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Baseline CL group	35.43	36.53	36.72	36.18	36.42	36.25	35.78	36.89	35.93	35.03	35.96
Baseline SL group	36.06	35.72	36.18	35.89	35.78	35	35.14	35.05	34.95	35.28	34.07

(a) Baseline

During Training

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
During training CL group	35.4	35.49	36.72	36.18	36.41	35.23	35.78	36.87	35.92	36.09	35.94
During training SL group	36.05	35	35.56	35.41	35.65	34.98	35.13	34.22	34.76	34.72	34.07

(b) During Training

Post- recovery

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-recovery CL group	35.05	36.33	36.31	36.06	36.99	36.89	36.73	36.5	35.03	36.1	36.77
Post-recovery SL group	35.7	35.42	35.54	35.45	34.94	34.37	34.83	34.49	34.58	34.39	33.39

(c)Post-recovery

Post-baseline

Session	1	2	3	4	5	6	7	8	9	10	Follow-up
Post-baseline CL group	35.06	36.34	36.29	36.06	35.98	35.92	35.74	36.5	35.92	35.11	35.8
Post-baseline SL group	35.55	35.56	35.66	34.91	35.01	34.36	34.78	34.03	34.75	34.75	33.58

(d)Post-baseline

Figure 4.7 PT results

From Figure 4.7, for further analyzing the change of their peripheral skin temperature during the follow-up session, when comparing the variations in PT across the session in baseline and post-baseline, a evident difference was found between the two groups the devoutness-based Salah group demonstrated a progressively decreased PT in the baseline and the post-baseline of the follow-up session. In contrast, PT of the control group were unstable irregularly behavior in baseline and post-baseline with no evident gradually change occurring over the follow-up session. From the whole training, this decrease in PT was essentially maintained throughout the 22-days and Salah intervention and the variant trend maintained stable in follow-up in comparison with last two session. Moreover, the follow-up session shown that in baseline and post-baseline of the control group, the psychophysiological values of PT of conservatively were unvarying compared with the baseline of the first session.

To compare the PT in Salah group and the respective control group, the interval expression of Figure 4.7 is used to illustrate clearly the changes in values of every section (baseline, during training, Post-recovery and Post-baseline) in training sessions and the follow-up session. Figure 4.7, presented in a interval expression, shows the general trend in PT. According to Figure 4.7, these show the changes in the number of PT over the interval from 31 to 38 ^{o}C. In the Salah group, in the post-baseline section, over the interval, from the first session to the fifth session the PT remained level. After

the fifth session, the curve shows the a little fluctuation of reducing the PT. After the eighth session, the curve shows the great changes of reducing the PT. Furthermore, in the follow-up session, according to Figure 4.7, the interval expression provides changes in PT data which can be kept the decreasing trend and have not backed the same interval of the first session. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.7.

Table 4.1 Summary of Psychophysiological Analysis

Mean(SD)	Salah intervention group				Control group			
	Before salah	After salah	Follow-up	p value	Before training	After training	Follow-up	p value
HR (time)	85.93	66.93	68.82	0.07	79.17	80.94	84.35	0.95
	(6.33)	(4.21)	(5.84)		(9.22)	(6.50)	(4.82)	
LF (uv)	47.00	11.82	16.04	0.01	45.97	44.17	47.29	0.97
	(4.26)	(2.17)	(3.61)		(5.76)	(4.39)	(6.33)	
HF (uv)	27.57	58.47	50.21	0.03	30.93	34.72	28.04	0.84
	(5.38)	(8.21)	(6.86)		(6.43)	(5.47)	(3.01)	
LF/HF	6.11	0.68	0.58	0.05	3.01	3.05	2.66	0.77
	(1.20)	(0.33)	(0.24)		(1.01)	(1.20)	(0.86)	
EMG (uv)	12.61	2.18	1.91	0.04	11.97	4.83	4.91	0.21
	(2.53)	(0.56)	(0.61)		(2.17)	(0.86)	(1.15)	
SCR (uS)	1.83	0.17	0.32	0.03	1.79	1.71	1.75	0.81
	(0.22)	(0.08)	(0.05)		(0.31)	(0.19)	(0.20)	
PT (Deg)	36.06	34.75	33.58	0.08	35.43	35.11	35.58	0.54
	(0.10)	(0.06)	(0.09)		(0.13)	(0.0)	(0.11)	

From Table 4.1, the comparison of both groups did not show any statistically significant difference between the groups before trainnig. Mean PT in the experimental group before Salah was 36.06. This decreased to 34.75 after Salah intervention. Furthermore, this decrease was statistically significant (p value =0.08). Mean PT in the control group was 35.43 at the beginning and 35.11 after training sessions, but these

were also not significantly different (*p* value=0.54). The devoutness-based Salah protocol benefited female college students by psychophysiological analysis compared between Salah group and the control group over a 22-day period. Therefore, the first null hypothesis of the research question 3 was rejected. Mean PT in the experimental group was 33.58, which indicated statistically stable changes. Mean PT in the control group was 35.58, which indicated that there were also not the significant difference in follow-up session. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group and the control group. Therefore, the second null hypothesis of the research question 4 was rejected. The similar changes in during training and post-recovery sections, it is apparent from Figure 4.7 Moreover, the baseline section always keeps distinctly unchanged.

4.7   MODIFIED PSS RESULTS

The modified Perceived Stress Scale is a 10-item self report questionnaire that measures persons' evaluation of the stressfulness of the situations in the past two days of their lives.

When comparing the variations in modified PSS scores across sessions in baseline and post-baseline, an evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased modified PSS scores in the baseline and the post-baseline of the 22-day training period as well as follow-up session, however, this decreased trend disappeared only in the fifth session. In contrast, Modified PSS scores of the control group were irregular and unstable in baseline and post-baseline with no evident gradually change occurring over the 22-day. From the whole training, this decrease in Modified PSS scores was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with last five session. Moreover, the follow-up session shown that in baseline and post-baseline of the control group, the psychophysiological values of PSS of conservatively were unvarying compared with the baseline of the first session.

Table 4.2 Comparison of different levels of PSS scores in experimental groups

PSSscores	Salah intervention group			Control group		
	Before salah	After salah	Follow-up	Before training	After training	Follow-up
	Sample population					
≤20	0	4	5	0	0	0
21-25	5	4	3	6	7	5
26-30	4	3	3	4	4	4
≥30	2	0	0	2	1	3
Mean(SD)	25.35(3.9)	20.55(5.7)	19.41(6.9)	26.77(4.1)	25.19(4.7)	26.21(5.0)
p value	0.07			0.75		

This study examined effects of Salah on perceived PSS in women referred to devoutness-based Salah. Symptoms of stress in both groups were assessed and compared pre and post intervention and between the experimental and control groups. As the study was done in women's devoutness-based Salah, all subjects were female. Experimental and control groups consisted of 11 and 12 women respectively. Mean PSS scores in the experimental group before Salah was 25.35. This decreased to 20.55 after Salah intervention. Furthermore, this decrease was statistically significant (p value=0.07) (Table 4.2). Mean PSS scores in the control group was 26.77 at the beginning and 25.19 after training sessions, but these were also not significantly different (p value=0.75).

4.8 STAI RESULTS

The State-Trait Anxiety Inventory (STAI) is a psychological inventory based on 4-point Likert scale. The STAI measures two types of anxiety-state anxiety, or anxiety about an event, and trait anxiety. Higher scores are positively correlated with higher levels of anxiety. Its most current revision is Form Y.

When comparing the variations in STAI across sessions, an evident difference was found between the two groups: the devoutness-based Salah group demonstrated a progressively decreased STAI results of the 22-day training period as well as follow-up

session. In contrast, STAI of the control group were unstable irregularly behavior baseline with no evident gradually change occurring over the 22-day. From the whole training, this decrease in STAI was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with the all sessions. Moreover, the follow-up session shown that of the control group, the psychophysiological values of STAI of conservatively were unvarying compared with the baseline of the first session.

Table 4.3 Comparison of different levels of STAI scores in experimental groups

	Salah intervention group			Control group		
	Before salah	After salah	Follow-up	Before training	After training	Follow-up
STAI	Sample population					
≥50	2	1	0	2	0	1
41-49	5	3	2	6	7	4
31-40	2	3	5	1	3	5
≤30	2	4	4	3	2	3
Mean(SD)	53.33(8.5)	40.11(7.3)	36.58(9.6)	50.21(5.8)	48.72(8.4)	51.11(4.9)
p value	0.06			0.81		

This study examined effects of Salah on perceived STAI in women referred to devoutness-based Salah. Symptoms of stress in both groups were assessed and compared pre and post intervention and between the experimental and control groups. Experimental and control groups consisted of 11 and 12 women respectively. Comparison of educational states in both groups did not show any statistically significant difference between the groups. Mean STAI scores in the experimental group before Salah was 53.33. This decreased to 40.11 after Salah intervention. Furthermore, this decrease was statistically significant (p value=0.06) (Table 4.3). Mean STAI scores in the control group was 50.21 at the beginning and 48.72 after training sessions, but these were also not significantly different (p value=0.81).

