Effects of Abbreviated Progressive Muscle Relaxation on Stress in Jordanian Nursing Students

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EFFECTS OF ABBREVIATED PROGRESSIVE MUSCLE RELAXATION ON STRESS IN JORDANIAN NURSING STUDENTS

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Abstract

Background: Nursing students around the world can experience tremendous stress due to their multi-faceted responsibilities. Stress is related to low performance, physical ailments, depression, and suicide. Abbreviated progressive muscle relaxation (APMR) has been used successfully to reduce stress among healthy and ill individuals in various cultures, but its effects have not yet been studied in the Arab culture. Thus, the purpose of this study was to examine the effects of APMR on stress in second-year Jordanian nursing students taking their first clinical training course.

Theoretical framework: Smith's ABC Relaxation Theory guided the study. Stress is defined as a physical, emotional, and cognitive reaction as a result one's exposure to stressors.

Methods: Using an experimental repeated measures design, 14 nursing students were randomly assigned to the experimental group and 14 to the control group at a large university in Jordan. The experimental group participated in six 30-minute APMR sessions (two sessions/week for three weeks) led by PI, an experienced trainer, in a private room. The control group watched one 30-minute documentary video/week for three weeks in another room at the university. Stress was measured at baseline (Time 1), the middle (Time 2), and the end (Time 3) of APMR in both groups using the Smith Stress Symptoms Inventory (SSSI) (alpha=.82), automated blood pressure (BP)/heart rate (HR) monitor and finger skin temperature (FST) thermometer.

Results: Demographic characteristics were not different between groups. Regarding the first

hypothesis, RM ANOVA results in the experimental group showed that APMR significantly decreased self-reports of stress, DBP, SBP, and HR, although not until Time 3. Yet, contrary to the hypothesis, APMR decreased FST in the experimental group, and this decrease occurred significantly at both Time 2 and Time 3. The control group watching documentary videos did not demonstrate any significant improvement in any outcome variables over time.

Regarding the second hypothesis, the subjects in the experimental group showed lower levels of self-reports of stress, DBP, SBP, and HR over time. However, unlike as hypothesized, they did not show more improvement in FST than those in the control group. Overall, post hoc t-tests showed that the experimental group, compared with the control group, showed improvements at Time 3 for most of the dependent variables.

Discussion and Conclusions: The current study has indicated that APMR was effective overall in reducing stress among nursing students in Jordan. The findings partially support previous studies and Smith's theory. Limitations include a brief intervention, a small sample size, and Jordanian specific setting. This research should be replicated in multiple settings over a longer time span with a larger sample size.

CHAPTER 1

Introduction

Background

Stress has been recognized worldwide as a prevalent health issue in nursing education (Beck & Srivastava, 1991; Pulido-Martos, Augusto-Land & Lopez-Zafra, 2012). Like nursing students in other countries, undergraduate nursing students in Jordan have reported moderate to high levels of stress, sometimes higher than students from other disciplines (Al-Hussain et al., 2008; Al-Zayyat & Al-Gamal, 214; Beck & Srivastava, 1991; Beck, Hackett, Srivastava, McKim, & Rockwell, 1997; Frassran, 2005; Khater, Akhu- Zaheya, & Shaban, 2014; Kumar, 2013; Mitchell et al., 2009; Pulido-Martos, et al., 2012; Shaban, Khater, & Akhu-Zaheya, 2012). The reason is that undergraduate nursing students are not only influenced by academic and social stressors, but also clinical stressors during their long clinical training that require emotional and personal maturity (Beck & Srivastava, 1991; Pulido-Martos, et al., 2012; Ross et al., 2014; Wolf, Stidham & Ross, 2014).

The initial clinical experience has been identified by undergraduate nursing students worldwide as the most stressful component of the nursing program because nursing students taking their initial training course lack sufficient knowledge and skills to perform their duties and provide adequate care of patients (Shaban, Khater, & Akhu-Zaheya, 2012; Sheu, Lin, Hwang, 200). In Jordan, nearly 52 % of second-year undergraduate nursing students taking their initial clinical course have reported high levels of stress— higher than their peers in subsequent years (Khater et al., 2014; Shaban, et al., 2012).

Although acute stress works to maintain bodily hemostasis, repeated exposures to stress over time can affect students' health, academic performance, attrition, and ability to care for

patients and themselves (Chan, So, & Fong, 2009; Deary, Waston, & Hogston, 2003; Evans & Kelly, 2004; Sheu, Lin, Hwang, 2002). In dealing with the stress Jordanian nursing students experience, it has been reported that they mostly use unhealthy coping behavior strategies such as avoidance and smoking (Al-Zyyat & Al-Gamal, 2014; Shaban, et al., 2012; Khater, et al., 2014; Khader & Alsadi, 2008). These strategies' benefits are short-lived and can be harmful in the long run, leading to poor physical and psychological health (Aldiabat & Clinton, 2013; Al-Zyyat & Al-Gamal, 2014; Shaban, et al., 2012; Khater, et al., 2014; Khader & Alsadi, 2008). Thus, Jordanian nursing students need to learn more effective or adaptive stress-reduction strategies to help them reduce the stress that they encounter.

There are numerous potentially beneficial stress-reduction strategies. One of these is the use of progressive muscle relaxation (PMR). PMR was initially developed by Edmund Jacobson (1974) as a procedure to decrease stress levels and stress-related psychosomatic health problems. His initial procedure was considered time consuming. It required 30 to 60 minutes of PMR, several times a week, for up to a year or more. Since that time, different abbreviated techniques of PMR have been proposed and developed, either as part of a treatment, such as systematic desensitization therapy (Wolpe, 1958), or as a stand alone treatment (Bernstein & Borkovec, 1973; O¨st, 1987). However, Smith (2002), in his theory on Attentional Cognitive Behavioral (ABC) Relaxation, maintained that the components of early versions of PMR were mixed with components of other relaxation techniques, such as breathing exercises. To provide a purer version of PMR, Smith (1999, 2002, 2005) proposed his own standardized version of PMR and explained how it works to decrease stress. It is an abbreviated technique involving 5 consecutive weekly sessions of PMR (Matsumoto & Smith, 2001; Ghoncheh & Smith, 2004; Smith, 2005). Studies have demonstrated that this form of abbreviated PMR (APMR) is as effective as the long

PMR in reducing stress (Dolbier & Rush, 2012; Ghoncheh & Smith, 2004; Matsumoto & Smith, 2001)

Overall, research has supported PMR as an empirically validated intervention to reduce stress physically, emotionally, and cognitively. Studies using different numbers of sessions in various populations (healthy and sick) found that PMR helped to improve anger management, depression, anxiety, insomnia, headache, memory, blood pressure, blood glucose, heart rate, and finger skin temperature (Alexandru, Ropert, Viorel & Vasil, 2006; Dolbier & Rush, 2012; Dayapogˇlu & Tan, 2012; Kiselica, Baker, Thomas, & Reedy, 1994; Konsta, et al., 2013; Kumar & Raje, 2014; Lolak, Connors, Sheridan, & Wise, 2008; Pawlow & Jones, 2002; Pawlow & Jones, 2005; Powell, 2004; Smith, 2002, Smith, 2005). Also, PMR combined with other mind-body techniques, such as deep breathing, autogenic training and guided imagery, has been studied in nursing students and has been found to be effective in improving some stress reactions, including, anxiety, heart rate, respiratory rate and finger skin temperature (Charlesworth, Murphy, & Beutler, 1981; Prato & Yucha, 2013). However, such combined modalities make it difficult to isolate the effect of PMR on stress reduction. Furthermore, such previous studies among nursing students were conducted only in the United States. Therefore, any generalization of these study findings to other nursing students in different cultures is limited due to these cultures' differing belief systems and self-care practices. Also, cultural variations in PMR delivery and definitions of stress make it more difficult to generalize about PMR's effectiveness in reducing stress.

The purpose of this study was thus to specifically examine the effects of APMR on stress in Jordanian undergraduate second-year nursing students using subjective reports of stress, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and finger skin

temperature (FST). These variables have been used in other studies as measures of stress in college students (Chen, 2013; Dolbier & Rush, 2012; Ghoncheh & Smith, 2004; Kanji, White & Ernst, 2006; Matsumoto & Smith, 2001; Prato & Yucha, 2013).

Research Hypotheses

In Jordanian second-year undergraduate nursing students:

1. In the experimental group, APMR will decrease self-reports of stress, DBP, SBP, and HR, and will increase FST over time.
2. When compared with the control group, the experimental group will do better over time in terms of self-reports of stress, DBP, SBP, HR, and FST.

Significance of Study

The psychological and mental health needs of Jordanian college students are generally disregarded or underserved (Hamdan-Mansour, Pusak, & Bandak, 2009). Although several mind-body modalities have been found to help college students in the United States effectively deal with stress and its negative consequences on psychological and mental health (Higginbotham, 2013), the use of such strategies among Jordanian college students does not exist (Hamdan-Mansour, et al., 2009; World Health Organization & Jordanian Ministry of Health, 2011). Mind-body modalities comprise a variety of techniques used to increase the capacity of the mind to influence the functions of the body. Evidence shows that mind-body modalities are effective, safe and inexpensive in reducing stress, physically, emotionally, and cognitively (National Centers for Complementary and Alternative Medicine [NCCAM], 2011; Saeedi, Ashktorab, Saatchi, Zayeri, & Akbari, 2012; Smith, 2005). Moreover, psycho-pharmacological approaches, mind-body modalities rely mainly on self-care, thus eliminating or decreasing visits to health care facilities (Belleville, 2010; NCCAM, 2011).

The American Holistic Nurses Association (AHNA) (2014) supports the integration of complementary alternative modalities, specifically mind-body modalities, into conventional healthcare because of their significant contribution to holistic nursing care. Holistic nursing is an official specialty area within the discipline of nursing, defined as all nursing practices concerned with the wholly organic health needs of a person or a group of people. Holistic nursing requires the nurses to: 1) integrate self-care modalities based on mind-body connection, known as mind-body modalities, into their own life and to serve as role models for others; 2) utilize effective and culturally appropriate modalities to care for their patients; and 3) investigate the effects of these modalities on all physical, psychological, spiritual, and social health outcomes (AHNA, 2014).

The NCCAM (2011) offers various mind-body approaches, including PMR, meditation, guided imagery, meditation, breathing exercises, yoga, and Ti Chi. The holistic perspective of the nursing discipline requires that the mind-body modalities used in a certain population should be culturally appropriate (AHNA, 2014). Jordanian universities and nursing colleges have significantly limited financial resources. Thus, the mind-body approaches in Jordan must be within the constraints of the institutions' budgets. Also, psychiatric and mental health problems are still stigmatized among Jordanians. This may be considered as an important barrier to seeking psychiatric and mental health services (Hamdan-Mansour, et al., 2009; Nasir, Al-Qutob, 2005). Furthermore, the majority of Jordanians are Muslims or Christians who may oppose practicing self-care modalities based on their religious beliefs (Al-Krenawi, Graham, & Kandah, 2000; Otoom, Al-Safi, Kerem, & Alkofahi, 2006; Tariq, 2000). Accordingly, utilizing mind-body modalities in Jordan should take into account budget constraints, potential stigmatization of mental health problems, and potentially religious-based opposition to mind-body modalities.

The use of PMR may have important advantages over other mind-body modalities among nursing students in Jordan. PMR rests on a scientific basis, not religious beliefs, thus is different from meditation, yoga or Ti Chi, possibly making it more culturally acceptable to Jordanians who might have religious-based opposition to such practices (Al-Krenawi, Graham, & Kandah, 2000; Otoom, Al-Safi, Kerem, & Alkofahi, 2006; Smith, 2002; Tariq, 2000). PMR is also an inexpensive self-care approach that requires minimal therapist involvement, materials, or preparation. Once learned, PMR can be self-practiced by individuals without further visits to and interventions from therapists (NCCAM, 2011; Saeedi, et al., 2012; Smith, 2005). In addition to the above advantages, Smith (2005) proposed that PMP requires the least skill at paying focused attention among all mind-body modalities because the sensations of muscle tension as generated by PMR are easy to detect and attend to. Thus, it can be used by individuals who might otherwise have difficulty with concentration.

Despite the potential benefits of using PMR, its effects have not been studied among Jordanian nursing students. Specifically, the current study intends to offer information about the effect of PMR on stress reduction in the target population. Practically, results from the study may inform the decision-making of faculty and administrators about adopting PMR in Jordanian nursing colleges. Theoretically, the current study also extend the body of nursing knowledge and fill the gap in the literature regarding the effects of PMR on stress reduction in nursing students outside the United States.

Theoretical Framework

The current study was guided by the Attentional Behavioral Cognitive (ABC_2) Relaxation Theory (Smith, 1999, 2001, 2002, 2005). It is the first evidence-based theory that explains the mechanisms of relaxation techniques and how these techniques affect stress, defined

as a combination of physical, emotional, and cognitive reactions as a result of an exposure to stressors (Smith, 2002). Physical reactions of stress include physiological changes related to autonomic arousal (e.g., increased blood pressure, heart rate, muscle tension, and blood sugar) along with symptoms or subjective reports that can indicate these changes (e.g., dry mouth, headache, or fatigue). Emotional reactions of stress refer to symptoms (subjective report) of negative emotions such as anxiety, depression, and anger that affect interpersonal relationship. Cognitive reactions of stress refer to subjective experience of worry, negative thinking, forgetfulness, and difficulty with concentrating (Smith, 2002).

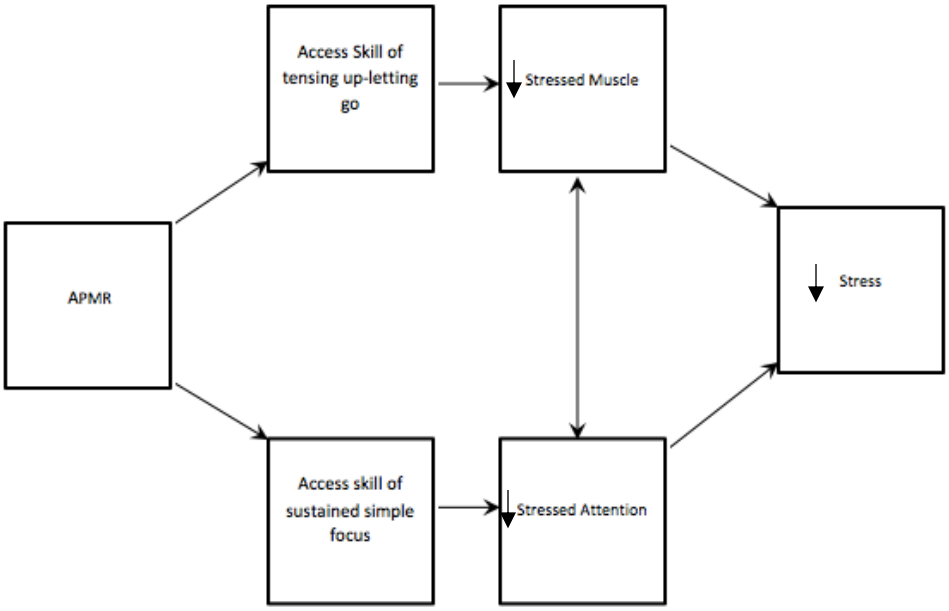
The ABC_2 Relaxation Theory indicates that most forms of professional relaxation techniques can be classified into six families: 1) stretching yoga, 2) PMR, 3) autogenic training, 4) breathing exercises, 5) imagery and relaxing self-talk, and 6) meditation/mindfulness. Each family of relaxation requires and develops different relaxation access skills, each with associated initial specific effects and different health benefits. Although all of these families of relaxation can reduce some stress signs and symptoms, PMR is presumed to be the most effective strategy that can reduce most stress signs and symptoms, physically, emotionally and cognitively (Smith, 2005).

Smith (2005) explained that PMR affects stress through two paths (see Figure 1.1). PMR deploys and develops two relaxation access skills: 1) *the access skill of tensing up-letting go*; and 2) *the access skill of sustained simple focus*. These two access skills are associated with initial effects; reductions in *stressed skeletal muscles and stressed attention* respectively. Stressed skeletal muscle refers to increased skeletal muscle tension as a result of one's exposure to stressful situations. Stressed attention is described as paying effortful and divided attention to and thinking about multiple competing tasks or stressful situations rather than one simple task.

The initial effects of reduced stressed muscle and stressed attention foster each other and in turn reduce cognitive, emotional, and physical stress arousal, as explained below (Smith, 2005).

Figure 1.1

ABC_2 Relaxation Theory (Smith, 2005)



The access skill of tensing up-letting go involves actively tensing up a group of skeletal muscles and then releasing tension. When distressed, striated skeletal muscles become tense as a result of stimulation of sympathetic nervous system. With tense muscles, blood vessels that carry oxygenated blood are often constricted by surrounding muscle tissue, preventing oxygen from reaching to them. Poor oxygenation of tense muscles tends to result in greater fatigue, discomfort, stiffness, and pain. Through the reticular activating system (RAS), these adverse effects associated with muscle tension are then transported as a stimulus to the cerebral cortex, which in turn can exacerbate HPA-mediated stress arousal. If stress is severe or chronic, the skeletal muscle tension may continue even after the source of stress is over. Sometimes distressed individuals do not notice whether their muscles are tense and the problem can

continue. With PMR, one attends to a group of skeletal muscles, deliberately creates muscle tension, and then lets the muscle relax and the tension go. As this process of generating skeletal muscle tension and then releasing this tension is applied to all major muscle groups, all of these muscles will become more relaxed than they were before. As a rebound effect, for example, respiratory rate, heart rate and blood pressure will decline because relaxed muscles require less oxygen. Also, the normal blood flow and oxygenation to the relaxed muscles improve, leading to lesser discomfort, stiffness, pain, and fatigue and warmer hands and feet. This parasympathetic-mediated generalized physical relaxation state reduces sensory input (e.g., tension headache) to the brain that then triggers the hypothalamus to additionally reduce stress arousal and associated worrisome thoughts. Furthermore, negative emotional symptoms are reduced because negative emotional states are absent in the presence of complete relaxation of skeletal muscles (Smith, 1999, 2002, 2005).

The skill of sustained simple focus involves paying attention to a restricted stimulus and redirecting attention to this stimulus after distraction (e.g. worrisome thoughts). This skill is the opposite of stressed attention, which is associated with six cognitive symptoms including, loss of concentration, becoming easily distracted, loss of memory and forgetting things, becoming confused, feeling disorganized, and feeling restless and fidgety (Smith, 1999, 2001, 2005). In everyday life, people are exposed to various stressors and their mind is synchronously preoccupied with various stressor-related thoughts, followed by emotional and physical arousal. The key to relaxation is focusing one's attention on just one stimulus rather than being cognitively preoccupied with stress-related thoughts. With APMR, the target stimulus is an internal physical sensation, a sensation of muscle tension and relaxation felt during practice. Such disengagement or redirection of attention from worrisome thoughts or competing tasks to

one simple target, the sensations of muscle tension and relaxation, can produce a quiet mind or mental relaxation through the hypothalamus. Mental relaxation is associated with improvement in cognitive abilities and emotional states, reducing adrenaline, norepinephrine, and epinephrine (stress hormones) through a parasympathetic activation. (Smith, 2005; Smith, 2002; Smith, 1999).

A theoretical-empirical structure of the relationships among the constructs, concepts, variables, and measures used for this research appears in Figure 1.2. Two constructs are depicted: *relaxation technique* and *relaxation benefits*. According to Smith (2002), *relaxation technique* is defined as the act of sustaining focused attention while minimizing overt behavior and covert **c**ognition. *Relaxation benefits* refer to intermediate or long-term positive health effects that practitioners of relaxation techniques can experience. This could include relieving stress, relieving destructive wear and tear on the body systems and organs, speeding healing and recovery from non-chronic conditions (e.g., wounds), reducing serious complications of chronic conditions, and increasing spirituality (Smith, 2002, 2005).

According to Smith (1999, 2002, 2005), the six families of relaxation techniques are stretching yoga, PMR, autogenic training, breathing exercises, imagery and relaxing self-talk, and meditation/mindfulness. In this study, *PMR* will be used and is defined as systematically tensing up and releasing tensions in various muscle groups while focusing one's attention to the sensation of muscle tension and relaxation. *PMR* will be operationalized based on Smith' (2005) protocol involving six 30-minute group sessions; one instructional session and five actual training sessions. As mentioned earlier, stress relief is one of the intermediate benefits of practicing relaxation techniques. *Stress* in this study refers to a combination of physical, emotional, and cognitive reactions as a result of one's exposure to stressors. *Stress* will be

measured subjectively by the Smith Stress Symptoms Inventories (SSSI) (Smith, 2002) and objectively by an automated blood pressure/pulse monitor for *blood pressure (BP)* and *heart rate (HR)*, and a skin temperature thermometer for *finger skin temperature (FST)* (see Table 1.1).

Figure 1.2

Substruction Based on Smith's ABC Relaxation Theory

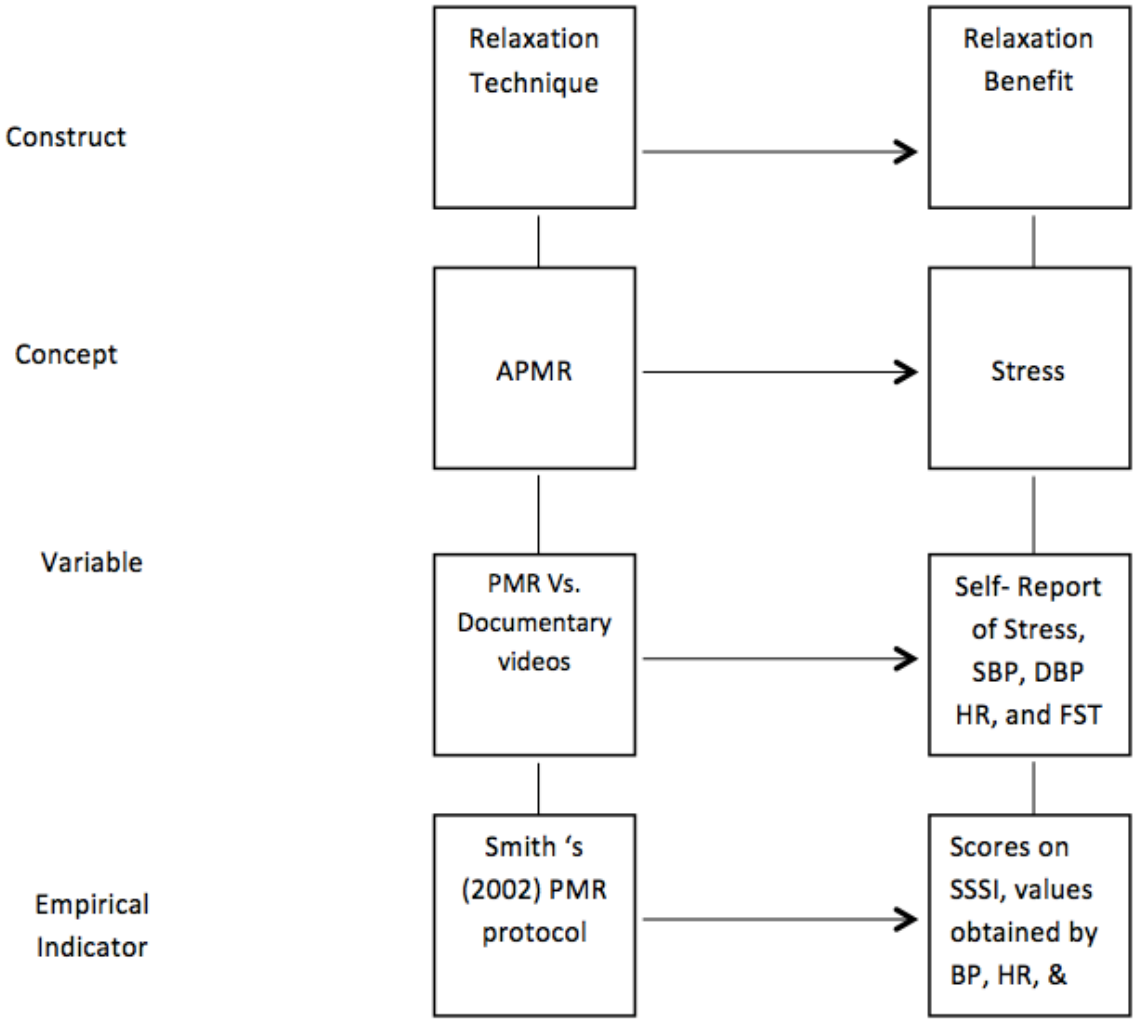


Table 1.1

Definitions of Terms

Variable	Theoretical Definition	Operational Definition
PMR	Systematically tensing up and releasing tensions in various muscle groups with focused attention to sensations of muscle tension and relaxation (Smith, 2005).	Smith's (2002) protocol of PMR (one educational session and five training sessions)
Stress	A combination of physical, emotional, cognitive reactions as a result of person's exposure to stressors (Smith, 1999, 2002).	Stress will be measured subjectively by the Smith Stress Symptoms Inventory 3 and objectively by physical measures of BP, HR, & FST.
Self-reports of stress	A combination of physical, emotional, and cognitive reaction as a result of person's exposure to stressors (Smith, 1999, 2002).	Numerical value (35-140) obtained from a 1-5 Likert-type scale, which is Smith Stress Symptoms Inventory 3. Larger scores indicate higher levels of stress.
Blood Pressure	The pressure of the blood against the walls of the blood vessels (World Health Organization, 2013).	Numerical values in mmHg representing systolic and diastolic BP obtained from automated BP/HR monitor.

		Larger values of systolic and diastolic BP indicate higher levels of stress.
Heart Rate	The speed of the heartbeat measured by the number of heartbeats per unit of time (Ahrens & Rutherford, 1993).	Numerical values (beat/minutes) representing the number of heartbeats per minute. Larger values of heart rate indicate higher levels of stress.
Finger Skin Temperature	Temperature of finger surface reflecting the digital blood perfusion and degree of vasoconstriction affected by sympathetic arousal (Jang & Line, 2013).	Numerical values in Fahrenheit representing finger skin temperature. Higher values of FST indicate lower levels of stress.

CHAPTER 2

Literature Review

Definition of Stress

Stress as a construct began to appear in the nursing literature in the 1950s and became common by the 1970s because evidence consistently shows that stress is related to overall health (Lyon, 2012). However, the literature shows both inconsistency and disagreement regarding the definition of stress. Various theoretical approaches have been developed to explain and define stress (Lyon, 2012). Theoretical approaches to define stress as a construct have been classified into three major categories: stress as a response, stress as a stimulus, and stress as a transaction (Lyon, 2012). A fourth theoretical approach appeared later, including all concepts from the first three approaches.

Stress as a response. The response-based theoretical approach to stress first emerged in 1956 when Selye (1956) used the term 'stress' to explain problems related to homeostasis (Cannon, 1938). According to Cannon (1938), people have internal mechanisms to maintain stable functioning or equilibrium. When a person experiences a challenge or threat, he/she responds through numerous physiological systems to compensate for the resources being overtaxed. An example of this type of compensation is fluid regulation. Individuals' failure to respond to challenges or threats by maintaining bodily homeostasis can result in damage to organs and ultimately death (Cannon, 1938). Stress is thus conceptualized as a "nonspecific response of the body to noxious stimuli" (Selye, 1956, p. 12). Stress within this context appears to be a dependent variable in research and can be measured objectively by physical measures (Lyon, 2012). According to Selye (1956), bodily stress response refers to a set of nonspecific generalized physiological responses that are experienced by all people exposed to challenges or

threats. The non-specific response to stress, also called General Adaptation Syndrome, proposes that numerous stressors provoke identical and general stress responses. The General Adaptation Syndrome involves three stages: alarm reaction, resistance, and exhaustion. The first stage, alarm reaction, involves the 'fight-flight' responses (Cannon, 1938). When people are exposed to a challenging situation, they deal with this situation through fight or flight responses that involve activating the HPA axis, nervous system (SNS) and adrenal glands. During this phase, the main stress hormones cortisol, adrenaline, and noradrenaline, are released to provide the body with immediate energy. When homeostasis starts to restore balance and a period of recovery arises, the body moves into the second phase, named the resistance phase. In the final phase, the exhaustion phase, the body's adaptation energy supply is consumed over time and the ability of the body to resist stress is depleted. This stage is harmful because it can influence many organs and can result in psychosomatic illnesses (Selye, 1956).

Based on this theoretical approach, the nature of stress responses are physiological so that cognitive concepts such as "perception" or "appraisal" are not understood to play a role in initiating or moderating responses (Selye, 1956; Lyon, 2012). The nature of such nonspecific physiological responses, however, does not include individual differences in terms of perceptions and coping strategies used to manage stressful or challenging situations (Lyon, 2012).

Stress as a stimulus. In the 1960s, the stimulus-based theoretical approach to stress emerged (Lyon, 2012). This approach relates stress to life changes or life events to which the body responds (Holmes & Rahe, 1967). Based on this approach, the exposure to many life changes in a short time increases the vulnerability of individuals to diseases. Unlike the response-based theoretical approach, stress is seen as independent variable in research (Lyon, 2012). Life changes in this context can be measured by tools such as the Social Readjustment

Rating Scale (SRRS) (Holmes & Rahe, 1967). The SRRS includes 42 life events such as marriage, loss of a loved one, pregnancy, vacation, divorce, retirement, and so on that have a priori weights derived from the estimated amount of adaptation needed by the body to respond to these events (Holmes & Rahe, 1967).

Like the response-based approach of stress, the stimulus-based approach ignores the role of appraisal or perception of events in the response to stress, so it does not explain why different individuals' health is affected differently even when they are exposed to the same stressors (Lyon, 2012).