4.9   DEVOUTNESS-BASED SALAH EVALUATION

The participants in this study were 23 students enrolled in a devoutness-based Salah training (n=11) or a paced breathing practice (n=12) at University Malaysia Pahang. The devoutness-based Salah protocol benefited female college students by psychophysiological analysis compared between Salah group and the control group over a 22-day period and the follow-up session. Moreover, the effects of the devoutness-based Salah protocol was tested by the devoutness-based Salah evaluation form. In the devoutness-based Salah group, the scales of Devoutness-based Salah evaluation are demonstrated. It showed a progressively increase of the 22-day training period as well as follow-up session. From the whole training, this increase in the scales of Devoutness-based Salah evaluation was essentially maintained throughout the 22-days Salah intervention and the variant trend maintained stable in follow-up in comparison with the all sessions. Therefore, the results indicated the efficiency of the developed devoutness-based Salah protocol.
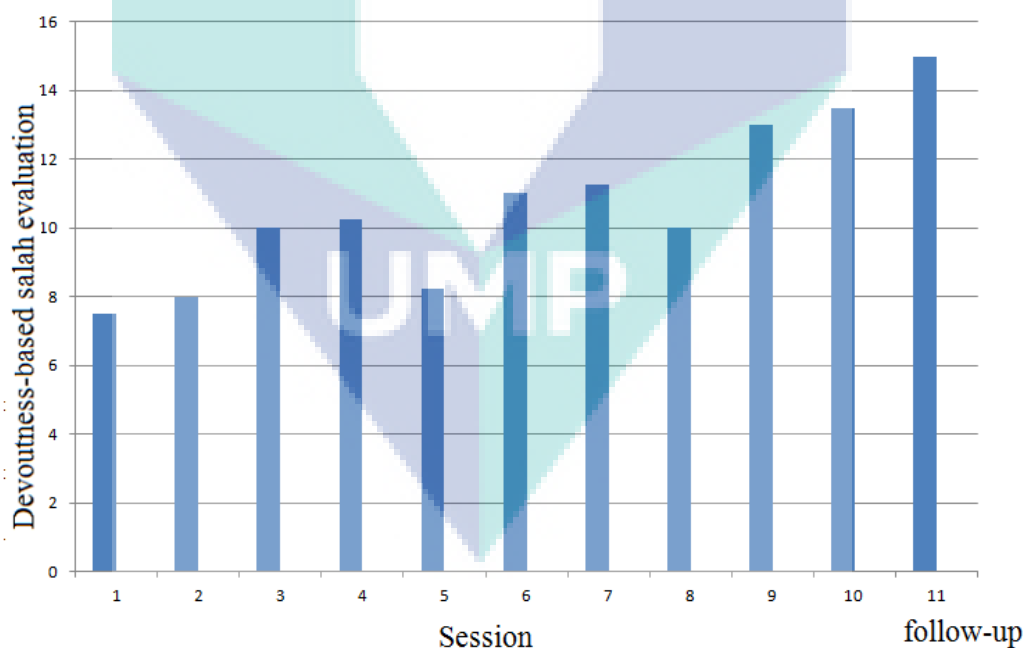
Figure 4.8: Devoutness-based Salah evaluations

4.10   SUMMARY

In this chapter, psychophysiological signals such as EMG, HRV, SCR and PT are analyzed between the devoutness-based Salah group and the controls. The experimental results of seven factors indicated that the devoutness-based Salah group had exceptional performances compared with the controls. Furthermore, the effects of the devoutness-based Salah protocol was tested by the devoutness-based Salah evaluation form. The results indicated the efficiency of the developed devoutness-based Salah protocol. Also, the PSS and STAI were discussed between the two groups. The devoutness-based Salah group had a significant difference compared with the controls.. Therefore, the first null hypothesis of the research question 3 was rejected. After receiving devoutness-based Salah training in long-term duration, the worshipers have stably benefits from the protocol compared between Salah group the control group. Therefore, the second null hypothesis of the research question 4 was rejected.
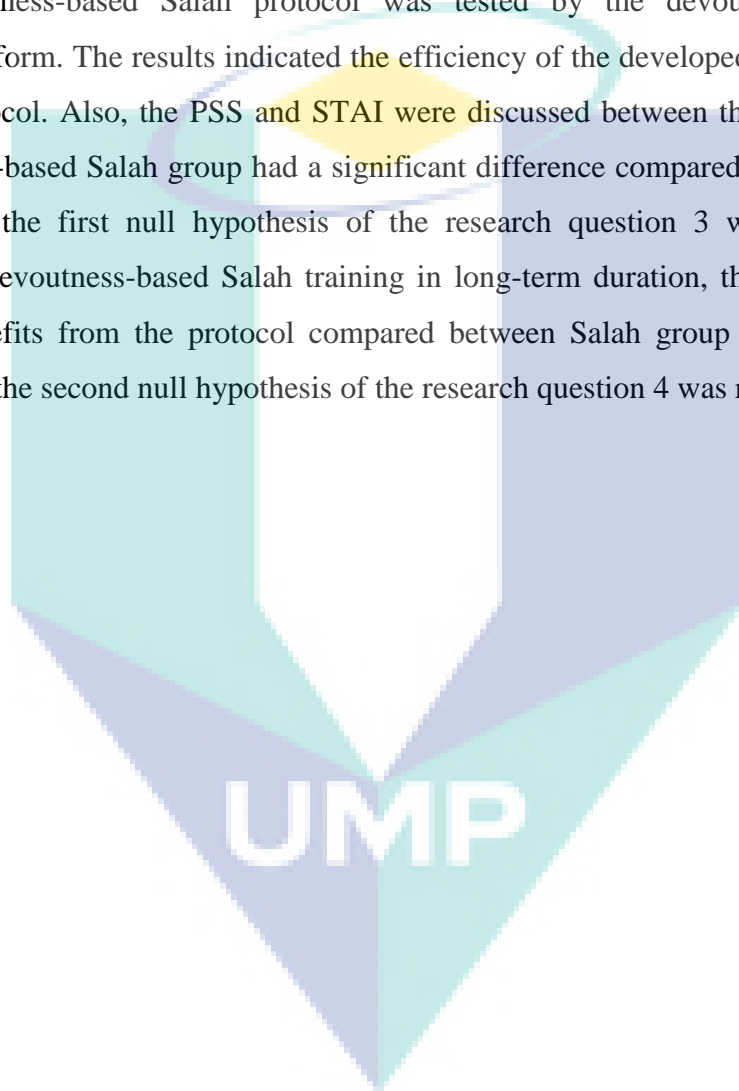
CHAPTER 5

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The primary purpose of this study was to explore the experience for 23 female students of undergoing Salah intervention and compared respective controls. This study provides interesting insight about the role of devoutness-based Salah for female college students. This chapter will present dicussions of psychophysiological benefits, findings from Modified PSS and STAI and effectiveness of devoutness-based Salah. Furthermone, limitations and future works will be dicussed in the following section.

5.2 PSYCHOPHYSIOLOGICAL BENEFITS IN HEART RATE VARIABILITY

This prospective, randomized, controlled study compared the effect of every 2 days practice, from the first session to the follow-up session, of a devoutness-based Salah program (n=11) and a program of paced breathing exercises (n=12) for female college students. In the Salah intervention group, measurements of the components of the HRV spectrum showed that the sympathetic tone (LF band power and LF/HF ratio) decreased, and the parasympathetic tone (HF band power) increased during Salah training in 22-day period. During follow-up session, the changes in HRV values were significantly enhanced.

The most interesting conclusion about the influence of the Vital Force Formulas is that across the board and regardless of category or condition, this study observed consistent positive responses. Positive shifts are observed in most of the Heart Rate Variability (HRV) parameters, particularly in the relationship of the Sympathetic to

Parasympathetic response (Vaschillo et al, 2006). It should be noted that in cases where the Parasympathetic and Sympathetic values fall in the normal range, changes in these values did not tend to occur, however, significant improvements were consistently registered in other key HRV values. Shifts in heart rate, myocardial response, high frequency and low frequency neurological function, total power and vascular compliance were observed repeatedly. Positive reactions in reserve capacity and physical fitness measurements are seen consistently.

The human nervous system has two major divisions, the voluntary and the autonomic systems. The voluntary system is concerned mainly with movement and sensation. It consists of motor and sensory nerves, among many others. The autonomic system mainly controls functions over which people have less conscious control. These include the digestion of food, the blood pressure and the heart rate. Its nerves leave the spine and connect to all the major organs and glands, either inhibiting or stimulating their activity.

When people achieve autonomic nervous system balance with HRV training that will enable participants to perform more effectively and allows for stress reduction allowing participants to self create improved coping strategies and calmness in participants' life. When challenged by stress, the balanced person is able to respond with vigor and fortitude. This finding shows that Salah was better than paced breathing relaxation in improving autonomic nervous system response in female college students with stress, anxiety and depression. This finding is nearly similar to the findings in (Lehrer et al, 2001; Lehrer et al, 1997).

The sympathovagal balance was defined by the LF/HF ratio. Devoutness-based Salah relaxation techniques are shown to improve sympathovagal balance by reducing the sympathetic tone. This study showed a significant reduction in sympathetic activity, with a decrease in the LF band power and increase in the HF band power during performing Salah. The stress, anxiety and depression reduction and healthier autonomic responses observed in this study may point to an all-important effect of Salah, that of enhancing the plasticity of the autonomic nervous system—thereby improving the system's ability to quickly restore its basal state of relaxation after it has responded to a

person with stress, anxiety and depression. This finding is nearly similar to the Modified Cognitive Therapy findings in (Wahass & Kent, 1997).

5.3 PSYCHOPHYSIOLOGICAL BENEFITS IN ELECTROMYOGRAPHY

23 samples were randomly assigned to the Salah intervention group and respective controls. Samples were seen for ten sessions and were evaluated before Session 1 and after Session 10, as well as follow-up session. Salah-trained subjects were significantly superior to subjects in the relaxation-trained condition, in decreasing stress, anxiety and depression during the function test, increasing relaxation, and decreasing Upper Trapezius EMG. During follow-up session, the changes in EMG values were significantly reduced.

The results of this study partially support the hypotheses examined. During the experimental sessions, the devoutness-based Salah group showed significantly lower EMG levels than the control group and this technique is effective in reducing EMG intensity in the upper trapezius, as well as reducing autonomic nervous system arousal.

This study showed that Salah is a good training technique for muscle relaxation. From a psychological standpoint, it also reduces stress, anxiety and depression. But Salah also has been shown to decrease neurological reaction time and improve muscle strength and endurance of the expiratory and upper trapezius muscles. This finding is nearly similar to the night prayers findings in (Zainuddin, 2007). This, then, has important benefits in terms of expiratory disorders such as asthma (Merletti, 1990).

Devoutness-based Salah can help students to do moderately physical activities regularly and consistently. This may get the healthy for the female college students. This finding is nearly similar to the findings in (Blanchard, 2008). Salah has special characteristics in that it is a short duration mild-to-moderate psychological, physical and brain activity. Scientific evidence also supports the notion that even moderate intensity activities, when performed daily, can have some long-term health benefits (American Heart Association). Salah is like a free hand exercise. It can be performed in groups or individually without any equipment. Thus, a person in a rehabilitation program can

practice the activity in their room with ease and comfort, even when sitting in a wheelchair or in bed. During the performance of Salah, most of the muscles and joints of the body are involved. This activity is convenient for all kinds of patients, including children, the elderly and physically handicapped, for strengthening their muscles as well as the mind. The similar study in (Reza et al., 2002) presented that the various positions in Salah include standing, prostrating, bowing and sitting. Prostrating is one of the unique position in Salah which is believed can promote a relaxation effect to human body. In this study, the autoregressive modeling was used to analyze the EEG signals during Salah on prostrating position. The result shows that prostrating during Salah generated higher alpha relative power as compare with mimic prostration. This finding concludes that prostration, one unique position in Salah may promote a remarkable relaxation state to human mind and body (Merletti, 1991).

5.4 PSYCHOPHYSIOLOGICAL BENEFITS IN SKIN CONDUCTANCE RESPONSES

The essence of psychophysiology is to infer psychological processes from measured physiological signals. Rendering such inference plausible rests on assumptions about how these signals are generated, albeit in many instances without a formal specification.

From early studies of religious activities (Banquet, 1973), a consistent pattern of characteristic state concomitants of Salah practices has emerged. Major dependable autonomic trends include slowing of heart rate and fewer spontaneous skin conductance responses-a pattern of responses suggesting generalized sympathetic inhibition. During follow-up session, the changes in SCR values were kept reduced. Devoutness-based Salah may have clinical application in stress-related disorders or it may alleviate the adverse effects of normal daily stress, depending on the resiliency of demonstrated state effects.

The significance of Salah as a stress intervention appropriate for daily life might prove if these Salah state effects carry over and transform the worshipers in a more permanent way, becoming traits. This finding is nearly similar to the findings of spiritual emotional freedom techniques in (Zainuddin, 2007). The relationship of Salah

to stress has been tested inferentially in terms of habituation of skin conductance responses to tones, and worshipers have been found to habituate more quickly, implying a more rapid recovery from stress-related arousal (Orme-Johnson, 1973).

5.5   PSYCHOPHYSIOLOGICAL   BENEFITS   IN   PERIPHERAL TEMPERATURE

A small study in which the same approach to devoutness-based Salah was compared to relaxation demonstrated that while those who prayed in "mental silence" manifested skin temperature reduction. Interestingly, the degree of skin temperature reduction in the Salah intervention group correlated highly with worshipers' self-reported devout scale of Salah (Ramesh et al., 2010). The skin temperature changes suggest that a potentially unique fractionation of the relaxation response occurs in association with the mental health.

Peripheral vascular beds are major sites of vasoconstrictor activity and are important for circulatory regulation. Measuring peripheral skin temperature may be useful as an indicator of sympathetic stress reactions (Musante et al., 1994) measured peripheral vasoconstriction in 6th and 9th graders during an extracurricular test. The researchers distinguished between "the worry group" and the "no worry group" and found that the "worry group" displayed higher levels of peripheral vasoconstriction than the "no worry group". Peripheral vasoconstriction for the "worry group" increased continuously during the test and continued to increase until 45 minutes after the test completion. This suggests that peripheral vasoconstriction reflects one of the body's responses to sympathetic activation (Musante et al., 1994).

This study suggests that measuring peripheral skin temperature is a valid and objective method of measuring anxiety and worry in subjects. Parallel results also have demonstrated that subjects voluntarily can learn how to increase or decrease their peripheral skin temperatures with training (Zaichkowsky, 1984; Violani & Lombardo, 2003). This implies that the mental silence-orientated conceptualization of devoutness-based Salah is associated with specific physiological changes of reducing the peripheral temperature. These changes are responsible for the specific effects observed in this

study. Future studies of this approach to devoutness-based Salah should therefore correlate clinical and behavioral changes with convention measures of arousal.

5.6   INDICATIONS FROM IN MODIFIED PSS AND STAI

This study investigated the health benefits of devoutness-based in reducing stress, anxiety and depression. The health status of study participants comprised levels of stress, with mild to moderate levels of anxiety and depression, which improved for Salah intervention groups by the end of the intervention. These findings extend those of previous research and indicate Salah intervention was effective and acceptable to subjects for managing their stress, anxiety and depression. In general, Salah was as effective as relaxation techniques in reducing anxiety, stress and increasing mental health. The Salah intervention was shown to result in significant short-term benefits that were maintained in the long-term.

During the follow-up period subjects in the Salah intervention group reported lower scores on modified PSS and STAI. Although only 80% prayer rate of subjects continued to practice during the follow-up period, the health benefits were sustained. The greater effectiveness and use of Salah intervention group by subjects during the follow-up period suggests that this may have been a little difficult to incorporate into their daily life duo to the way to making a regular and good daily schedule.

The current study supports previous research suggesting devoutness-based Salah may have a beneficial effect in reducing stress, anxiety and depression. Stress is a growing and significant public health problem that results in important physiological, emotional, social and economic consequences to individuals, their family and the community at large. For individuals looking for self-help interventions to assist with the management of their stress, anxiety and depression, Salah and relaxation may provide viable treatment modalities for relieving these symptoms. This finding is nearly similar to the findings in (Ebert et al., 2004).

Psychological stress is increasingly being recognized as a modifiable cardiovascular risk factor, and is being vigorously investigated in animal studies, human

experimental and clinical research, and in population-level epidemiological studies (Fink, 2007). There is a growing trend for the incorporation of stress management into cardiac rehabilitation programs and into preventive cardiology. However, stress is multifaceted and often misunderstood, and requires as much scientific scrutiny as other pathological processes relevant to cardiology (Fink, 2007).

From results of the heart rate, it is obvious that the devoutness-based Salah group demonstrated a progressively decreased heart rate in the baseline and the post-baseline of the 22-day training period as well as the follow-up session. The finding of this devoutness-based Salah training is to provide an up-to-date and religious survey of research relating stress with cardiovascular disease. From results of the Low Frequency and High Frequency, it is clear that the devoutness-based Salah group demonstrated a progressively decreased Low Frequency and increased High Frequency in the baseline and the post-baseline of the 22-day training period as well as follow-up session. The finding of this devoutness-based Salah training is to highlight the clinical implications of physiological and population studies of stress. The devoutness-based Salah protocol has some certain roles to aid physicians in their management of stress-related issues in cardiac potential patients and high-risk individuals.