Stress as a transaction. The third theoretical approach that defines and explains stress as a construct is the transactional approach (Lazarus & Folkman, 1984). Here, stress is conceptualized as a transaction between individuals and their environment whereby stress factors are appraised by individuals as exceeding their resources and threatening their health (Lazarus & Folkman, 1984). Based on this theoretical approach, appraisal and coping are important factors concerning how a person responds to challenging, threatening or harmful situations or events. In other words, appraisal and coping function as mediators between stressors and somatic, psychological and social health. Appraisal and coping are thus essential attributes of the transactional stress construct and need to be measurable to make the construct measurable (Lazarus & Folkman, 1984).

The transactional theoretical approach is consistently used to inform nursing research due to the emphasis on the roles of appraisal of and coping with stress and individuals' variations in response to the same stressors (Lyon, 2012). However, this theoretical approach describes stress as a subjective phenomenon (Lazarus & Folkamn, 1984) so that the measurement of stress in research is prone to response biases. Furthermore, Lazarus and Folkman (1984) have identified

three appraisals within the transactional approach which are inter-dependent: primary appraisal, secondary appraisal, and reappraisal. Because they can occur simultaneously during stressful encounters, it is difficult to measure each type of appraisal separately.

Stress as a combination of concepts. A fourth approach describes stress in a comprehensive way whereby the aforementioned concepts from the works of Selye (1956), Holmes and Rahe (1967), and Lazarus and Folkman (1984) are combined to define stress (Smith, 2002). For example, Smith (2002) defines stress as a somatic, emotional, and cognitive reaction as a result of person's exposure to stressors. Smith (2002) explains that stress is a complex combination of different concepts such as stressors, cognitive arousal or distorted cognitive appraisal, physical arousal, and emotional arousal.

In consistence with the transactional theoretical approach to stress, Smith (2002) explains that a stressor by itself does not cause physical or emotional stress arousal, but also how a person thinks about or evaluates this stressor (cognitive appraisal of stressor). For example, when faced with a stressor in a clinical setting (e.g. giving a medication to a patient), an individual evaluates whether this situation is stressful (i.e. threatening, challenging or harmful) (Smith, 2002). This decision about whether the situation is stressful or not is made based on different factors such as 1) the relevance of the situation with one's goals or needs (i.e. giving medication correctly to pass a clinical course or avoiding harm to a patient) and 2) distorted or irrational thoughts (i.e. "I am lousy at math; I did not pass in the math exam last semester. So, I may not be able to calculate the dose of medication correctly"). The last factor, which is that of distorted or irrational thoughts, involves patterns of thinking that usually contradict reason and fact and cause individuals to make biased appraisals that are stressful (Smith, 2002). In the example above, the individual might not be bad in math, and the reason why she/he did not pass the math course is

that she/he was sick or busy during the last semester (Beck, 1976; & Ellis & Bernard, 1985). The cognitive process of evaluating whether a situation is threatening, challenging, or harmful is called a primary appraisal (Lazarus & Folkman, 1984; Smith, 2002).

When the situation is appraised as stressful, the limbic system in the brain is activated and initiates emotional responses (Van der El, 2010). There are a variety of emotional responses that can be evoked based on stressful situations that individuals face. These responses are classified into three major areas of emotional symptoms: 1) depression: includes feelings of sadness, shame, guilt, hopelessness, dejection, despondency, discouragement, and sorrow; 2) anxiety: includes feelings of fearfulness, threat, panic, dread, and tension; and 3) anger: includes feelings of hostility, resentment, irritability, and cynicism that affect inter-personal relationships (Smith, 2002).

Simultaneously, the hypothalamus in the limbic system stimulates physiological responses. The hypothalamus stimulates the physiological responses by activating two systems: the hypothalamic-pituitary-adrenal (HPA) system and the sympathetic nervous system (SNS) (Smith, 2002; Smith & Wylie, 2006). In the first system (HPA), the hypothalamus releases a corticotrophin-releasing factor (CRF) that stimulates the release of a variety of hormones from the anterior and posterior areas of the pituitary gland. The hormones that are released from the anterior pituitary gland include prolactin (PRL), growth hormone (GH), and adrenocorticotropic hormones (ACTH). The hormone that is released from the posterior pituitary gland is antidiuretic hormone (ADH). ACTH released from the anterior pituitary gland stimulates the adrenal cortex to secrete cortisol that affects mainly metabolic processes. Cortisol, described as a stress hormone, increases the concentration of blood glucose through gluconeogenesis, reduces glucose uptake in cells, suppresses immune system and inflammatory functions, increases amino acids,

lipids and fatty acids in the bloodstream, stimulates and increases gastric-acid secretion, and decreases formation of bone (Chrousos & Gold, 1998; Chyun, Kream, & Raisz, 1984; Shelby & McCance, 2001; Soffer, Dorfman, & Gabrilove, 1961).

While the stimulation of the HPA system leads mainly to the release of cortisol from the adrenal cortex, SNS stimulation results in releasing catecholamines from the medulla of the adrenal gland. SNS is the second system involved in stress responses that is activated by the CRF released from the hypothalamus. When the hypothalamus is activated as a result of the exposure to a stressor, it releases CRF, which in turn activates the SNS. SNS stimulates the medulla of the adrenal gland to secrete catecholamines such as epinephrine, norepinephrine, and dopamine into the bloodstream. These catecholamines are responsible for the initiation of a variety of physiological responses. For example, epinephrine increases cardiac output, heart rate, and blood pressure. It increases blood flow to the heart, brain, and skeletal muscles by dilating vessels that supply these organs. It increases muscle tension. It dilates the airways, thereby increasing delivery of oxygen to the blood stream. Simultaneously, norepinephrine causes constriction of viscera and skin blood vessels (Chrousos, 1992; Herbert & Cohen, 1993; Maddock & Pariante, 2001; Shelby & McCance, 2001, as cited in Hsiao, 2008).

People often experience a variety of symptoms that may indicate physical responses to stress such as irregular and fast heartbeat or heart palpitations, shallow and fast breathing, tension or being clenched up as manifested by a furrowed brow, making a fist and clenching jaws, restlessness, feeling too warm, feeling the need to use the bathroom, dry mouth, feeling heavy, back pain, feelings of tensed shoulder, neck, and back, oily skin, tearing eyes, stomachache, loss of appetite, headache and fatigue (Smith, 2002).

The hormones and neurotransmitters released as a result of activating the HPA axis and SNS also cause a variety of negative cognitive symptoms or responses such as deficits in working memory, scattered thoughts, and loss of focus or concentration. For example, when people appraise a situation as stressful, the HPA axis is activated and causes the adrenal cortex to secrete glucocorticoids. Glucocorticoids activate glucocorticoid receptors in the prefrontal cortex of the brain once glucocorticoids move through the bloodstream and cross the blood-brain barrier (De Kloet, Joëls, & Holsboer, 2005, as cited in Shansky & Lipps, 2013). Although this process takes place to enhance long-term memory associated with the event appraised as stressful, the actions of glucocorticoids in the prefrontal cortex also impair working memory (Shansky & Lipps, 2013).

As a response to the primary appraisal of stress and the emotional, cognitive and physical responses resulting from it, the nursing student may evaluate the coping resources available to manage the situation itself (i.e. "What, if anything, can be done to give medication correctly?"), or resulting physical, emotional, and cognitive responses (i.e "How can I decrease my anxiety?"). The cognitive process of evaluating coping resources available to manage the stressful situation is referred to as a secondary appraisal. If effective coping resources are not available (i.e. "There is no way that can help me give the medication correctly") or maladaptive cognitive coping is used (i.e. "I will not do it and I should start thinking about changing my program"), the negative emotional responses and associated physical and cognitive responses may continue or even increase. All these responses can be present as new stressors are cognitively appraised as being stressful (i.e. threatening or harmful) (Smith, 2002).

Some nursing theorists adopt the comprehensive theoretical approach to define stress. For example, Pollock (1984) defined stress as:

> The whole set of physiologic and psychological phenomena including the objective event or stressor, the person's perception of the stressor, the conditioning factors or contextual stimuli, the various intervening processes or the residual stimuli, and the manifestations of response to the stressor (p. 3).

Stress in Nursing Education

Stress has been extensively investigated in nursing students because of its negative effects on their physical and psychosocial health, academic performance, attrition, and the quality of the healthcare they provide to patients (Al-Zayyat & Al-Gamal 2014; Deary, et al., 2003; Hamdan-Mansour et al. 2009; Lindop, 1993; O'Regan, 2005; Park & Lee, 2004; Smith, 2002). In the following sections, topics related to nursing students in different countries (except Jordan) are reviewed: 1) the prevalence of stress, 2) sources of stress, 3) comparing stress between different academic years, 4) comparing stress across cultures, and 5) the impact of stress.

Prevalence of stress. The prevalence of stress among nursing students in countries outside Jordan was found to range nearly from 24% to 50%. In Canada, one objective of a cross-sectional descriptive exploratory study was to investigate the prevalence of stress among undergraduate nursing students using Depression Anxiety Stress Scales (DASS) (Lovibond & Lovibond, 1995). Of 882 nursing students, 437 completed the study's online survey. The results of this study showed that 24 % of the 437 nursing students reported moderate to severe levels of stress. Using just one undergraduate nursing program in Canada and the low response rate in this study, however, makes it difficult to arrive at a generalizable conclusion (Chernomas & Shapiro, 2013).

In another study using a cross-sectional design, approximately 40 % of 85 undergraduate nursing students recruited from three Swedish universities reported high levels of stress during clinical practice (Blomberg, et al., 2014). A limitation of this study was that the authors used a convenience sample of students and a self-reported instrument to measure stress (a numerical rating scale, NRS–10). The use of nonrandom sampling involves the risk that the study sample is not representative of the population under study. Response bias also may occur when self-reported instruments are used in a study (Shadish, Cook, & Campbell, 2002).

In a similar study, nearly 40 % of 373 randomly selected Egyptian nursing students reported high levels of stress as measured by the Perceived Stress Scale (Amr, El-Gilany, El-Moafee, Salama, & Jimenez, 2011). The study examined the prevalence of stress among Egyptian nursing students using a cross sectional design and was conducted in one setting. Collecting data at only one point in time and from only one setting, however, limits the generalization of findings. Furthermore, stress was measured using a self-reported instrument, and thus potential for response bias exists (Amr et al., 2011).

In Thailand, although the percentage of nursing students experiencing stress has not been examined, one objective of a descriptive correlational study was to examine the relationship between stress and depression among nursing students (Ross et al., 2005). By recruiting 331 nursing students from three universities in Thailand, the results indicated that Thai nursing students experienced high levels of stress. Stress in Thai nursing students was positively correlated with depression, with nearly 50 % of them reporting moderate to high levels of depression. This study used self-reported instruments to measure stress and depression: the Perceived Stress Questionnaire (Levenstein et al., 1993) and The Center for Epidemiology Studies Depression Scale (Radloff, 1977) respectively. These instruments are subject to response

and social desirability bias, however, and the study subjects were selected using a convenience sampling method, compromising the generalizability of findings (Ross et al., 2005).

Sources of stress among nursing students. A substantial amount of research has explored sources of stress in undergraduate nursing students. Stressors experienced by nursing students have been categorized as academic, clinical, and personal/external. In Spain, one objective of a cross sectional study was to identify types of stressors in novice and experienced nursing students. In this study, 357 students from all 3 years of a nursing program at a Spanish nursing college completed the Perceived Stress Scale (Sheu et al., 1997). Results showed that clinical stressors such as lack of professional knowledge and skills and actual care of patients were the major sources of stress among Spanish nursing students in each year or experience level (Jimenez, Navia-Osorio, & Diaz, 2010).

Contrary to the previous study, a descriptive cross sectional study was conducted in 287 Nepali nursing students who reported external personal stressors as their most frequent stressors, followed by clinical and academic stressors. The most common personal external stressors experienced by these students were high parental expectations, changes in eating or sleeping patterns, and lack of play and recreational activities. Inability to balance study and leisure time and preparation of assignments were the most common academic and clinical stressors experienced by these students respectively (Shrestha, 2013). The data related to Nepali nursing students' stressors were collected by a rating scale developed by the researcher based on reviews of similar studies. However, this scale had a low value of internal consistency reliability (Chronbach alpha = 0.66), leading to a potentially high degree of random measurement error (Shrestha, 2013).

Unlike the previous studies conducted in Nepal or Spain, a Japanese cross-sectional study

found that academic stressors such as taking an examination were more commonly reported by Japanese nursing students than clinical or external/personal stressors. Of these, relationships with friends and report presentations in clinical practice were the most common external/personal and clinical stressors reported by the students respectively. The study subjects were 1,370 junior nursing students currently enrolled in seven universities in Japan. Based on that sample, the findings of this study cannot be generalized to senior nursing students (Yamashita, Saito, & Takao, 2012).

A systematic review of studies on stressors in nursing students published until the end of 2010 identified several types of clinical and academic stressors reported by nursing students across continents (Pulido-Martos et al., 2012). Fear of unknown situations, fear of making a mistake with patients, and fear of handling of technical equipment were the most common overall stressors reported, and study workload and examinations were the most common academic stressors. Although this systematic review was useful in terms of summarizing the state of science about stressors as reported by nursing students across cultures, the authors explained that methodological differences between the studies reviewed made it difficult to make a robust conclusion (Pulido-Martos et al., 2012).

Clinical training settings have been identified as one of the most stressful work environments for nursing students (Alzayyat & Al-Gamal, 2014; Ross, et al., 2014, Wolf, Stidham, & Ross, 2015). A main objective of one integrative review was to identify types of stressors reported by undergraduate nursing students during their clinical education. Based on 13 studies published between 2002 and 2013, the review found academic demands, relations in the clinical environment, and caring for patients and families to be the most common clinical stressors reported by nursing students across continents (Alzayyat & Al-Gamal, 2014). However,

methodological differences between the studies included in the review in terms of sample characteristics and instruments used to measure stressors led to difficulties related to the generalizations of the results (Alzayyat & Al-Gamal, 2014).

Comparisons between different academic years. Nursing students in different academic years have reported different levels of stress. For example, a study in Spain using a descriptive prospective design was conducted to assess stress as experienced by nursing students in clinical training settings throughout their program. Sixty-nine students were recruited from one Spanish nursing college through convenience sampling. Data was collected using the KEZKAK instrument (a bilingual questionnaire in English and Spanish designed to evaluate nursing students' stress in clinical settings) at four data collection points (before starting practical training, end of the first year, end of the second year, and at end of students' studies). Common sources of stress (stressors) reported by these students throughout their program included feelings of lack of capability, powerlessness and uncertainty, and inability to set limits in relationships with clients, teachers and colleagues. The levels of stress reported by students were different throughout their program, as students at the end of the program reported lower levels of stress (Gorostidi, et al., 2007).