Long-term deleterious consequences of stress-induced anovulation may include an increased risk of cardiovascular disease, osteoporosis, depression, other psychiatric conditions, and dementia. The devoutness-based Salah protocol contributes to the enhancement of ovulation, and further advances pregnancy rate. The similar results have shown that the Research on female subjects has shown that chronic stress causes anovulation (Berga & Loucks, 2005), and that it can raise the number of natural abortions (Lipp & Fothergill, 2009). Moreover, even though some of the more stressed women became pregnant, these women didn't carry the pregnancy to full term. However, this study produced some effects of reducing stress symptoms by investigated devoutness-based Salah for female college students. The finding of the study may teach one of relaxation techniques during infertility treatment became pregnant. The possibility of carrying a pregnancy to full term is dependent partly on progesterone levels. The further research will develop and investigate the relationship between progesterone levels and devoutness-based Salah. This finding is nearly similar to the

findings in (Azhar & Varma, 2000; Azhar & Varma, 1995a, b; Azhar et al., 1994; Razali et al., 2002).

Furthermore, the study may provide the easy way to improve rates of successful in-vitro fertilization by decreased STAI, which was essentially maintained throughout the 22-days Salah intervention. The similar study is shown that an Italian study found "stressed" women undergoing infertility treatments with invitro fertilization to have had less chance to become pregnant. In a sample of forty-nine women, stress level was measured by the Spielberger State Trait Anxiety test (SSTA), and the Stroop effect task, as well as by physiological arousal signs such as heart rate increase. This finding is nearly similar to the findings of spiritual emotional freedom techniques in (Craig, 1999).

5.7   EFFECTIVENESS OF DEVOUTNESS-BASED SALAH

Devoutness-based Salah provided participants with the resilience and strength to cope with living with stress, anxiety and depression. Their accounts provided unique perspectives on the lay role of spirituality and faith in mental health care for female college students in Malaysia context. Participants used scale protocol of devoutness-based Salah directly in the management of their stress, anxiety and depression. The concept of devoutness has roots in Islamic prayer and other contemplative traditions where conscious attention and awareness are actively cultivated. It is most commonly defined as the state of being attentive to and aware of what is taking place during various worships.

Prayer includes formal prayer and optional prayer as Muslim performs on daily basis (Syed, 2003). Three correlational studies of Islamic prayer and one study of two group experimental designs were reviewed. Formal prayer has been shown to be an effective way to enhance happiness and physical health (Abdel-Khalek, 2007), alleviate anxiety, and depression among Muslim students, in Iraqi (Abdel-Khalek, 2007), in Arabia (Vasegh & Mohammadi, 2007), enhance coping among cancer patients (Rezaei et al., 2008). In addition, night prayer, an optional prayer performed daily approximately 20 to 40 minutes, was found statistically significant in improved

immunity in high school students as shown by an increase in the number of macrophages after a month (p< 0.01) (Sholeh, 2004), as compared with the baseline.Commonly in Muslim community, therapy of the holy Qur'an is mainly used for curing mental problems, mindfulness, and palliative care in dying patients (Syed, 2003).

In addition, the relationship between devoutness-based Salah and psychophysiological health was positive as expected. Higher self-reports of devout scale were related to better functioning in the psychological and physiological domains of life. This is in accordance with many previous studies that showed positive effects of devoutness-based training on well-being and quality of life ((Mehmet et al., 2002; Nalika et al., 2011; Augustine et al., 2007). Devoutness may be important in disengaging individuals from automatic thoughts, habits and unhealthy behavior patterns and thus could play a key role in fostering informed and self-endorsed behavioral regulation, which has long been associated with well-being enhancement.

5.8   LIMITATIONS

Some researchers choose to increase their sample size if they have an effect which is almost within significance level. This is done since the researcher suspects that he is short of samples, rather than that there is now effect there. people need to be careful using this method, as it increases the chances of creating a false positive result. When researchers have a higher sample size, the likelihood of encountering Type-I and Type-II errors occurring reduces, at least if other parts of the study is carefully constructed and problems avoided. Higher sample size allows the researcher to increase the significance level of the findings, since the confidence of the result are likely to increase with a higher sample size. This is to be expected because larger the sample size, the more accurately it is expected to mirror the behavior of the whole group. Therefore if researchers want to reject their null hypothesis, then researchers should make sure the sample size is at least equal to the sample size needed for the statistical significance chosen and expected effects. In addition, apart from the small effect size, the other serious limitation was the short follow-up period. Selection of the follow-up period is often based on convenience, availability of data, available resources, costs, and

other factors. After a longer duration of Salah practice a greater magnitude of change may have occurred. Third, learning the skill of Salah could be considered to be more challenging initially than relaxation and therefore an underestimation of the therapeutic effect of Salah cannot be excluded. The average attendance in both groups may limit the study's ability to determine the true effectiveness of Salah, but this pragmatic trial highlights the potential limitations of undertaking Salah in the community.

5.9   RECOMMENDATIONS FOR FUTURE WORKS

This study aimed to assess the devoutness-based Salah performance of psychophysiological analysis strategy on stress, anxiety and depression reduction for female college students. Prayer is a psychological therapy that helps calm the soul and relieve all tension for many reasons, of which the most significant is: man feels that all his problems are very small in the face of the Greatness and Capability of the Creator Who handles this large universe. The Muslim, after finishing his prayer, has thrown all he has of problems and worries, as he has deputized the Merciful Lord to manage and relieve him of such troubles. Prayers help remove all sources of tension due to the constant change of movements. It is known that such a change leads to an important physiological relaxation; therefore, the Prophet commanded that the Muslim when afflicted with states of stress, anxiety and depression should resort to prayers. It has been proved that prayer have an immediate effect on the nervous system, as they calm agitation and maintain balance. They are as well a successful treatment for insomnia resulting from the nervous dysfunction.

Since this was a pilot study, the sample size and power of the statistical analyses was quite low. Although the results are to some extent consistent with earlier biobehavioral research (Yucha et al., 2001), it is unclear if the significant decrease in psychophysiological results will be maintained. Therefore follow-up measurements to this study are recommended for future research.

Future research could examine the therapeutic effects of the individual interventions, as well as other styles of Salah. Studies incorporating a wait list control could examine the effects of spontaneous remission, and confirm that observed changes

in health status may be credited to the interventions and not to other confounding variables. Further studies are required using larger samples and longer periods of follow-up with the possible inclusion of biochemical studies as objective measures of health to determine an outcome endpoint for mind body treatments.

5.10   CONCLUSIONS

This study explored the experience of devoutness-based Salah training for female college students in Salah samples and compared them with respective controls. During the processes of performing Salah, The indexes of Heart Rate Variability (HRV), Electromyography (EMG), Skin Conductance Responses (SCR) and Peripheral temperature (PT) were investigated. First, the designed protocol is effective by the comparison with the controls. The improvement of performance may be evident when the data is disseminated for the whole group. Second, a physiological shift towards ANS balance, muscle relaxation, stress decrease and depression reduce should transpire over the Salah intervention.Finally, the influence of the participant's devoutness-based salah would be affirmative if they believed in the training protocol, as well as diligently and devoutly practiced with the protocol and the direction of the researcher.

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APPENDIX A

Appendix A Modified Perceived Stress Scale- 10 Item

The questions in this scale ask you about your feelings and thoughts during the last two days. In each case, please indicate with a check how often you felt or thought a certain way.

1. In the last two days, how often have you been upset because of something that happened unexpectedly? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

2. In the last two days, how often have you felt that you were unable to control the important things in your life? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

3. In the last two days, how often have you felt nervous and "stressed"? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

4. In the last two days, how often have you felt confident about your ability to handle your personal problems? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

5. In the last two days, how often have you felt that things were going your way? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

6. In the last two days, how often have you found that you could not cope with all the things that you had to do? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

7. In the last two days, how often have you been able to control irritations in your life? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

8. In the last two days, how often have you felt that you were on top of things? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

9. In the last two days, how often have you been angered because of things that were outside of your control? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often

10. In the last two days, how often have you felt difficulties were piling up so high that you could not overcome them? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often
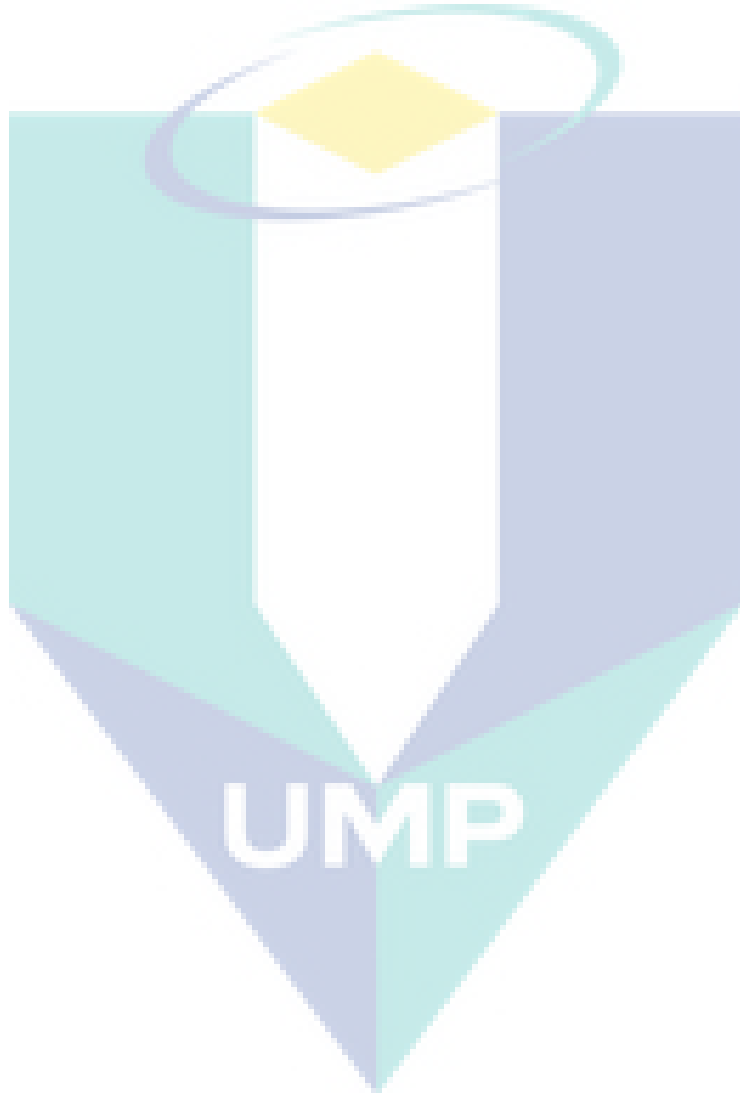
Appendix B

INFORMED CONSENT AGREEMENT

Center For Modern Language And Human Science, University Malaysia Pahang (+609-549 3021)

Development of a devoutness-based Salah for the reduction stressful situation.

You are being asked to participate in a research study. However, before you give your consent to be a volunteer, we want you to read the following and ask as many questions as necessary to be sure that you understand what your participation will involve.

PRINCIPAL INVESTIGATOR: Wang Jing, Center for modern language and human science, Master Candidate Student at University Malaysia Pahang

PURPOSE OF THE STUDY. You are invited to participate in a master research project, which is being conducted at University Malaysia Pahang under the direction of Dr. Muhammad Nubli Bin Abdul Wahab. The purpose of this study is to develop a research based manual on devoutness-based Salah for the reduction stressful situation. This manual will provide stressful students the opportunity for further knowledge, as they will have a broader range of awareness and can make well-informed choices for them.

PROCEDURES TO BE FOLLOWED DURING THE RESEARCHER. You will be asked to review and evaluate a parent manual using a provided survey form. Your participation may take a minimum of one hour of your time, including completion of the survey. Upon completion of the manual and survey, please return both back to the

investigator, Wang Jing. Please do not provide any personal information that would lead to your identity as information is to remain confidential.

RISKS. Although there are no known risks in this study, some of the information may be personally sensitive. You may withdraw at any time and you may choose not to answer any questions that you feel uncomfortable answering.

BENEFITS OF THE RESEARCHER. The only direct benefit to you if you participate in this research project may be that you will learn about the benefits of devoutness-based Salah for the reduction stressful situation.

CONFIDENTIALITY. You have a right to privacy and all information identifying you will remain confidential (private), unless otherwise required by law. The consent forms with signatures will be kept separate from the survey forms, which will not include names. The results of this study may be presented at professional meetings, you will not be named as long as you are not identified and cannot reasonably be identified. However, it is possible that under certain circumstances data can be subpoenaed by court order.

SUBJECT RIGHTS AND RESEARCH WITHDRAWAL. Your participation in this study is voluntary. If you choose not to participate in this research project, there will be no penalty or loss of benefits to which you are otherwise entitled and your relationship with University Malaysia Pahang and the researcher, Wang Jing, will not be affected. In addition, you may discontinue participation at any time without any penalty or loss of benefits. You may also refuse to answer any questions you do not wish to answer.

SIGNATURE AND ACKNOWLEDGMENT. My signature below indicates that I have read the above information and I have had a chance to ask questions to help me understand what my participation will be, I agree to participate in the study until I decide otherwise. I acknowledge having received a copy of this agreement. I have been told that by signing this consent form I am not giving up any of my legal rights.
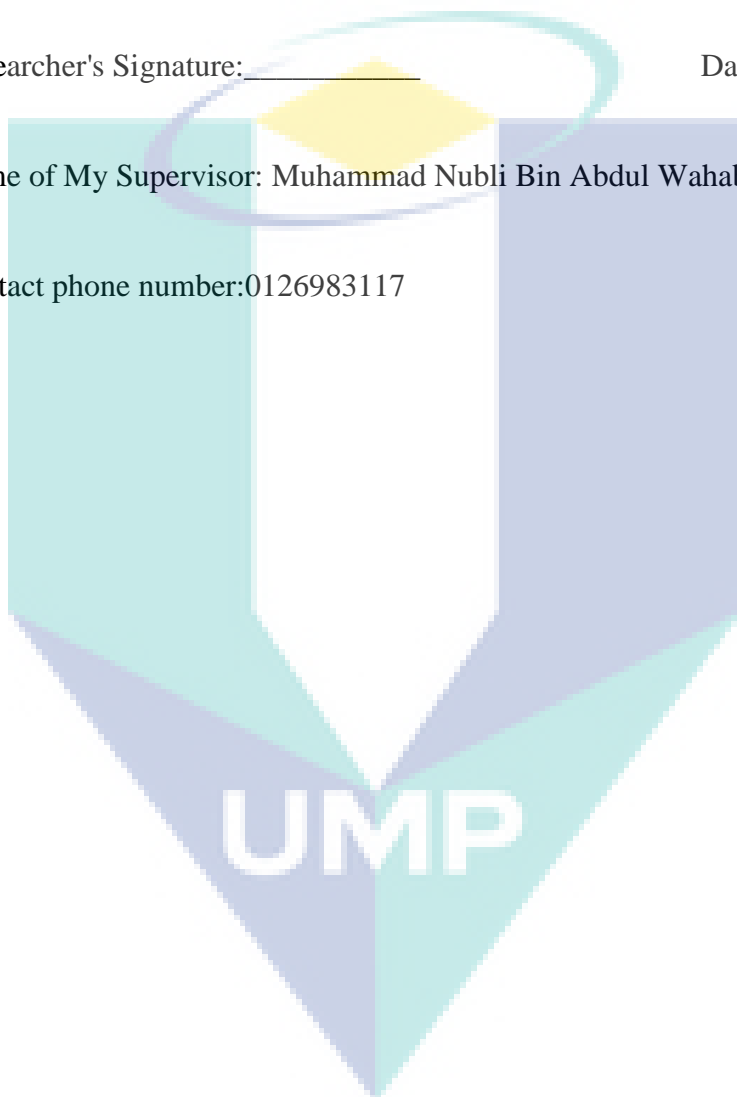
Signature of Research Participant and Occupational Title: Date: _____

Researcher's Name: Wang Jing   Contact phone number: 0149231586

Researcher's Signature:_____   Date:_____

Name of My Supervisor: Muhammad Nubli Bin Abdul Wahab

Contact phone number:0126983117

Appendix C

Understanding Salah

Prayer (Salah) is the most important pillar of Islam. Indeed it is the dividing line between Islam and infidelity. Salah is a duty incumbent on every Muslim, male or female, who has attained the age of maturity and has a sound mind. There are numerous verses in the Holy Qur'an commanding Muslims to observe Salah regularly. Allah (SWT) says "Verily, I am Allah. There is no god but I: So serve thou Me (only), and establish regular prayer for My remembrance". (Sura Táhá ayah 14). Salah in Islam is a unique institution. It brings man closer to Allah (SWT) by harmonizing his mental attitude with physical posture. In Salah, a Muslim submits himself completely to his Creator.

Step. 1 Before Salah

Ensure that clothes are taahir (paak-clean) and make wudhu'. Stand respectfully on a taahir place facing the Qiblah. Keep feet parallel with toes pointing towards the Qiblah and submit totally to Allah I. When you are sure that you have fulfilled all necessary conditions for Salah.