In a similar study using a descriptive prospective design (Edwards, Burnard, Bennett, & Hebden, 2010), 169 British nursing students completed the Stress in Nurse Education (SNE) Questionnaire (Rhead, 1995) at different time points of their study program (at the end of the first year after two clinical rotations, at the beginning of the second year, at the end of the second year after five clinical rotations, at the beginning of the third year, and after the third year). The levels of stress were found to be significantly varied between the different data collection times. Unlike the previous study (Gorostidi et al., 2007), this study indicated that nursing students at the

beginning of the final (third) year reported the highest levels of stress. These findings were interpreted as being that because more professional stressors are placed on third year students compared with students in earlier years, third year students experience higher levels of stress (Edwards et al., 2010).

Although using longitudinal designs in the previous two studies (Edwards et al., 2010; Gorostidi et al., 2007) helped measure the changeable nature of stress in nursing students, these studies used convenience sampling methods and had relatively small sample sizes. Therefore, the generalization of the findings to nursing students in the same countries may be restricted. Furthermore, these two studies reflected stress resulting from stressors related to particular curriculum programs in Spain and England. Consequently, generalization of the findings to other countries with different nursing curricula may be compromised (Alzayyat & Al-Gamal, 2014).

Comparisons across cultures. Comparisons between nursing students from different cultures and countries in terms of stress have been rarely conducted. In one study using a longitudinal design (Burnard et al., 2008), the authors explored and compared the levels of stress and the sources of stress among nursing students throughout their courses of study across five different countries (Albania, Brunei, the Czech Republic, Malta and Wales). The SNE questionnaire (Rhead, 1995) was used for data collection. Results indicated that nursing students in Wales reported the highest levels of stress, while nursing students from Brunei reported the lowest levels of stress. Nursing students in Brunei and Malta experienced stress resulting mainly from academic stressors, whereas nursing students in the Czech Republic, Wales and Albania reported stress resulting from both clinical and academic stressors. In Albania, Malta and Wales, there were no significant differences in the level of stress by year of study. However, in Brunei, students in the third year reported the highest levels of stress (Burnard et al., 2008).

This study was the first of its kind to compare the levels and sources of stress in an international sample. However, there are various factors that should be considered when interpreting the study's results. First, there were possible cultural differences between student groups that were not accounted for in the study. Such potential cultural differences include teacher-student affiliations, attitudes towards the education process, and perceptions about manners of caring. All of these cultural differences between students in different countries may have influenced stress levels. Second, there were differences in the curricula offered to the different student groups in terms of the breadth, depth and type of content offered, examinations, assessment processes and evaluation methods. Those different factors that were not accounted for in the study can all affect nursing students' stress levels (Burnard et al., 2008).

Comparisons with students from other disciplines. Researchers have reported that nursing students experience higher levels of stress than students from other disciplines (Beck et al., 1997). In a descriptive correlational study conducted in Canada (Beck et al., 1997), a main objective was to compare undergraduate nursing students to those enrolled in other health-related colleges, such as medicine, pharmacy and social work in terms of stress and stress-related physical and psychological symptoms. Five hundred and fifty- two university students enrolled in the above colleges participated in the study. Using the Beck-Srivastava Stress Inventory (BSSI), undergraduate nursing students reported higher levels of stress than those in the other health-related colleges (Beck et al., 1997).

This study (Beck et al., 1997) may be the only one to provide evidence that nursing students experience higher levels of stress than their peers in other health-related disciplines. It has limitations, however, that affect the validity of its findings. The study's use of a self-reported instrument to measure stress might have led to a social desirability bias. The study sample was

also selected by convenience sampling, thus limiting the generalizability of findings to the study population (Beck et al., 1997).

Impact of stress. Stress influences different aspects of nursing students' lives. There is strong evidence to show that nursing students in different countries such as England, Kuwait, Israel, and the USA who reported high levels of stress experienced a reduction in their cognitive abilities involving memory, concentration and problem solving abilities. These reduced cognitive abilities can negatively impact academic performance (Al-Kandari & Vidal, 2007; Flyod, 2010; Pryjmachuk & Richards, 2007; Sarid, Anson, Yaari, & Margalith, 2004; Wells, 2007). Furthermore, evidence reveals that college students in the USA with higher levels of stress are more likely to engage in unhealthy and high-risk behaviors such as unprotected sexual practices, increased consumption of alcohol and junk food, and decreased exercise or physical fitness. These stress-related unhealthy behaviors adversely affect academic performance (Hudd et al., 2000).

The nursing shortage is a global issue exaggerated by high rates of nursing students' burn- out and attrition (Deary et al., 2003; Floyd, 2010; Watson et al., 2008). Some studies have shown that stress is a significant factor contributing to the high rates of burn out and attrition among nursing students (Deary et al., 2003; Floyd, 2010; Watson et al., 2008). In quantitative and qualitative studies conducted in the UK, USA, and Hong Kong, stress has been found to be a significant predictor of or related to nursing students' burn out and attrition (Deary et al., 2003; Floyd, 2010; Watson et al., 2008).

Researchers have also reported that stress in nursing students does not just have negative effects on them, but also on patients. In Ireland, Taiwan, the USA, and Hong Kong, researchers have reported that stress experienced by nursing students during their undergraduate programs

may lead to psychological and physical impairments during the nurses' professional life later on. These deleterious health effects from stress can cause nurses to leave work periodically or permanently. In turn, stress-related absences increase the workload and stress on the remaining nurses, leading to lower quality patient care (Evans & Kelly, 2004; Ryan, Powell, & Watson, 2005; Sheu et al., 2002; Watson et al., 2008).

Stress in Jordanian Nursing Students

Jordan is one of the smaller countries in the Middle East. It has many characteristics that are similar to those of other neighboring Middle Eastern countries (Sorenson, 2014). The official spoken language in Jordan is Arabic, although English is used by some. Approximately 80% of the Jordanians are Muslims, while the rest belong to other religious groups such as Christianity. Religion is seen as part of the constitution that is applied in the daily life of Jordanians. (Al-Krenawi et al., 2000; Otoom et al., 2006).

Jordan's educational and health care systems have advanced with the development and implementation of higher educational and healthcare standards, beginning in the mid-twentieth century and continuing today (Zahran, 2010). These high standards have created new challenges and stressors for nursing students that put them under severe stress (Aldiabat & Clinton, 2013). In this section, the following topics related to stress in Jordanian nursing students will be reviewed: 1) prevalence of stress and sources of stress, 2) comparing stress between academic years, 3) comparing stress in nursing students to students from other disciplines, and 5) impact of stress.

Prevalence of stress and source of stress. Like students from other countries, Jordanian nursing students have reported moderate to high levels of stress resulting from different types of stressors. In a study using a descriptive cross-sectional design (Shaban et al., 2012), nearly 52 %

of 181 second-year undergraduate nursing students taking their initial clinical course (Medical-Surgical Health Nursing) had stress above the mean. The most common type of stressors perceived by them was worrying about grades, followed by having to be early in the hospital (7am) and experiencing pressure from the nature and quality of clinical practice. Of the 181 students, approximately 30 % experienced two stressors, while approximately 55% experienced more than three stressors. The study used a self-reported perceived stress scale (Sheu et al., 1997) to measure stress. However, social desirability bias or response bias influencing internal validity could be a problem with this kind of measure. Furthermore, the sample was second-year undergraduate nursing students selected non-randomly from two Jordanian public nursing colleges, leading to a compromise in generalizability to students from other academic years and private nursing colleges in Jordan (Shaban et al., 2012).

Using the same instrument as in the above study, Alzzayat and Al-Gamal (2014) conducted a descriptive longitudinal study to compare the degrees of stress and types of stressors reported by 65 Jordanian undergraduate nursing students taking clinical psychiatric/mental health courses at two data-collection times: at the beginning of clinical psychiatric/mental health courses and at the end of clinical psychiatric/mental health courses. Stress was higher among students at the beginning of the courses than at the end. The most common stressors reported were taking care of patients, assignments, and workload. These kinds of stressors were similarly reported at both data-collection times. Although the subjects were recruited from five nursing programs, data were collected from the students in lecture classrooms, and students who were not present in those classrooms might have had different responses on the study scale. The self-report scale used in the study might also have led to social desirability bias or response bias. Finally, although the use of the longitudinal design in this study might have detected changes in

stress levels over time, other factors that were not identified might have affected the levels of stress between or during measurements (Alzzayat & Al-Gamal, 2014).

Comparisons between academic years. Jordanian undergraduate nursing programs have been greatly influenced by the American model of nursing education (Sultan, 1998; Zahran, 2012). Like most American undergraduate nursing programs, Jordanian undergraduate nursing programs are composed of four years. In the first year of programs and before nursing students are placed in clinical practice, they usually take basic medical and nursing courses, such as anatomy, physiology, foundation of nursing, and basic nursing skills in labs. In the second year of the programs, nursing students begin clinical practice and take mainly theoretical and clinical adult health nursing courses. In the third year, they are mainly required to finish clinical and theoretical courses such as maternal health nursing and pediatric health nursing. In the last year, they must successfully complete clinical and theoretical courses such as community health nursing, advanced adult health nursing, and training. The clinical courses are usually taught by clinical instructors having at least a Bachelor's degree and adequate clinical experience, while the theoretical courses are usually taught by instructors holding at least a Master's degree (Akhu-Zaheya et al., 2012; Khater et al., 2014).

A recent descriptive cross-sectional study (Khater et al., 2014) used a perceived stress scale (Sheu et al., 1997) to determine and compare the levels and sources of stress in Jordanian undergraduate nursing students taking clinical courses and enrolled in different academic years of study. The results showed that 48% of 597 students had stress levels above the mean, regardless of their academic year of study. Second-year nursing students who took the initial clinical training reported higher levels of stress than third-year and fourth-year nursing students (Khater et al., 2014). In addition to the academic year, the student's age, interest in studying

nursing, and the clinical courses that students were enrolled in were identified as predictors of their stress. For example, the students who were older, more interested in studying nursing, and enrolled in the Adult Health Nursing course experienced higher levels of stress (Khater et al., 2014).

Regardless of the academic year of study, the most common stressor reported by students across levels was worrying about grades. This stressor was followed by experiencing pressure from the nature and quality of clinical practice and students' feeling that their performance does not meet teachers' expectations. Other sources of stress were found to vary throughout the years of study. For example, assignments, followed by taking care of patient were the most common sources of stress reported by second-year students, whereas taking care of patients, followed by dealing with nurses in clinical areas were the most common sources of stress reported by fourth-year nursing students (Khater et al., 2014).

Although the study (Khater et al., 2014) provided valuable information about stress among Jordanian nursing students, it was subject to some limitations that may have impacted the results. The study used a self-reported scale that might have increased the potential for response bias or social desirability bias. In addition, although faculty characteristics and different teaching styles of educators may have affected the levels of nursing students' stress, these two variables were not included in the study. Using a convenience sampling method and recruiting students from two universities in Jordan also compromised the generalizability of the results to Jordanian undergraduate nursing students overall (Khater et al., 2014).

Comparison with students from other disciplines. Many Jordanian university students complain of mistreatment from educators and unfair grading systems, leading to higher levels of stress. In a cross-sectional study (Al-Hussain et al., 2008), 500 students in five health related

faculties at the Jordan University of Science and Technology (JUST) responded to a questionnaire concerning occurrences of different forms of mistreatment of students and student mistrust of the grading system. Results showed that 61% of the students experienced at least one form of mistreatment. The most common form of mistreatment was psychological mistreatment (shouting and humiliation). Compared to students from other health-related faculties, the nursing students reported higher levels of mistreatment. Furthermore, 66% of students reported that the grading system at JUST is unfair. Perceived mistreatment and an unfair grading system are considered as major sources of stress among Jordanian nursing students, and these stressors may affect the process of teaching and learning (Al-Hussain et al., 2008).

Coping strategies. Using the Coping Behavior Inventory (CBI) (Sheu et al., 2002), the objective of three descriptive correlational studies (Alzzayat & Al-Gamal, 2014; Khater et al., 2013; Shaban et al., 2012) was to identify coping strategies used by Jordanian nursing students. In a descriptive correlational study, coping strategies used by Jordanian nursing students during pre- and post-clinical periods in Psychiatric-Mental Health Nursing (PMHN) courses were identified (Alzzayat & Al-Gamal, 2014). Results showed that the most common coping strategy used in the pre-PMHN clinical training period was the problem-solving strategy, followed by the avoidance strategy. The most common strategy used in the post-PMHN clinical training period remained the problem-solving strategy; it was followed, however, by the stay-optimistic strategy (Alzzayat & Al-Gamal, 2014). Similar results have been found when coping strategies used by Jordanian nursing students taking their initial clinical course (Medical-Surgical Health Nursing) have been examined. The problem solving strategy was again the most frequent strategy used by these students, followed by the avoidance strategy (Shaban et al., 2012).

Contrary to the above two studies, a descriptive correlational study (Kahter et al., 2013) that aimed to identify and compare the coping strategies used by Jordanian nursing students taking clinical courses in different years showed that the avoidance strategy is the least used coping strategy, regardless of the year of study. However, the most commonly used strategy was problem solving, followed by staying-optimistic and transference strategies. When comparing coping strategies in different years of study, the second-year nursing students who took their initial clinical course were more likely to use the avoidance strategy than fourth-year nursing students. However, no significant differences were found between students in different years of study on other coping strategies (Kahter, et al., 2013). This was interpreted as nursing students in their initial clinical courses being less confident about their nursing skills and knowledge, and thus avoiding situations in clinical settings (Khater et al., 2013; Shaban et al., 2012).

The three above studies (Alzzayat & Al-Gamal, 2014; Khater et al., 2013; Shaban et al., 2012) used the same instrument, the Coping Behavior Inventory (CBI) (Sheu et al., 2002), to measure coping strategies; however, this instrument doesn't include all potential coping strategies used by students. For example, the CBI doesn’t include items about using mind-body approaches as coping strategies; therefore, it was unknown whether these strategies were used by Jordanian nursing students (Alzzayat & Al-Gamal, 2014; Khater et al., 2013; Shaban et al., 2012).

Impact of stress. Negative effects of stress on Jordanian nursing students have not been studied extensively. Similar to nursing students from other countries, Jordanian nursing students have experienced maladaptive behaviors as a result of stress they have encountered (Aldiabat & Clinton, 2013; Suleiman, Yates, Berger, Pozehl, & Meza, 2010). A common maladaptive behavior reported by Jordanian nursing students is smoking. In a recent qualitative study using

grounded theory method, stressful demands of university nursing programs such as examinations, written assignments, and theory-practice gaps were identified as important factors influencing male Jordanian nursing students to transition from occasional to regular smoking. Smoking can adversely affect Jordanian nursing students' health and their patients' health (Aldiabat & Clinton, 2013).

Another maladaptive behavior found to be associated with stress experienced by Jordanian nursing students is disturbed sleep behavior. Using the Arabic version of the Pittsburg Sleep Quality Index (PSQI) (Suleiman et al., 2010), most Jordanian nursing students reported low sleep duration (6.48 hours per day), experienced a difficulty in falling asleep within 30 minutes, and used sleep medications moderately (Suleiman et al., 2013). The main causes for sleep disturbance in Jordanian nursing students were stressors related to job, education, and financial demands. A high percentage of the Jordanian nursing students also work full time or part time to manage the financial demands of their education and family. Working part time or full time means that additional effort is needed to complete their educational requirements, and this can put students under stress and consequently disturb sleep (Suleiman et al., 2013). Stress-induced sleep disturbance as reported by Jordanian nursing students was associated with decreased mental and social functioning, leading to lower academic performance (Suleiman et al., 2013).