A detailed account of how to perform salaah follows:

Intention For Salah (Niyyah) I intend to offer (number of) rak'at of (Type of salaah, i.e. Fardh, Sunnah, etc.) In the time of (Name of salaah, i.e. Fajr, Zuhr etc.) For the sake of Allah (SWT) while my face is towards the direction of Qiblah, Allahu Akbar. (If the salaah is being offered in congregation behind an Imam, one should utter these words "I offer this particular salaah behind this Imam".

For Males : No garment, jubba or trousers should be allowed to overlap the ankles. It is Makruhut Tahrimi to perform salaah while any garment is overlapping the ankles. This means that the Fardh (obligation) of salaah will be considered as fulfilled, but there is very little reward and benefit in such a salaah.

Female Salaah : Women also perform their salaah in the same way, except with a few differences:- without hands being exposed women should raise their hands to the height of their shoulders.

Step.2 Takbirut-Tahrimah

When saying takbirut-tahrimah after making niyyah, lift the two hands up to the earlobes in such a manner that both face towards the Qiblah. Then say

ALLĀHU-AKBAR

Allah is the Greatest
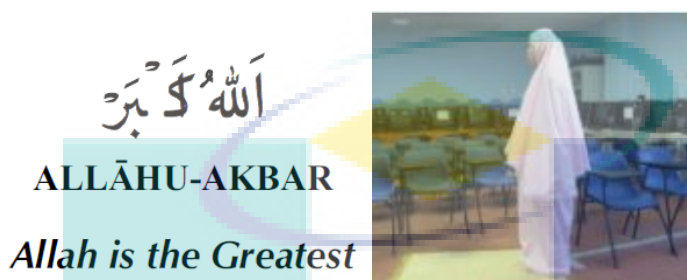
and fold them. Place the hands in such a way that the right hand is clasped over the back of the left. While in Qiyaam (standing posture) the eyes should be fixed to the spot where the forehead will be placed in sajdah.

Women: They do not raise hands higher than shoulders and place arms on the chest. Place the right hand over the back of the left hand above the breast and do not hold it like the Male).

Now Read the Thana:

SUBḤĀNAKAL-LĀHUMMA WABIḤAMDIKA WA TABĀRAKAS-MUKA WA TA`ĀLĀ JADDUKA WALĀ ILĀHA GHAYRUK

All Glory be to you O Allah! and praise be to you:
Blessed is Your name and Exalted is your Majesty,
and there is none worthy besides You.

Step.3 First Rak'ah

First recite

A`ŪDHU BILLĀHI MINASH-SHAYṬĀNIR-RAJĪM.

I Seek refuge in Allah from the rejected Satan.

بِسْمِ اللهِ الرَّحْمٰنِ الرَّحِيْمِ

BISMILLĀHIR-RAḤMĀNIR-RAḤĪM

In the name of Allah, the most beneficent, most merciful

and thereafter recite Suratul-Fatihah

اَلْحَمْدُ لِلّٰهِ رَبِّ الْعٰلَمِيْنَ ۙ الرَّحْمٰنِ الرَّحِيْمِ ۙ

مٰلِكِ يَوْمِ الدِّيْنِ ۭ اِيَّاكَ نَعْبُدُ وَاِيَّاكَ نَسْتَعِيْنُ ۭ

اِهْدِنَا الصِّرَاطَ الْمُسْتَقِيْمَ ۙ صِرَاطَ الَّذِيْنَ اَنْعَمْتَ

عَلَيْهِمْ ۙ غَيْرِ الْمَغْضُوْبِ عَلَيْهِمْ وَ لَا الضَّآلِّيْنَ اٰمِيْنَ

AL-ḤAMDU LILLĀHI RABBIL-ʿĀLAMĪN,
AR-RAḤMĀNIR-RAḤĪM,
MĀLIKI YAWMID-DĪN
IY-YĀKA NAʿBUDU WA IY-YĀKA NASTAʿĪN
IHDINAṢ-ṢIRĀṬAL-MUSTAQĪM
ṢIRĀṬAL-LADHĪNA ANʿAMTA ʿALAYHĪM,
GHAYRIL-MAGH-ḌŪBI ʿALAYHIM WA LAḌ-ḌĀLLĪN.
ĀMĪN

Praise be to Allah , Lord of the worlds.
The Beneficent, the Merciful.
Master of the Day of Judgement.
Thee alone we worship and to Thee alone we turn for help.
Guide us to the Straight Path.
The path of those whom You favoured,
Not of those who earned Your anger,
nor of those who went astray.

It is necessary that a minimum of three short ayah (verses) or one long ayah (equivalent to three short verses) be read in proper sequence as in the Qur'an. eg.

Step.4 Surah Al Ikhlaas

بِسْمِ اللهِ الرَّحْمٰنِ الرَّحِيْمِ ٥

قُلْ هُوَ اللهُ اَحَدٌ ٥ اَللهُ الصَّمَدُ ٥

لَمْ يَلِدْ ٥ وَلَمْ يُوْلَدْ ٥ وَلَمْ يَكُنْ لَّهُ كُفُوًا اَحَدٌ ٥

BISMILLĀHIR-RAḤMĀNIR-RAḤĪM
1. QUL HUWAL-LĀHU AḤAD.
2. ALLĀ-HUṢ-ṢAMAD
3. LAM YALID, WA LAM YŪLAD,
4. WA LAM YAKUL-LAHŪ KUFU-WAN AḤAD

In the name of Allah, the most beneficent, most merciful
1. Say: He is Allah, the One!
2. Allah, the eternally Besought of all !
3. He begetteth not nor is he begotten.
4. And there is none comparable unto Him.

Then saying:

اَللهُ كَ بَرُ

ALLĀHU-AKBAR

Allah is the Greatest

go into ruku (the eyes should be fixed onto the feet)

MEN : In ruku hold both the knees with the fingers apart. Ensure that the arms do not touch the body. Keep the back straight, while the head should neither be lowered nor raised. In ruku recite softly at least three or five times

سُبْحَا نَ رَبِّيَ الْعَظِيْمِ

SUBḤĀNA RABBIYAL AẒĪM

Glory to my Lord, the Greatest.

WOMEN : When making ruku a woman should only bend over sufficiently so that her hands reach her knees. The hands should be placed on the knees, with the fingers kept together. In ruku the elbows should touch the sides of her body.

Step.5 Tasmi'

Whilst rising from Ruku Say

سَمِعَ اللّهُ لِمَنْ حَمِدَه

SAMI`AL-LĀHU LIMAN ḤAMIDAH.

Allah hears all those who praise Him.

And stand up. Then in the upright position say: Tahmid:

رَبَّنَا لَكَ الْحَمْدُ

RABBANĀ LAKAL-ḤAMD

Our Lord ! All praise be to Thee.

(If one does not stand erect after ruku and merely lifts ones head and goes into sajdah, then the salaah will not be valid, and it will be necessary to repeat the salaah if sajdah sahw is not performed).

Step.6 First Sajdah

Now saying

اَللّهُ كَ بَرَ

ALLĀHU-AKBAR

Allah is the Greatest

And placing both hands on the knees, go into sajdah.

(On completing the takbir one should have reached the position of sajdah). When going into sajdah first place the knees on the ground, then the palms, then the nose and lastly the forehead. The face should rest between the two hands with fingers pointing towards the Qiblah. When in sajdah the feet should be upright with the toes pointing towards the Qiblah. The arms should not touch the sides of the body nor the

ground. The stomach should be away from the thighs. In sajdah recite softly at least three or five times the following tasbih

سُبْحَانَ رَبِّيَ الْأَعْلٰى

SUBḤĀNA RABBIYAL A`LĀ.

Glory to my Lord, the Highest.

WOMEN: In sajdah the upper part of the leg (the thigh) should not be upright but in as flat a position as possible, with the feet spread towards the right. While in sajdah the stomach and thighs must be kept together. The forearms should be put flat on the ground in sajdah. Women must not raise their voice when reciting tasbih.

Step. 7 Jalsah (To sit between the two sajdahs)

Saying

اَللّٰهُ اَكْبَرْ

ALLĀHU-AKBAR

Allah is the Greatest

Sit up straight, do not sit with the back crooked or stooped. It is important to sit up and pause after the first sajdah, merely lifting the head from the ground without sitting up before the second sajdah will nullify the salaah if sajdah sahw is not performed).

Men : Sit resting the back on the left leg only and having the right leg raised, the toes facing the Qiblah.

Women : Note that a female does not sit on her left leg but instead sits on the floor, with both legs on the right side.

Step. 8 Second Sajdah

The second sajdah is performed as the first one.

One rak'ah is now complete.

Step. 9 Second Rak'ah

Saying Allahu Akbar stand up for the second Qiyaam. On getting up from the sajdah first lift the forehead, then the nose then the palms, and then the knees. Whilst getting up, ensure that the hands are on the knees and not on the ground for support, except for a valid reason.

Saying Bismillahir Rahmanir Rahim recite Suratul Fatihah and a Surah and complete the second rak'ah in the same manner as the first one.