Stress has also been found to be associated with lower levels of quality of life among employed Jordanian undergraduate students (Suleiman, Alghabeesh, Jassem, Abu- Shahroor, & Ali, 2013). One study used the Arabic version of the SF-36 scale (Sabbah et al., 2003) to measure 8 health domains - physical functioning, role physical, bodily pain, general health, vitality, social functioning, emotional well-being and mental health- among employed Jordanian

nursing students. Half of the sample were employed to fulfill their financial academic requirements. Employed students reported lower scores on all dimensions of the SF-36 scale, except for physical functioning, than students who were not employed. The study found that employment and financial demands increase stress and in turn reduce quality of life in Jordanian nursing students (Suleiman, et al., 2013).

Like other countries, Jordan has been experiencing a shortage of nurses (Hweidi & Al-Obeisat, 2003). Stress has been identified as an important factor contributing to nursing students' attrition in different countries, leading to increased rates of nursing shortages (Deary et al., 2003; Floyd, 2010; Watson et al., 2008). Although the relationship between stress and attrition rates has not been studied among Jordanian nursing students, Jordanian nursing students appear dissatisfied with nursing programs due to high standards and numerous requirements that exhaust students and put them under considerable stress. The Jordanian nursing students' dissatisfaction could increase their attrition rates (Aldiabat & Clinton, 2013; Jaradeen, Jaradat, Abo Safi, & Tarawneh, 2012).

Stress Management Programs Used in Nursing Students

Stress management interventions can be categorized in a number of ways. However, the most popular perspective was provided by Folkman and Lazarus (1984) who classified stress management interventions into problem-focused (removing or reducing stressors) or emotion-focused interventions (modifying an individual's response to stress). Examples of emotion-focused intervention are meditation and relaxation techniques (Lazarus & Folkman, 1984). Literature shows that the majority of interventions that have been used to manage nursing students' stress are emotion-focused interventions.

A variety of emotion-focused interventions have been used to reduce nursing students' stress, such as mindfulness meditation, autogenic training, yoga, and therapeutic touch. Mindfulness meditation is the most common intervention used in nursing students. In three studies (Beddoe & Murphy, 2004; Chen, 2013; Kang, Choi, & Ryu, 2009), mindfulness meditation has been found to be effective in reducing psychometric and physiologic measures of stress in nursing students. Using a randomized controlled trial (RCT), the first study found mindfulness meditation to be effective in decreasing depression and anxiety in Korean nursing students (Kang et al., 2009). Another RCT conducted in China (Chen, 2013) found that mindfulness meditation reduced depression, anxiety, and systolic blood pressure. In the United States, a pilot study (Beddoe & Murphy, 2004) using a one-group design indicated that mindfulness meditation significantly reduced nursing students' self-reported stress. The results of these three studies, however, were predominantly limited by their small sample size, convenience sampling methods, single site location, short intervention period, high attrition rate and sometimes unequal pre-intervention values between the groups (Beddoe & Murphy, 2004; Chen, 2013; Kang et al., 2009).

Autogenic training (AT) is a mind-body intervention used for decreasing stress (NCCAM, 2011). In a randomized controlled study conducted in the USA (Kanji, White & Ernst, 2006), AT was more effective in reducing signs and symptoms of stress such as anxiety, blood pressure, and pulse rate than laughter therapy in nursing students. However, the attrition rate was high at all stages of this study because of difficulties in incorporating AT into a busy daily schedule or because students did not find AT rewarding. Attrition bias can threaten the internal, external, and statistical conclusion validity of a study (Kanji et al., 2006).

Another stress management intervention that has been used among nursing students is therapeutic touch, a specific nursing intervention that involves passing the hands of practitioners over the body of the individual being treated. It was designed to induce relaxation and reduce stress (Olson et al., 1997). In a randomized controlled study, therapeutic touch appeared to be effective in reducing the immunological response of stress, such as the T-lymphocyte function (CD25), and immunoglobulin levels in a sample of highly stressed nursing and medical students. The most prominent limitations of the study are its use of a small sample size and its recruitment of a non-probability sample from one setting in the USA. These limitations can affect the generalizability of the study's findings (Olson et al., 1997).

Laughter Yoga is another stress management intervention involving a combination of unconditional laughter with Yoga breathing exercises (Pranayama) (Yazdani, Esmaeilzadeh, Pahlavanzadeh, & Khaledi, 2014). The findings of a randomized controlled study (Yazdani et al., 2014) showed that Laughter Yoga was effective in reducing some stress symptoms such as sleep disturbance, anxiety and depression in nursing students. However, the subjects in this randomized controlled study were all male nursing students selected by a convenience sampling method from one setting in Iran. Thus, the findings of this study may not be generalized to female nursing students or nursing students from other settings (Yazdani et al., 2014).

In a two-group quasi-experimental study among U.S. accelerated nursing students, 1-hour per week of class time dedicated to mind-body self-care (yoga, mindful breathing, Reiki, and essential oil therapy) significantly reduced perceived stress, but not mindfulness (Drew et al., 2016). These results, however, were limited by the uses of small sample size, non-equivalent groups, and short intervention (Drew et al., 2016).

Progressive Muscle Relaxation

History of PMR. PMR has been developed as a procedure to decrease stress levels and stress-related psychosomatic health problems. The procedure initially developed by Edmund Jacobson (1974) was considered time consuming. It involved 30 to 60 minutes, several times a week, for up to more than a year. Since that time, different abbreviated techniques of PMR have been proposed and developed, either as part of a treatment, such as systematic desensitization therapy (Wolpe, 1958), or as a complete treatment (Bernstein & Borkovec, 1973; O¨st, 1987). Because these techniques' procedural variations limited comparisons of outcomes across settings, a detailed manual of PMR training was developed to standardize the procedure (Bernstein & Borkovec, 1973). The manual's approach was based on the procedures proposed by Wolpe (1958) and, rather than focusing on a distinction between different degrees of tension, focused instead on either tensing or relaxing muscle groups completely. Practitioners were asked to tense muscle groups, focus attention on the tensed muscle groups, and then maintain contraction for 5–7 seconds. After that they were asked to relax the muscle groups upon a signal from the trainer while paying attention to the sensations of relaxation in the muscle group (Bernstein & Borkovec, 1973).

Smith (2002), however, explained that the components of old versions of PMR were mixed with components of other relaxation techniques such as breathing exercises. For example, after each phase of tensing up and relaxing a muscle group, practitioners were asked to take deep breaths. To provide a purer version of PMR, Smith (1999, 2002, 2005) proposed his own version of the technique and explained how it works to decrease stress. Smith's version as used in this study will be explained later in the Methods chapter in the intervention section.

Effects of PMR. PMR is a mind-body intervention that aims to improve signs and symptoms of stress (Bernstein & Borkovec, 1973). As evidenced by the preceding studies, the effect of PMR on the signs and symptoms of stress have been examined in a wide variety of clinical populations and non-clinical populations. In these populations, PMR has been used alone or in combination with other mind-body interventions. In both cases, it has appeared to be effective in reducing abundant signs and symptoms of stress (Alexandru et al., 2006; Charlesworth et al., 1981; Dolbier & Rush, 2012; Dayapog˘lu & Tan, 2012; Kiselica et al., 1994; Konsta et al., 2013; Kumar & Raje 2014; Lolak et al., 2008; Pawlow & Jones, 2002; Pawlow & Jones, 2005; Powell, 2004; Prato & Yucha, 2013).

Clinical population. In studies with psychiatric patients, PMR was found to be highly effective in reducing self-reported stress and anxiety in adults with schizophrenia (Vancampfort et al., 2013; Georgiev et al., 2012). It improved performances on cognitive responses, such as memory, in adults with mild to moderate dementia (Suhr, Anderson, & Tranel, 1999). However, when PMR was compared to a biofeedback relaxation technique in patients with post-traumatic stress disorder (PTSD) being treated in a residential treatment facility for a substance use disorder, PMR did not improve depression, insomnia or heart rate variability (HRV) as much as the biofeedback technique did (Zucker, Samuelson, Muench, Greenberg, & Gevirtz, 2009). All of the above studies, however, had serious limitations, such as a small sample size, the study interventions being conducted in conjunction with a residential treatment program, lack of standardization and supervision during the intervention protocol, and low intervention adherence (Georgiev et al., 2012; Suhr et al., 1999; Vancampfort et al., 2013; Zucker et al., 2009). Khanna, Paul and Sandhu, (2007) compared the efficacy of two relaxation techniques, PMR and galvanic skin resistance biofeedback, on HR in stressed females. They found that PMR was more

effective in reducing HR as compared to galvanic skin resistance biofeedback,

PMR has been applied in populations with different medical conditions such as cardiovascular diseases, cancer, multiple sclerosis, pregnancy, chronic renal disease, asthma and tension headache. For example, in patients with cardiovascular diseases, a randomized controlled study indicated that PMR was effective in reducing patients' perception of stress and systolic and diastolic blood pressure in Taiwanese patients with essential hypertension (N= 40) (Sheu, Irvin, Lin, & Mar, 2003). Its use of convenience sampling and small sample size, however, limits the generalizability of this randomized controlled study's findings. Similarly, in a quasi-experimental study, PMR was found to be effective in improving both systolic and diastolic blood pressure in patients with coronary artery disease in a cardiac rehabilitation program (N=8) **(**Cole, Pomerleau, & Harris, 1992). However, because of the use of a one group quasi-experimental design in this study, it was unknown whether the changes in outcome were caused by PMR or other variables. A small convenient sample (N=8) was also used in this study, leading to reduced power and compromised generalizability **(**Cole et al., 1992).

PMR has been examined in individuals with cancer. In two randomized controlled studies, PMR appeared to be effective in reducing anxiety and depression in American colorectal cancer patients (N= 59) after stoma surgery and Iranian cancer patients undergoing chemotherapy (N= 60) (2- 3 sessions a day for 3 months) (Cheung, Molassiotis, & Chang, 2003; Herizchi et al., 2012). Also, in a quasi-experimental study with one control group, PMR improved sleep quality and fatigue in Turkish Women (N=27) with breast cancer undergoing adjuvant chemotherapy (8 sessions) (Demiralp, Oflaz, & Komurcu, 2010). Additionally, Isa, Moy, Abdul Razack, Zainuddin, and Zainal (2013), in their a quasi-experimental cohort study, showed that Malaysian patients with prostate cancer who received 6- month training of PMR

reported lower levels of anxiety and stress in comparison to those who received usual care. Many limitations, however, may have influenced these studies' findings (Cheung et al., 2003; Herizchi et al., 2012; Isa et al., 2013). For example, the use of small convenience samples limited the studies' generalizability and reduced their power (Demiralp et al., 2010; Cheung et al., 2003; Herizchi et al., 2012; Isa et al., 2013). The inclusion of a heterogeneous sample in terms of the type of colorectal cancer, disease stage, socioeconomic status, number, type and dosage of radiotherapy and chemotherapy also limited the conclusion of one study (Cheung et al., 2003; Isa et al., 2013). Although a random assignment strategy was used in the randomized controlled studies, subject differences existed on the baseline measurements of the educational level and marital status (Cheung et al., 2003). These two variables have been identified as covariates that can influence internal validity. The Hawthorne effect and experimenter expectation bias were also potentially high, as blinding was not used (Cheung et al., 2003; Herizchi et al., 2012; Demiralp et al., 2010; Isa et al., 2013). Finally, there were variations between these studies in terms of the number and duration of the PMR sessions, so that conclusions about the effectiveness of PMR in cancer patients are compromised (Cheung et al., 2003; Herizchi et al., 2012; Demiralp et al., 2010; Isa et al., 2013).

The effect of PMR on stress signs and symptoms in patients with multiple sclerosis (MS) is another research area that has been studied. For example, in a recent RCT, PMR that was practiced once a day for three months by 70 Iranian patients with MS appeared to be effective in reducing pain (Bikmoradi, Zafari, Oshvandi, Mazdeh, & Roshanaei, 2014). In a pilot study, PMR improved fatigue in 4 patients with MS (Moriya & Ikeda, 2013). However, both studies used small convenience samples and were not blinded, thus limiting the generalizability of their

findings and negatively affecting their internal validity (Bikmoradi et al., 2014; Moriya & Ikeda, 2013).

Other research studies have indicated the effectiveness of PMR in improving signs and symptoms of stress in patients with other medical conditions, such as women with ectopic pregnancy or pregnant women with asthma. In a RCT with 90 patients experiencing ectopic pregnancy, the use of PMR in combination with methotrexate treatment was found to be more effective in reducing anxiety than the use of methotrexate treatment only. Unlike other RCTs with a defined length of intervention time, this RCT was based on the length of the patients' in-patient stay, whereby the experimental group received PMR starting within 72 hours of admission and continuing until discharge. Therefore, the length of intervention varied with individual patients, and this variation may have affected the outcome measures (Pan, Zhang, & Li, 2012). Nickel et al. (2006), in their 8-week randomized, prospective, controlled trial conducted in Helsinki, found that PMR appears to be an effective method to improve blood pressure, lung parameters and heart rate, and to decrease anger levels, thus enhancing health-related quality of life in pregnant women with bronchial asthma. However, this study had methodological limitations, including the use of small sample size (N=64) and a convenience-sampling method, limiting generalization of their findings. Urech et al (2010) compared the immediate effects of one session of three stress- reduction techniques, including PMR, guided imagery and passive relaxation techniques, on perceived and physiological indicators of stress in Swiss pregnant women. The findings of this randomized controlled trial indicated that these different stress-reduction techniques had differential effects on various psychological and physiological indicators of stress. For example, guided imagery was significantly more effective in enhancing levels of relaxation, but both the PMR and guided imagery significantly reduce

heart rate. Within groups, the all techniques significantly reduced endocrine measures (e. g. cortisol and norepinephrine) except epinephrine. Blood pressure did not significantly decrease in all three groups. This study used a single and brief relaxation intervention and small sample size (N= 39), limiting valid conclusion regarding the potential benefits of PMR on stress among pregnant women (Urech et al., 2010).

In 35 Iranian patients with renal disease undergoing hemodialysis, a quasi-experimental study with a one-group design found 60 sessions of PMR to be effective in improving sleep disturbance (Saeedi et al., 2012). This study had serious limitations, however, due to its one group design; many confounding variables were thus not controlled for, such as educational level and attitudes toward relaxation (Saeedi et al., 2012).