Step. 10 First Qa'dah

After completing the second sajdah of the second rak'ah saying Allahu Akbar sit up for Qa'dah. The method of sitting is placing the left foot flat on the ground and sitting on it, with the right foot upright and its toes facing towards the Qiblah. The palms must be placed on the thighs with the tip of fingers near the knees facing the Qiblah and the ground. It is important that the fingers are kept close together and that they face the Qiblah and not towards the ground. The eyes should be fixed on the lap. Then Read: Tashahhud (Atta-Hiyyaat) :

اَلتَّحِيَّا تُ لِلّٰهِ وَالصَّلَوٰ ةُ وَالطَّيِّبٰ اتُ السَّلَا مُ عَلَيْكَ اَيُّهَ االنَّبِيُّ وَرَحْمَةُ ا للّٰهِ وَبَرَكَاتُه اَلسَّلَا مُ عَلَيْنَا وَعَلٰى عِبَا دِ ا للّٰهِ الصّالِحِيْنَ اَشْهَدُ اَنْ لَّا اِلٰهَ اِ لَّا اللهُ وَاَشْهَدُ اَنَّ مُحَمَّدًا عَبْدُه وَرَسُوْلُه ○

AT-TAḤĪYATU LILLĀHI WAṢ-ṢALAWĀTU WAṬ-ṬAYIBĀTU AS-SALĀMU ʿALAYKA AY-YUHAN-NABĪYYU WARAḤMATUL-LĀHI WABARAKĀTUH. AS-SALĀMU ʿALAYNĀ WA ʿALĀ ʿIBĀDIL-LĀHIṢ-ṢĀLIḤĪN. ASH-HADU AL-LĀ ILĀHA ILLAL-LĀHU WA ʿASH-HADU ANNA MUḤAMMADAN ʿABDUHŪ WA RASŪLUH.

All prayers and worship through words, actions and sanctity are due to Allah only. Peace be Upon you, O Prophet and the Mercy of Allah and His Blessings. Peace be on us and those who are righteous servants of Allah . I bear witness that there is no god but Allah, who is without partner, and I bear witness that Muhammad is His Servant and messenger.

On reaching the kalimah Ash-hadu-allaa-ilaaha form a circle with the thumb and middle finger and lift the index finger of the right hand and at illal-laahu lower it to meet the thumb. The circle should be maintained to the end.

Step. 11 Third And Fourth Rak'at

If one wishes to perform three or four rak'at one should not read anything more than the Tashahhud in the Qa'dah, but instead saying Allahu Akbar stand up and perform the remaining one or two rak'at. No other Surah should be read after Suratul Fatihah in the third and fourth rak'at of any Fardh salaah. However, it is Wajib to do so In any Wajib, Sunnah or Nafl salaah.

Step. 12 Second Qa'dah

In the second Qa'dah after the Tashahhud read Durud Ibrahim:

اَللّٰهُمَّ صَلِّ عَلٰى مُحَمَّدٍ وَّعَلٰى اٰلِ مُحَمَّدٍ كَمَا صَلَّيْتَ عَلٰى
اِبْرَاهِيْمَ وَعَلٰى اٰلِ اِبْرَاهِيْمَ اِنَّكَ حَمِيْدٌ مَّجِيْدٌ ○
اَللّٰهُمَّ بَارِكْ عَلٰى مُحَمَّدٍ وَّعَلٰى اٰلِ مُحَمَّدٍ كَمَا بَارَكْتَ عَلٰى
اِبْرَاهِيْمَ وَعَلٰى اٰلِ اِبْرَاهِيْمَ اِنَّكَ حَمِيْدٌ مَّجِيْدٌ ○

**ALLĀHUMMA ṢALLI `ALĀ MUḤAMMADIW-WA `ALĀ 'ĀLI
MUḤAMMADIN KAMĀ ṢALAYTA `ALĀ IBRĀHĪMA WA `ALĀ ĀLI
IBRĀHĪMA INNAKA ḤAMĪDUM-MAJĪD.
ALLĀHUMMA BĀRIK `ALĀ MUḤAMMADIW-WA `ALĀ 'ĀLI
MUḤAMMADIN KAMĀ BĀRAKTA `ALĀ IBRĀHĪMA WA `ALĀ ĀLI
IBRĀHĪMA INNAKA ḤAMĪDUM-MAJĪD.**

*O Allah shower Thy Blessings on Muhammad and the descendants of
Muhammad as Thou did shower Thy Blessings on Ibrahim and the
descendants of Ibrahim; Thou art the Praiseworthy, the Glorious.
O Allah, Glorify Muhammad and the descendants of Muhammad as
Thou did Glorify Ibrahim and the descendants of Ibrahim;
Thou art the Praiseworthy, the Glorious.*

After the Durud recite this du`a:

اَللّٰهُمَّ اِنِّيْ ظَلَمْتُ نَفْسِيْ ظُلْمًا كَثِيْرًا اَوْ لَا يَغْفِرُ
الذُّنُوْبَ اِلَّا اَنْتَ فَاغْفِرْ لِيْ مَغْفِرَةً مِّنْ عِنْدِكَ
وَارْحَمْنِيْ اِنَّكَ اَنْتَ الْغَفُوْرُ الرَّحِيْمُ

**ALLĀHUMMA INNĪ ẒALAMTU NAFSĪ ẒULMAN KATHĪRĀW WALĀ
YAGHFIRUDH-DHUNUBA ILLĀ ANTA FAGHFIRLĪ MAGHFIRATAM-
MIN `INDIKA WARḤAMNĪ INNAKA ANTAL GHAFŪRUR-RAḤĪM.**

*O Lord! Make me and my children steadfast in prayers; Our Lord!
Accept my prayer. Our Lord! Forgive me and my parents and
all the believers on the Day of Judgement.*

Step.13 Salaam

Complete the salaah by turning the face to the right saying:

اَلسَّلَا مُ عَلَيْكُمْ وَرَحْمَةُا لله

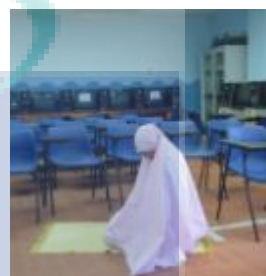ASSALĀMU `ALAYKUM WA RAḤMATUL-LĀH

Peace be on you and Allah's Mercy.

Then turn the face to the left, and repeat the salaam.

اَلسَّلَا مُ عَلَيْكُمْ وَرَحْمَةُا لله

ASSALĀMU `ALAYKUM WA RAḤMATUL-LĀH

Peace be on you and Allah's Mercy.

When making salaam one should make intention of greeting the angels. When making salaam the eyes should be fixed onto the respective shoulders.

b) The importance of intention

This is the first Hadith of Bukhari discusses the Intention. The actual Hadith reads as follows: O People! Actions are based on intention. For every person, there is that which he intended. Thus, if one intends migration towards Allah and His, then his migration is definitely towards Allah and whosoever intends to make migration towards the materialist world so that he may attain it, or if he intends to journey towards a woman with the intention of marrying her, then his migration is definitely towards that which he intended.

Intention refers to the firm intent of the heart. Just to know that one is doing something is not good enough. There must be intention present, like in Salah, Fasting etc. It is not necessary to say the intention with the tongue as long as a firm intention has been made in the heart. It is however better to say it with the tongue. When making intention especially for Salah, one must state the Salah that one is making intention for. Muslims need to pay attention to the intentions for Ibaadat. If our intentions are incorrect, then our actions will not be fulfilled in the Court of Almighty Allah. The Hadith mentioned earlier clearly mentions that one needs to make a firm intention. This means that one must do so with full conviction.

c) The importance of Salah,

Salah (prayer) is one of the five pillars of Islam. Such is that importance of Salah that unlike any other commandment, Allah called the Prophet (pbuh) to the heavens to proscribe him with the five daily prayers. Initially, the commandment was for fifty prayers a day, but fearing that this would become a burden to the Ummah, the Prophet (pbuh) requested for it to be brought down to just five. Despite this, the rewards for keeping the prayers are as if we had prayed all fifty.

The daily prayers are a way for us to keep a close connection to our Creator. It is through Salah that we can get our supplications answered and our needs fulfilled. When the companions of the Prophet (pbuh) were in need, they would turn to Allah in prayer. Salah is a way for us to show a commitment to our faith. Everytime we pray Salah, we renew our commitment to Allah and relieve ourselves from the pressures of our daily lives.

Once Prophet (pbuh) once shook a dry branch of a tree so that all of the leaves of the branch fell off. Then the Prophet (pbuh) said "The sins of those who pray Salah drop off as the leaves of this branch fell off." Salah is thus the main path towards spiritual purification. It is through Salah that we can gain self-discipline and good qualities. For example, in prostration (sajda) we submit our will to Allah in all humbleness. We also purify our hearts. The prophet (pbuh) once asked his companions "Tell me if there was a river at the door step of one of you in which you washed 5 times a day would any of your dirt remain?" When he received the reply that none of it would remain he then said "That is like the 5 daily prayers, with which Allah wipes out our sins."