Tension headache results mainly from increased muscle tension associated with stress (Smith, 2002). Because of its effectiveness in the reduction of muscle tension and stress, PMR was used with patients experiencing this type of headache. A randomized controlled trial was conducted to compare the effectiveness of transcutaneous electrical nerve stimulation (TENS) and PMR in terms of stress and the relief of tension headaches in patients experiencing tension headache. Subjects in the experimental group who received PMR reported lower levels of stress than those in the control group who received TENS. However, both groups reported similar levels of tension headache relief. Each subject-either in the experimental or control group-received her or his assigned intervention once a day for 7 days (Kumar & Raje, 2014). This study had several methodological limitations, however. For example, the sample size was small (N=36), leading to a reduction of statistical power. Also the data were collected by the primary investigator and not blinded for group allocation, which might have led to measurement bias (Kumar & Raje, 2014).

Non-Clinical population. PMR has been used with non-clinical populations such as workers and students. For example, when introduced to 30 Indian staff nurses, PMR appeared to be effective in decreasing subjective reports of stress**.** However, this study used a weak experimental one-group pre-test and post-test research design in terms of controlling confounding variables (Patel, 2014). Similarly, in an older study among nurses, PMR was more effective in decreasing nurses' muscle tension and self-reports of stress than biofeedback. Biofeedback, however, was more effective in increasing hand skin temperature and lowering autonomic arousal. Both were effective in reducing anxiety. However, its convenience sample (N= 44) and lack of blinding may have affected the external and internal validity of this study respectively (Murphy, 1983). Chaudhuri et al. (2016), in one-group quasi-experimental study, evaluated the effects of PMR on physiological and psychological indicators of stress among Indian female health care professionals. The study findings showed significant reductions in resting heart rate, blood pressure and perceived Stress Scale levels, total cholesterol, triglyceride and low‑density lipoprotein cholesterol after three months of PMR practice. However, the use of one- group quasi-experimental design and small sample size (N=57) resulted in compromised internal and external validity respectively (Chaudhuri et al., 2016).

Researchers in education settings using randomized controlled trials have found that PMR improved state anxiety, test anxiety, worry, perception of stressors, stress tolerance and some physiological signs of stress such as salivary cortisol, salivary immunoglobulin A (sIgA), heart rate, HRV ratio, and skin temperatures in graduate and undergraduate students, regardless of academic majors (Delgado et al., 2010; Dolbier & Rush, 2012; Jarasiunaite, Perminas, Gustainiene, Peciuliene, & Kavaliauskaite-Keserauskiene, 2015; Pawlow & Jones, 2002; Pawlow & Jones, 2005). In these studies, however, the different number of intervention sessions,

including one session (Delgado et al., 2010; Pawlow & Jones, 2005), two sessions (Dolbier & Rush, 2012.; Pawlow & Jones, 2002), and 4 sessions (Jarasiunaite et al., 2015), makes it difficult to make a conclusion about the effectiveness of PMR in university undergraduate students. Furthermore, there were baseline differences between these studies' groups on the covariates of smoking, exercise, and relaxation history, leading to compromised internal validity (Pawlow & Jones, 2002; Pawlow & Jones, 2005).

In psychology undergraduate students (N= 387), a randomized controlled study indicated that one session of PMR was more effective in reducing physical symptoms of stress than one session of mantra meditation, although these two interventions were equally effective in reducing cognitive symptoms of stress. However, the effect size for the two interventions was small, possibly due to the setting and duration of intervention. The interventions were introduced in an academic classroom with participants seated at wooden desks, and this setting may have inhibited full relaxation of subjects and decreased the anxiety-reducing impact of the interventions. Also, only one session for both interventions was provided for the study groups, and one session may not have been enough to induce larger effects of the interventions (Rausch, Gramling, & Auerbach, 2006)

***Nursing students*.** In nursing students, PMR has only been studied in combination with other relaxation techniques such as biofeedback, autogenic training, deep breathing exercises, and guided imagery. In a study using a one-group experimental design, 14 nursing students were introduced to three relaxation techniques: diaphragmatic breathing, PMR, and autogenic training. These techniques were introduced for 15 minutes a day for 4 weeks and significantly reduced test anxiety and respiratory rates and increased peripheral skin temperatures (Prato & Yuch, 2013). Similarly, in an older study using a nonequivalence two group (N= 18) quasi-

experimental design, nursing students in the experimental group who received a 10 session, 5 week, group-administered stress management program made up of progressive relaxation, deep muscle relaxation, autogenic training, visual imagery and modified systematic desensitization reported lower levels of state and trait anxiety than their peers in the control group. (Charlesworth et al., 1981).

In the above research among nursing students, studying the effect of PMR in combination with other relaxation techniques on stress signs and symptoms makes it difficult to know whether any improvement was caused by PMR or one of the other relaxation techniques. Moreover, many confounding variables may have affected the causal relationship between stress management programs and outcomes because of their lack of random assignment or their use of a one-group design. Generalizability was also compromised due to their use of small sample sizes and convenience sampling methods. Finally, the studies using nursing students were conducted in the United States, so that any generalization of findings to nursing students from other countries, such as Jordan, is compromised. No study has examined the effect of PMR on stress in Jordanian nursing students.

Research Questions

In Jordanian second-year undergraduate nursing students:

1. Will abbreviated progressive muscle relaxation (APMR) decrease self-reports of stress, DBP, SBP, and HR, and increase FST over time in the experimental group?

2. Will the experimental group do better over time in terms of self-reports of stress, DBP, SBP, HR, and FST in comparison with the control group?

CHAPTER 3

Methods

Design

The proposed study was conducted using a repeated randomized controlled experimental design. This design was selected based on the nature of the study and the stated research objectives. The purpose of randomized controlled experimental designs is to examine causal relationships between independent and dependent variables in which control on covariates is possible. This design is appropriate to test the research hypotheses in the proposed study where the effects of an intervention on dependent variables are examined. The strengths of this repeated randomized controlled experimental design include the ability to: a) compare two groups of Jordanian nursing students, b) control threats to validity, and c) follow up and detect changes in the dependent variables over time (Shadish et al., 2002).

The study subjects were selected using a convenience sampling method. Although the convenience sampling methods suffer from biases such as under-representation or overrepresentation of particular groups within the sample, they are least costly to carry out in terms of time, effort, and money. They also help researchers gather study data that would not be possible using probability sampling techniques, for example, due to ethical issues (Marshall, 1996).

Subjects were randomly assigned to either the control or experimental group using a stratified random strategy. Shadish et al. (2002) indicate that a valuable stratifying variable in RCTs is the pretest score on the main outcome of interest. Therefore, in the proposed study, the pretest scores on the Smith Stress Symptoms Inventory (2002) used to measure the study main variable (self- reports of stress) was used as stratification. Stratifying (matching participants with

similar stress scores and randomly assigned them into either group) significantly increases the possibility that the two groups will have comparable pretest means and variances on the stratifying variable and on any variables correlated with it, especially when sample sizes are small. When appropriately analyzed, the variance due to the stratifying variable can be removed from overall error variance thus producing a more powerful statistical test.

In this study, the experimental group participated in six 30-minute sessions of group-based APMR (twice a week), led by PI, experienced trainer. Jordanian second-year undergraduate nursing students have their clinical training (the most stressful component of nursing program) twice a week (e.g., Monday and Wednesday or Tuesday and Thursday). Wyatt, Sikorskii, Rahbar, Victorson, and Adams (2010) explained that the CAM intervention sessions are preferably introduced parallel with most distressing times for subjects. Thus, the experimental group subjects received the six sessions of APMR over six subsequent clinical training days that matched the same time frame of students' clinical training. Delgado et al. (2010) demonstrated positive outcomes on stress with this twice-a-week time frame of PMR sessions.

Bernstein and Borkovec (1973) advised APMR be performed at the end of a workday and not during the day because lectures and school assignments during the day could affect subjects' attention during the intervention sessions and, in turn, potentially affect the quality of APMR practice. Therefore, each APMR session was performed at the end of a clinical training day.

APMR intervention was introduced to the experimental group between the middle and the end of an academic semester when stress is likely to be heightened (Beck, 1995; Ross et al., 2005). Beck (1995) found that, at this time, American nursing students had multiple academic assignments, clinical assignments and examinations, often in the same week. Accordingly, their

stress levels were high. They also could not engage in activities to relieve their stress, such as socializing or exercising, because they did not have enough time. Nursing programs in Jordan are developed based on American nursing programs so the nature and times of assignments are similar to those incorporated in American nursing curricula (Shaban, et al., 2012). As a result, Jordanian nursing students potentially experience similar levels of stress during this time of the semester.

The first session included education about APMR intervention to inform the subjects about APMR, especially because these students reported that they had never heard about APMR before the current study. From the second through the sixth session, the subjects received actual training in APMR. The subjects in the control group watched three 30-minute documentary films about nature during the first, third, and sixth sessions of APMR as a group in another room at the university. These films included scenes without music and information about the locations of the seven natural wonders of the world and the characteristics qualifying them for that title. Watching documentary videos about nature has been found to have neutral effects on stress (Bosse, Gerritsen, de Man, & Stam, 2014).

Group-based interventions can possess unique advantages over individual-based interventions. Group-based interventions are often less expensive and less time consuming for the trainer. Furthermore, group-based interventions may provide additional benefits such as greater social support, group cohesion, and comradeship among subjects who share similar physical and psychological challenges (Cotton, 1990; Floyd & Moyer, 2010).

The dependent variables, self- reports of stress, SBP, DBP, HR, and FST were measured three times for the two groups: at baseline (before the first educational session), at the middle (after the third session), and at the end of intervention (after the sixth session). Baseline

measurements of dependent variables help examine whether the two study groups are different on the dependent and confounding variables before introducing the intervention. Based on the ABC Relaxation Theory (Smith, 1999, 2002, 2005), at least two, and preferably five sessions of actual PMR training should be provided to evoke relaxation or to relieve stress (Ghoncheh & Smith, 2004; Matsumoto & Smith, 2001;). In the proposed study, the dependent variables were measured at the middle and at the end of intervention to see whether further reductions of stress occur between these two measurements.

Setting

The study was conducted at the Jordan University of Science and Technology (JUST)/ College of Nursing. The setting was selected based on its ability to provide a sufficient number of subjects for the proposed study. The college of nursing at JUST is the largest nursing college in the region. In Jordan, there are 15 baccalaureate nursing programs offered by six public universities and eight private universities (Al-Maaitah, 2007). The nursing students of these universities are obligated to undertake their clinical training in several hospitals located in different cities in Jordan. Therefore, the researcher would find it time consuming and expensive to conduct an experimental study by recruiting students from all of these nursing programs. Moreover, because this was the first study to test the effectiveness of PMR on stress among Jordanian nursing students, the effectiveness of APMR on stress among this population of interest has been yet unknown. Researchers aiming to test the effectiveness of this intervention among Jordanian nursing students may need first to pay more attention to issues that can affect internal validity than those that can affect external validity or generalizability. One strategy to increase internal validity is selecting a homogeneous sample from one setting. As a result, this

study included a sample of undergraduate Jordanian nursing students who were studying at one setting, which is the College of Nursing at JUST.

Population and Sample Characteristics

The target study population was Jordanian second–year undergraduate nursing students. The accessible population was Jordanian second–year undergraduate nursing students at JUST, who started their clinical rotation in the medical-surgical area. The sample in this study included 28 second-year undergraduate nursing students at JUST. Jordanian second-year undergraduate nursing students were asked to participate in the current study if they were

1. In their initial clinical rotation.
2. At least 18 years old.

Exclusion criteria include students who were:

1. Practicing of any type of relaxation techniques, such as yoga, guided imagery, meditation, cognitive behavioral therapy.
2. Taking hypnotics, sedatives, anxiolytic, anti-depressant, and anti-hypertensive drugs.
3. Having musculoskeletal injuries such as muscular strain, contusion, and rupture or seizure.

Subjects who already practice a relaxation technique, take hypnotics, sedatives, anxiolytic depressant or anti-hypertensive drugs could introduce extraneous variables that would minimize internal validity of the study. Also, the study intervention needs subjects to tense all body muscles; therefore, subjects with musculoskeletal injuries or seizure could be harmed.

Determination of Sample Size

Using G* Power software 3.1 (Faul et al., 2007), mixed-design (within groups-between groups) repeated measures ANOVA, an alpha of .05, a power of 0.85, the number of

measurements of 3, the number of groups of 2, and an effect size of 0.3, the sample size of 22 was generated. This effect size was obtained from a study that examined the effects of APMR on physiological and psychological functioning among high-stress college students (Dolbier & Rush, 2012). A 15% attrition rate was reported in a previous study with variables similar to the present study (Prato & Yuch, 2013). Considering an expected attrition rate of 15%, 4 participants should be added. Also, to be more conservative, 4 additional participants were recruited, thus yielding the final total sample size of 30.

Data Collection Instruments

The study data were collected using self-reported and physical measures. For the self-reported variables, the study utilized an Arabic self-reporting questionnaire in three parts (Appendix D). The first part included questions about smoking behaviors and demographic characteristics including: age, religion, gender, marital status, and nationality. The second part was the Coping Behavior Inventory (CBI) (Sheu et al., 2002) used to measure nursing students' coping behaviors. The third part was the Smith Stress Symptoms Inventory (SSSI) used to measure subjective reports of stress (Smith, 2002). For the physical variables, an automated blood pressure/pulse monitor and a traditional FST thermometer were used to measure SBP, DBP, HR, and FST respectively.

Self-reported Instruments

Covariates and demographic variables. There are many covariates that have been identified based on the literature review. The effects of PMR on stress in Jordanian undergraduate nursing students may be affected by gender, nationality, employment, smoking, and nursing students' self-directed coping behaviors (Al-Hussain et al., 2008; Khader & Alsadi, 2008; Khater et al., 2014; Shaban et al. 2012). These covariates, except the self-directed coping

behaviors, were assessed at baseline by questions included in the first part of the study questionnaire.

Other demographic variables such as age, marital status, and religion were assessed to provide a description of the study sample. They were also examined to identify whether these variables were correlated with stress in the proposed study. These demographic variables were assessed at baseline by questions included in the first part of the study questionnaire.

Coping Behaviors Inventory. Nursing students' self-directed coping behaviors included in the current study as a covariate were assessed by the Coping Behaviors Inventory (CBI) (Sheu et al. 2002). The CBI is used to identify nursing students' coping behaviors. It includes nineteen 5-point Likert-type items divided into four factors: avoidance behavior (efforts to avoid a stressful situation), 6 items; problem-solving behavior (efforts to manage or change the stress arising out of a stressful situation), 6 items; optimistic coping behavior (efforts to keep a positive attitude toward the stressful situation), 4 items; and transference behavior (efforts to transfer one's attention from the stressful situation to other things), 3 items. Higher scores for each factor indicate more frequent use and greater effectiveness of a certain type of coping behavior.

The original reliability and validity of the instrument were reported in a study of 613 nursing students (Sheu et al, 2002). Cronbach's alpha coefficient was 0.76. The construct validity was demonstrated by identifying four factors after factor analysis, where 38.2 % of the total variance was accounted for by these four factors.

In Jordanian nursing students, internal consistency reliability of the English version was established using Cronbach's Alpha at 0.73. Content validity of the English version was established by a panel of experts (Shaban et al. 2012). Furthermore, the English version of the CBI was translated from English to Arabic according to the Brislin's model of translation and

back translation (Alzayyat & Al-Gamal, 2014). The Arabic version demonstrated a Cronbach's alpha coefficient of 0.74, demonstrating sufficient internal consistency reliability (Alzayyat & Al-Gamal, 2014).

Smith Stress Symptoms Inventory. Stress is defined as a combination of physical, emotional, and cognitive reactions as a result of exposure to stressors (Smith, 1999, 2002). This definition thus includes various physical, emotional, and cognitive signs and symptoms of stress (Smith, 1999, 2002). The Smith Stress Symptoms Inventory (SSSI) (state version) (Smith, 2002), as translated into the Arabic language, was used to measure self-reports of stress in the current study. It has been designed to measure frequently reported stress symptoms (Smith, 2002). The inventory includes 6 dimensions that represent physical, emotional, and cognitive symptoms of stress: Worry/Negative Emotion; Attention Deficits; Striated Muscle Tension; Autonomic Arousal/Anxiety; Depression; and Interpersonal Conflict/Anger. The inventory includes thirty-five items asking subjects to indicate how they feel "right now" (state version) on a 4- point Likert scale ranging from 1 = "Doesn't fit me at all" to 4 = "Fits me very well." Item ratings fall between 35 and 140, with higher scores indicating higher levels of stress. SSSI was standardized on a sample of 952 college students, and the Alpha reliabilities range from .89 to .76 (Piiparinen & Smith, 2004; Smith & Piiparinen, 2003).

Several instruments have been developed to measure stress. However, due to a lack of agreement about the definition of stress, these scales operationalize stress differently. For example, stress has been defined as a reaction to stressful events measured subjectively by the Somatic Stress Response Scale (SSRS) (Koh, Park, & Cho, 2005), as a stimulus or stressful event measured by the Social Readjustment Rating Scale (SRRS) (Holmes & Rahe, 1967), or as a transaction between person and environment measured by the Perceived Stress Scale (Sheu et

al., 1997). To optimize the construct validity of the current study, SSSI was used to measure stress because this scale was consistent with the definition of stress used in the current study and provided by Smith (2002) who developed the ABC Relaxation Theory guiding the current study.

Among Jordanian nursing students, no previous research has examined stress using a tool that measures physical, emotional, and cognitive reactions to stressors. The SSSI is consistent with the study's definition of stress. It has been used in experimental studies using relaxation techniques as interventions (Deuskar, 2011). Furthermore, it has demonstrated valid and reliable values when it has been used in college students (Piiparinen & Smith, 2004; Smith & Piiparinen, 2003), as mentioned previously.

Physical Instruments

Blood pressure and heart rate monitor. SBP, DBP, and HR measurements were collected using a digital BP/HR measurement device, the Omron model automatic sphygmomanometer (see Appendix E). The device uses automated inflation and deflation of a cuff put on the upper arm over the brachial artery to detect the blood's movement through the brachial artery. The detected blood's movement is then converted into a digital reading displaying SBP and DBP in mmHg units and HR in beat/minute on a display panel. Measures of SBP, DBP, and HR displayed digitally were manually recorded by the observer. This device has been recommended by the European Society of Hypertension (O'Brien, Waeber, Parati, Staessen, & Myers, 2001). It met the validation and reliability criteria of the Association for the Advancement of Medical Instrumentation (AAMI) and the British Hypertension Society (BHS) (Terathongkum, 2006). Furthermore, in a study that has examined the validity and reliability of this device in a sample of healthy and unhealthy people (age= 8-80 years old), the correlations between Omron and mercury measurements (gold standard) were high (r = 0.92, systolic BP; r =

0.79, diastolic BP). Overall, the mean between-device differences (Omron and mercury) were –1.6 mm Hg for systolic and –0.6 mm Hg for diastolic. Assuming mercury to be the gold standard, between-device agreements (Kappa) was 0.7, demonstrating good reliability (Ostchega et al., 2012).

The mercury sphygmomanometer has been the gold standard used for obtaining blood pressure (BP). However, due to environmental concerns, other devices have been discovered and tested for reliability and validity. There is evidence in the literature that automated BP/HR monitors can replace mercury sphygmomanometers. Compared to mercury sphygmomanometers, automated monitors are easier to use, safer, less time-consuming, and not prone to observer bias. Moreover, automated monitors can provide reliable and valid measurements of HR, leading to fewer burdens on participants and less time consumed by researchers (Dolan, et al. 2005; Menezes, et al., 2010).

Finger skin thermometer. FST is the temperature of the finger in Fahrenheit that reflects the degree of digital blood perfusion and vasoconstriction influenced by sympathetic arousal (Jang & Line, 2013). When compared with other sophisticated and complex indicators for autonomic stress response, FST is easy and simple to analyze (Kistler, Mariauzouls, & van Berlepsch, 1998). A study examined the test validity for three types of finger skin thermometers-traditional thermometer with a thermistor sensor, finger skin thermometer with an infrared thermopile sensor, and finger skin thermometer with an infrared thermography camera (Jang & Line, 2013). The results showed that the correlations of measurements obtained by these three devices were high. These results suggest that all these devices are valid instruments that could be used to measure FST in people practicing relaxation techniques such as APMR. In another study

(Burnham, McKinley, & Vincent, 2006), test-retest reliability of traditional FST thermometer was found to be high in healthy subjects (intra-class correlation = 0.97).

FST was measured with a traditional finger skin thermometer in the current study (Appendix F). This device obtains FST by gently taping the thermistor sensor on the tip of the participant's left middle finger. This device provided valid and reliable results when used in people practicing relaxation techniques such as biofeedback and PMR (Jang & Line, 2013).

Experiences of practicing APMR. An open-ended question asking "what was your experience of practicing the APMR?" was added to the questionnaire packet at the end of study. The objective of this question was to explore the narratives as provided by the subjects in the experimental group regarding the experience of practicing APMR. Findings from this question helped the principal investigator to understand any positive and/or negative reactions on APMR based on the subjects' feedback, thus, benefiting a plan for future larger APMR research.

Intervention

The ABC version of PMR (Smith, 2005) was used as the study intervention (see Appendix G). This abbreviated version of APMR involves a tense-let go exercise of 11 muscle groups including hand, arm, arm and sides, back, shoulder, face, front of neck, stomach, chest, leg, and foot. This tense-let go exercise is performed twice for each muscle group. The tensing up phase for each muscle group should last for 5 to 10 seconds and the letting go phase for 20-30 seconds. Simultaneously, the subjects are asked to pay attention to the sensations of muscle tension and relaxation. After the tense-let go exercise, subjects are asked to systematically scan the muscle groups to notice and let go any remaining muscle tension. The entire exercise should take around 30 minutes, not counting instructions and times of measurement.

To achieve high levels of adherence, a checklist involving all steps of the intervention was maintained (see Appendix G). The PI had a hard copy checklist to refer to, which included each step and the length of time to spend on each step. The development of this checklist was based on Smith's (2005) protocol. Delivery of intervention was immediately evaluated by the principal investigator (PI) using the checklist after each training session. The PI was an experienced APMR practitioner who received a 4-day APMR training at the Psychology Department, Kent State University three years ago. Since then, the PI has been practicing APMR daily.

Procedure

First, approvals from the Kent State University (KSU) and JUST institutional review boards were obtained. After that, a translation from English to Arabic and pilot testing of the SSSI were performed using several steps. The process started by obtaining official permission from the first author of the scale to translate the SSSI. A forward-backward translation method was used to translate the English version of SSSI (see Appendix C). First, the 35-item inventory was translated from English language into Arabic language by two bilingual doctoral candidates (a translator from the nursing college and another translator from the college of translational studies) who had proficiency in English and Arabic languages. Secondly, the two translations were compared and agreed by the first two translators. Following this, other two bilingual doctoral candidates (a translator from nursing college and another translator from English college) were asked to back-translate the items into English language. Next, the back- translated items were compared and agreed by these two translators. As final step of translation, all translators met to evaluate the Arabic version of inventory on cultural fit, content, and wording.

Then, cognitive interviewing was undertaken that helps the investigators to discover the

cognitive process participants undergo while responding the inventory (Collins, 2003). The Arabic version of the SSSI was introduced for 5 Jordanian undergraduate nursing students (3 female students and 2 male students). They were asked separately to read loudly the items while responding to the SSSI. The PI observed and participants indicated that they did not have any difficulty reading and understanding the inventory items.

After taking the permission of the dean of nursing college and class's instructors, the PI visited students in their classrooms where they take Medical-Surgical Nursing course. As the lecture finishes, The PI made an announcement about the title and objectives of the study and asked the students who would like to participate to contact him using a business card including the PI's contact information (his name, phone number, and email) given for each one. The contact information was used only for the purpose of the study. The PI arranged an initial meeting to meet with students who would like to participate on another day in a private room at the university. At this meeting, the PI informed the students the study's objectives, risks, benefits, confidentiality and answered questions that they had about the study. Also, they were assured that they had the full right to refuse or discontinue the participation at any time and that such refusal or discontinuation will not affect their academic achievements in any way. If agreed to participate and eligibility criteria were met, informed consent (see Appendix A & B) was obtained at the meeting. Finally, at this meeting, dates and times for the six study sessions were set up.

At the first session, baseline measurements—demographic data, smoking behavior, coping behavior, self-reports of stress, DBP, SBP, HR, and FST—were obtained. Based on the baseline measurements of self-reports of stress (main outcome variable), the subjects were randomly assigned to either the control or experimental group using a stratified random

assignment (matching participants with similar stress scores and randomly assigned them into either group). After randomization, to avoid experiment contamination, the subjects in the experimental group were asked not to share any information related to the intervention with subjects in the control group. Then, the PI presented to subjects in the experimental group the rationale and procedures of APMR including a demonstration of the entire intervention protocol. During the second to sixth sessions, the actual APMR training was introduced to the subjects in the experimental group. The PI led APMR in all sessions. Before each training session of APMR, the PI briefly demonstrated to the subjects in the experimental group how the APMR is performed. The six APMR sessions were provided to the experimental subjects in a private, quiet, comfortable, and spacious room at the university, while 30-minute documentary videos were shown to the subjects in the control groups during the first, third, and sixth sessions of APMR intervention in a different room.

The dependent variables, self- reports of stress, SBP, DBP, HR, and FST were measured three times for the two groups: at baseline, at the middle, and at the end of intervention, as mentioned previously. Various strategies were followed to decrease measurement errors potentially affected by variations of data collection procedure. For example, filling out the questionnaire may be stressful for some subjects and, in turn, influences objective measures. Therefore, the self-reports of stress using the SSSI were completed after taking the objective measures, including DBP, SBP, HR, and FST. Also, all study measurements in both intervention and control groups were undertaken in the same conditions (i.e. same room temperature and environment). Furthermore, two measurements of each objective variable (DBP, SBP, HR, and FST) were obtained each time. The average of the two measurements was used. While taking the DBP, SBP, HR, and FST, the American Heart Association's recommendations were followed

(Pickering et al., 2005; Jang & Line, 2013). In addition, quiet environments, free from distraction, were maintained with a "Do Not Disturb" sign on the door of the rooms during the intervention and data collection. To decrease response bias (attention bias), the PI took the objective measures but was not present while participants filling out the self-report instruments. Because the PI was the only person who measured theses physical outcomes, some participants had to wait for the measurements, thus, creating a time lag and could have affected such outcomes. However, because this happened equally for both the control and experimental groups, this issue of time-lag measures is not a concern.

Data Analysis

Data Management. Before addressing the study's research questions and testing hypotheses, preliminary steps with data management were undertaken. As soon as the data were obtained, they were immediately checked before they were entered into a SPSS data set. Coding for each item values and for missing information were decided. For example, a code of 1 for female, 0 for males, and 9 for missing value for the variable "gender" were assigned. The raw data were entered into a SPSS spreadsheet and checked again. Double entrance of data into a SPSS spreadsheet can help decrease errors or missing data that could result from the data entry procedure. Hard copies of data entered into SPSS spreadsheets were obtained as a way to avoid data loss.

When the raw data were coded and entered into SPSS files, the problem of missing values and outliers were examined. Missing data were assessed using frequency distribution or descriptive statistics. Strategies used to handle missing values depended on the extent of missing data, pattern of missing data, nature of missing data, role of variable, and level of measurement

of the variable. Box plots and whiskers plots and frequency distributions were used to identify outliers.

The assumptions of statistical tests used to analyze the data were then examined. The assumptions of normality and homogeneity of variance for a t-test, which was used to test baseline differences between the 2 groups, were examined. The assumptions of multivariate normality, homogeneity of variance-covariance matrix, and Sphericity for a mixed–design repeated measure ANOVA (mixed-design RM-ANOVA) were examined. Although mixed-design RM-ANOVA is fairly robust to violation of normality and homogeneity of variance, it is not robust to the violation of sphericity (Tabachnik & Fidell, 2007). Therefore, epsilon, which is an index of magnitude of violation of Sphericity, was inspected. When it was severely violated– for example, when epsilon was less than .75- Greenhous-Geisser or Huynh-Feldt corrections were used. Furthermore, Chronbach's alpha for SSSI (translated version) was measured to identify the internal consistency for SSSI.

Statistical analysis. Statistical analysis was conducted using SPSS software (version 23). Descriptive statistics were used to describe the sample. The sample and variables were described by measures of central tendency and dispersion appropriate to the level of measurement. For example, means and SD were calculated for the dependent variables that were measured on interval level of measurement, and frequency were calculated for the categorical variables such as gender. Initial analyses were conducted to ensure that the randomization across covariates was successful. The gender, marital status, employment, nationality, and smoking behavior variables were all tested at baseline using Chi-square to demonstrate that they were not significantly different between groups. Independent t-tests were run at baseline measurements of the

dependent variables to make sure the study groups were not significantly different on these variables before introducing APMR.

Repeated measures (RM) ANOVA were used to test the first study hypothesis, which is "In the experimental group, the APMR will decrease self-reports of stress, DBP, SBP, and HR, and will increase FST over time." Repeated measures ANOVA for mixed designs (between-subjects and within-subjects designs) were used to test the second study hypothesis, which is "when compared with the control group, the experimental group will do better over time in terms of self-reports of stress, DBP, SBP, HR, and FST". The analysis compared means for the same people over time (within-subjects factor), means for different people in the treatment groups (between-subjects factor), as well as the interaction term (group X time factors). Post hoc t-tests were run to examine if the two study groups were significantly different on the dependent variables at the middle or end of the intervention separately.

Ethical Considerations

To protect the ethical principle of respect for subjects, all subjects were informed about the purpose and nature of the study, and informed consent was obtained from all (see Appendices A & B). Students were assured that they have the full right to refuse to participate in the study, and that such refusal will not affect their academic achievements in any way. They were also assured that their information would not be made available to others without prior consent, the study data would be locked in a secured storage area in a locked locker and that their names would be replaced by numbers to avoid their identification. Also, the meetings with students were conducted in a private room at JUST and at convenient times for subjects. Moreover, to meet the ethical principle of justice, no students were excluded from the study because of gender, ethnicity, or nationality.