The last thing that Prophet Muhammad (pbuh.) emphasized at his deathbed was Salah. He also said the first thing we will have to answer about on the day of judgement is Salah. If our record on Salah is good then insha Allah the rest of our reckoning will be made easier. The importance of Salah was emphasized in the Quran about 500 times, so all Muslims should be aware of how central Salah is to our faith. Indeed, the Prophet (pbuh) said that "Salah is the only distinction between a believer and a non-believer." (Muslim) So imagine of the status of that person who misses his prayer? What distinction does that person has from the non-believers?

A companion of Prophet (pbuh) came to him one day and asked him "What is the thing that Allah loves most?" Muhammad (pbuh) replied "The thing that Allah loves most is when his people pray Salah on time." (bukhari)

Despite this, so many of us miss Salah completely or do not make Salah on time. There is no excuse for this. Alhamdulillah, we even have prayer rooms at our universities. Imagine how Allah, the most merciful, appreciates when his servant turns to Him in prayer, interrupting all worldly duties. Whoever does Salah, Allah makes his day easier and facilitates his needs in this world and also in the hereafter.

Another habit Muslims should have is to make Salah wherever they are. So even at work, or when we are out, we should not miss the Salah. The ground in which we pray Salah, even if in the streets, will be a witness for us in the day of judgement. The Prophet (pbuh) used to say that the Salah was the light of his eyes. Once Salah becomes regular in our lives we begin to understand the meaning of this saying of the Prophet (pbuh). Salah becomes such a basic part of our lives that we feel empty without praying to the extent that we find relief in Salah.

Finally, some of us may have missed Salah in the past and may have not recovered those prayers thinking that missed prayers do not really matter. Salah becomes obligatory to all Muslims once they reach puberty. Therefore it is important that we calculate those prayers that we have missed and make up for them. We will be accountable in the day of judgement for every prayer that we miss and there is a severe punishment for missing the Salah. Unfortunately, many fail to pray particularly the night and morning prayers (Fajr and Isha). Abu Hurayra reported that the Messenger of Allah (pbuh) said, "And if they only knew what was in the prayers of 'Isha' and Subh [fajr], they would come to them even if they had to crawl." (Bukhari/Muslim)

May Allah strenghten our determination and steadfasteness in performing our Salah and may we grow closer to our Creator through Salah. Ameen.

d) The further meaning and background of verse in Quran and Hadith as well as the writings inside Salah.

For achieving devoutness inside Salah, the further meaning and background of verse in Quran and Hadith is conductive to the concentration on Quran and Hadith during. It is important to samples for training repeatedly.

e) The standard way of Quran recitation, the gentle of movement and reciting writings,

The Quran is the central religious text of Islam. Muslim should learn how to recitative it. The Qur'an itself outlining the general method of how it is to be recited: slowly and in rhythmic tones. Tajwid is the term for techniques of recitation, and

assessed in terms of how accessible the recitation is to those intent on concentrating on the words. Soroush Iman is educational software of Quran recitation for Islam world. People can use its professional methods to learn recitation of Koran.

The Qur'an is the word of Allah, and its every syllable is from Allah. Its recitation must be taken very seriously. The purpose of the Science of Tajweed in essence is to make the reciter proficient in reciting the Qur'an, observing the correct pronunciation of every letter with the rulings and characteristics which apply to each letter, without any exaggeration or deficiency. And so through this the reciter can recite the Qur'an upon the way of the Prophet pbuh. as he received it from Jibreel who received it from Allah (SWT) in the Classical Arabic dialect that it came down in.

Arabic letters each have a Makhraj – an exit or articulation point - in the mouth or throat from which they originate and they also each have Sifaat – attributes, or characteristics - particular to them. Knowing the Makhraj and Sifaat of each letter is an important part of Tajweed. Sometimes two letters have very similar exits which makes mixing them up easy. So if a person does not know the attributes of each letter there is a danger that he will change the meaning of the words in Qur'an recitation. Observing the rules of Tajweed in reciting protects the reciter from making mistakes in reciting the Qur'an.

f) The exercise of breathing paralleled with Quran recitation and writings
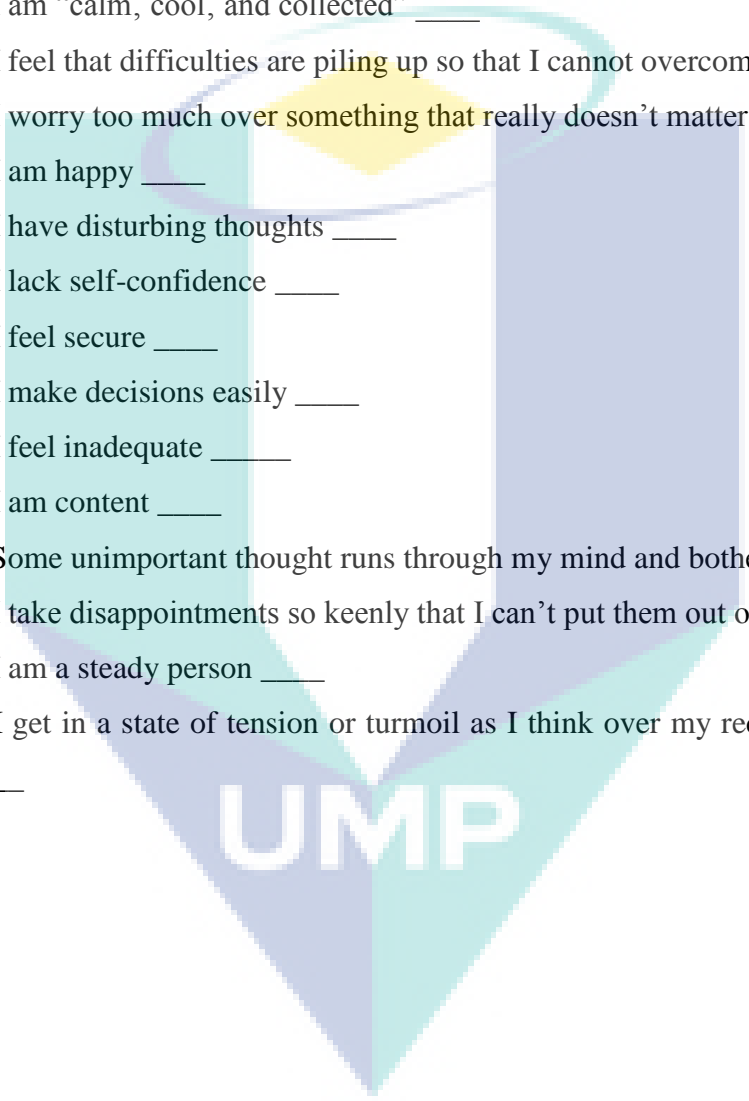
The Quran, in addition to all else it may be, is a set of breathing practices. The enigmatic and most revered Qari (one who melodiously recites Quran) Abdul Basit of Egypt, whose recitation of the Quran is considered the best till date, practiced breathing exercise exactly similar to pranayam and was able to recite a surah by holding his breath for such a long duration that even the medical experts were amazed. However, no one told the Qari that he did it with yoga.

Appendix D

State-Trait Anxiety Inventory

Read each statement and select the appropriate response to indicate how you feel right now, that is, at this very moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1	2	3	4
Not at all	**Somewhat**	**Moderately so**	**Very Much So**

1. I feel calm _____

2. I feel secure _____

3. I am tense _____

4. I feel strained _____

5. I feel at ease _____

6. I feel upset _____

7. I am presently worrying over possible misfortunes _____

8. I feel satisfied _____

9. I feel frightened _____

10. I feel comfortable _____

11. I feel self-confident _____

12. I feel nervous _____

13. I am jittery _____

14. I feel indecisive _____

15. I am relaxed _____

16. I feel content _____

17. I am worried _____

18. I feel confused _____

19. I feel steady _____

20. I feel pleasant _____

21. I feel pleasant ____

22. I feel nervous and restless ____

23. I feel satisfied with myself ____

24. I wish I could be as happy as others seem to be ____

25. I feel like a failure ____

26. I feel rested ____

27. I am "calm, cool, and collected" ____

28. I feel that difficulties are piling up so that I cannot overcome them ____

29. I worry too much over something that really doesn't matter ____

30. I am happy ____

31. I have disturbing thoughts ____

32. I lack self-confidence ____

33. I feel secure ____

34. I make decisions easily ____

35. I feel inadequate _____

36. I am content ____

37. Some unimportant thought runs through my mind and bothers me ____

38. I take disappointments so keenly that I can't put them out of my mind ____

39. I am a steady person ____

40. I get in a state of tension or turmoil as I think over my recent concerns and interests ____

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