In respect to the principle of beneficence, physical or psychological harm or risks that might be associated with the measurement activities or intervention employed in the current study were minimal. One risk that might have resulted from the study was making demands on the subject's time. Thus, the subjects were provided with compensations ($1 at baseline, $2 at the middle of the intervention, and $3 at the end of the intervention) for their times spent in the study. Potential benefits of the measurement activities and intervention to study subjects included increased knowledge and awareness about their health and APMR. For society, potential benefits included a greater understanding of the effects of APMR on stress reduction and the potential improvement of the study population's health. In this study, potential benefits were believed to exceed risks.

CHAPTER 4

Results

This chapter relates to the study's descriptive analysis, data screening, preliminary between-groups comparison, testing for the hypotheses, and analysis of APMR experiences.

Demographic Characteristics and Coping Behaviors

Overall Sample. The mean age of participants was 20.4 (*SD*= 0.99), ranging from 19 to 23 years of age. All participants (n= 28, 100 %) were single. The nationalities reported by the overall sample were Jordanian (n= 26, 93 %), American (N=1, 3.5 %) and Israeli (N=1, 3.5 %). Twenty five participants (89 %) were nonsmoker and unemployed. Coping behavior inventory (CBI) scores ranged from 24 to 58, with a mean of 45.1 and standard deviation (SD) of 7.60.

Experimental group. In the experimental group (n=14), the mean age of the student participants was 20.3 (*SD* = 0.99). The majority of these participants was female (n= 11, 78%), non-smoker (n=12, 86%), and not employed (n=13, 93%). Thirteen participants (93%) reported being Jordanian with one Israeli. Thirteen participants reported being Muslim, and one participant as Christian. The scores of the CBI ranged from 24 to 58, with a mean of 45.2 (SD= 9.00) (see Table 3.1)

Control group. In the control group (n= 14), the mean age of the participants was 20.5 (*SD*= 1.00), ranging from 19 to 23 years of age. As in the experimental group, the reported religious composition of the control group included Muslims (n = 13, 93%) and Christian (n = 1, 7 %). The majority of participants in the control group was non-smoker (n= 13, 93 %) and not employed (n=12, 86 %). The scores of the CBI ranged from 33 to 51, with a mean of 44 (SD = 6.20) (see Table 3.1).

Table 4.1

Characteristics of Sample and Group Comparison on Demographic & Confounding Variables

Characteristics	n (%)		Mean (SD)		x^2 (*p*)	*t* (*p*)
	Exp.	Cont.	Exp.	Cont.		
Sex					.24 (.62)	
Female	11(78%)	12 (86%)				
Male	3 (22%)	2 (14 %)				
Marital Status					.00 (1.0)	
Single	14 (100 %)	14 (100%)				
Religion					.00 (1.0)	
Muslim	13 (93%)	13 (93%)				
Christian	1 (7 %)	1 (7 %)				
Smoking					1.5 (.47)	
Yes	2 (14 %)	1 (7 %)				
No	12 (86 %)	13 (93 %)				
Nationality					2.0 (.37)	
Jordanian	13 (93 %)	13 (93 %)				
Israeli	1 (7 %)	0 (0 %)				
American	0 (0 %)	1 (7 %)				
Employment					.37 (.54)	
Yes	1 (7 %)	2 (14 %)				
No	13 (93 %)	12 (86 %)				
Age						-.56 (.58)
			20.3	20.5		
			(0.99)	(1.00)		
Coping behaviors						.78 (.44)
			45.2	44		
			(9.00)	(6.20)		

Note. Exp. = experimental group; Cont. = Control group. * $p < .05$.

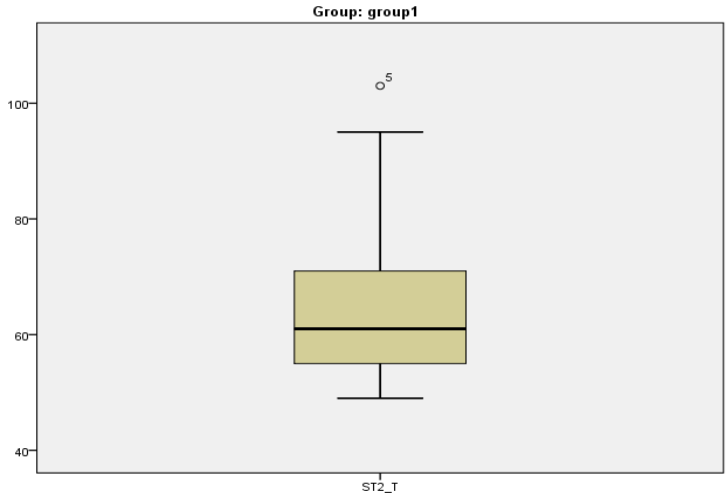
Data Screening and Cleaning

Attrition. Of the 30 participants who agreed to participate in the study, 28 participants completed the study interventions and measurements. Two female participants decided not to complete the study after initially signing their consent forms because of their busy schedules. Every participant in the experimental group (n=14) completed all sessions of APMR and the required measurements at the three points of time. Also, all participants in the control group (n=14) attended the documentary video sessions and completed the measurements at the three points of time.

Outliers. Prior to the primary analyses, two outliers—defined as values exceeding 3x the interquartile range (Tabachnik & Fidell, 2007)—were identified in the experimental group on the self-reports of stress in Time 2 (see Figure 3.1) and on the HR variable in Time 3 (see Figure 3.3). Also, an outlier was identified in the control group on self-reports of stress in Time 3 (See figure 3.2).

Figure 3.1

Outlier on Self-reports of Stress in Time 2

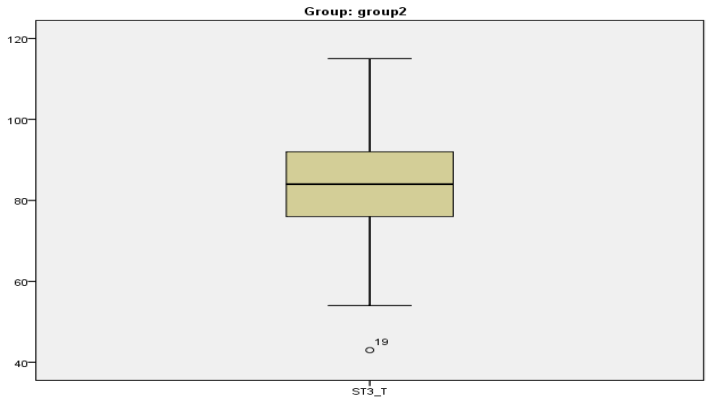


Note. Group1= Experimental group. ST2_T= Time 2 measurements of self-reports of stress

The outliers identified on the self-reports of stress variable were considered as illegitimate because they were different on some demographic variables from the majority of participants. For example, the participant in the experimental group with an outlier on self-reports of stress-Time 2 was the only American. Moreover, although this participant scored above the mean on self-reports of stress, she had values lower than the mean for other objective measures of stress such as SBP, DBP, and HR, thus indicating that she may have responded to the SSSI items in a socially desirable way. The participant in the control group with an outlier value on self-reports of stress-Time 3 was also different on nationality. She was the single Israeli in the control group. Her score was above the mean of self-reports of stress-Time 3 even though her values on objective measures of stress such as SBP and DBP were lower than the means, indicating that she also may have responded to the SSSI in a socially desirable way. Different transformation strategies were performed to reduce the undesirable effects of these outliers on self-reports of stress variable, such as square-root and Log10 transformation strategies but none were successful. Thus, parallel analysis was conducted excluding these two outliers from the main analysis so that these outliers could not bias the results.

Figure 3.2

Outlier on Self-reports of Stress in Time 3

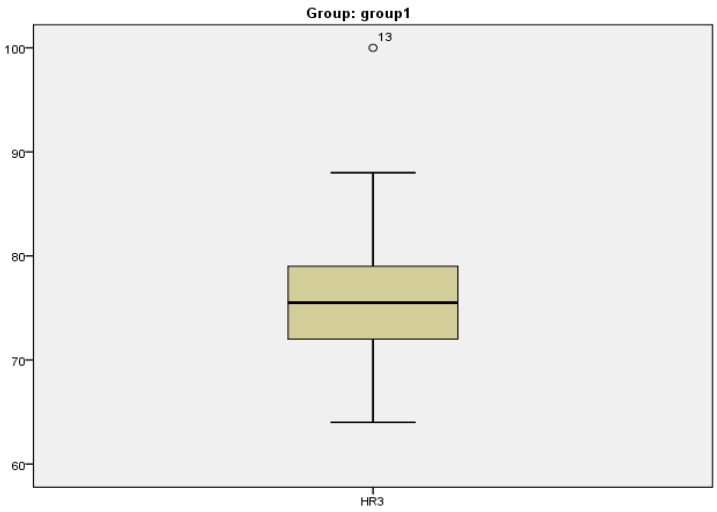


Note. Group2= Control group. ST3_T= Time 3 measurements of self-reports of stress

For the outlier identified on the HR—Time 3, it was considered as a legitimate value and assumed to reflect an accurate measure of HR because the value fell within the normal range of possible scores for the HR (100 beats/minute), was consistent with other measures of stress (e.g. SBP, DBP, and FST), and the identified participants with this outlier value did not vary on any demographic variables from the majority of participants. Several transformation strategies (e.g. square-root and Log10) were performed to reduce the undesirable effects of this outlier on the HR variable, but no strategy successfully removed its effects of this outlier. Therefore, parallel analysis was conducted excluding this outlier from the main analysis.

Figure 3.3

Outlier on HR in Time 3



Note. Group1= Experimental group, HR3= Time 3 measurements of HR variable

Missing. The SSSI scores involved a small portion of missing data at item level (< 1 % of all SSSI scores). The pattern of missing values was *missing completely at random* (MCAR) identified by the missing value analysis. Therefore, the Expectation of Maximization method was used to impute the missing values of self-reports of stress (Tabachnick & Fidell, 2007). Then, two analyses were conducted; one with the exclusion of the cases with missing values and one

with the inclusion of all cases after the missing values were replaced.

Normality. Sharipo-Wilk test and skewness and kurtosis statistic values were used as indicators of normality. Tabachnick and Fidell (2007) stated that these tests of normality are preferable for small to moderate sample sizes, as opposed to graphical devices, such as histogram, preferred for large sample sizes. Continuous variables were considered as not normally distributed if their skewness or kurtosis statistic divided by their standard error was greater than z +3.29 and their Sharipo-Wilk test was statistically significant ($p < .01$) (Tabachnick & Fidell, 2007). On this basis, preliminary analyses ensured that all relevant study variables in each condition or group were approximately normally distributed (see Appendix H).

Homogeneity of Variance. Levene's test of equality of variances examines the assumption that variances of each variable are equal across groups (Tabachnick & Fidell, 2007). In this study**,** the assumption of homogeneity of variance was violated for the following variables: SBP-Time 3 ($p = .02$), DBP-Time1 ($p = .007$), HR-Time 1 ($p = .026$), and self-reports of stress-Time 3 ($p = .019$). However, RM ANOVA and RM ANOVA (mixed model) tests, the main statistical tests in this study, are robust to violation of homogeneity of variance assumption because the sample sizes in the two groups are equal (Polit, 2013; Tabachnick & Fidell, 2007) (see Table 3.2).

Table 3.2

Levene's Test of Homogeneity of Variances for Dependent Variables in 3 Times of Measurement

	Levene's Test of Homogeneity of Variances					
	Time 1		Time 2		Time 3	
Variable	*F*	*p*	*F*	*p*	*F*	*p*
SBP	.50	.48	.10	.749	6.08	.021*
DBP	3.98	.057	.004	.947	.04	.846
HR	5.58	.026*	.24	.626	.07	.792
FST	.13	.724	1.62	.214	3.71	.065
Stress	.01	.922	1.49	.233	6.30	.019*

*P < .05.

Sphericity: Sphericity**,** a necessary assumption for RM ANOVA, refers to the variances of the differences between all possible pairs of within-subject groups being equal (Tabachnick & Fidell, 2007). Mauchly's test of sphericity is used to assess whether the sphericity assumption has been violated. When Mauchly's test of sphericity is significant ($p < .05$), the assumption of sphericity has been violated. Because of its importance, the results of Mauchly's tests are discussed with each mixed model RM ANOVA and RM ANOVA test used in this study (see Table 3.4, 3.5, and 3.6).

Reliability. In the current study, Chronbach's alpha was calculated for the SSSI and CBI to arrive at internal consistency reliability (see Table 3. 3). The Chronbach's alpha for the 35-item SSSI was .82, displaying an acceptable level of internal consistency reliability. For the 19-item CBI, however, the Chronbach's alpha was .62. Although the generally agreed lower limit of Chronbach's alpha is 0.7, the lower acceptable limit may decrease to 0.60 for exploratory

purposes and in the early stages in any research (Hair, Black, Babin, Anderson, and Tatham, 2010; Nunnally, 1978, as cited in Khalifa, Ibrahim, & Ali, 2014). In the current study, the CBI was only used to provide a description of coping behaviors used by the nursing students. Because of its exploratory purpose in the current study, the CBI with an alpha of 0.62 was assumed to be reliable.

Table 3.3

Chronbach's Alpha for SSSI and CBI

Scale	N	Mean	SD	Cronbach's Alpha
SSSI	28	77.89	12.29	.82
CBI	28	45.14	7.70	.62

Note. N= Total number of subjects, SD= Standard Deviation,
SSSI= Smith Stress Symptom Inventory, CBI= Coping Behavior Inventory.

Comparison between Groups on Coping Behaviors and Demographic Variables

Chi-square tests and independent t-tests were conducted to investigate any group differences on demographic variables, smoking status, and coping behaviors. Results examining the variables of gender (x^2 (1) = .243, p = .622), employment status (x^2 (1) = .373, p = .541), smoking status (x^2 (2) = 1.50, p = .472), nationality (x^2 (2) = 2.00, p = .368), religion (x^2 (1) = 0.00, p = 1.000), age (t (26)= -.563, p = .578), and coping behaviors (t (26)= .781, p = .442) indicated no significant differences between the two groups (see Table 3.1).

Comparison between Groups on Dependent Variables

Independent t-tests were conducted to examine any pretest mean differences on the dependent variables between the experimental and control groups. The results revealed no significant differences among the experimental and control groups on the baseline SBP scores (t

(26)= .595, *p*= .557), baseline DBP scores (*t* (26)= .714, *p*= .481), baseline HR scores (*t* (21.008)= -.741, *p*=.467), baseline FST scores (*t* (26)= .537, *p*= .596), and baseline scores of self-reports of stress (*t* (26)= -.166, *p*= .869) (See Table 3.4).

Table 3.4

Baseline Group Comparison on Dependent Variables.

	Baseline Means (SD)		*t-tests*	
Outcomes	Exp.	Cont.	*t*	*P*
SBP	111.14 (17.2)	107.71 (12.9)	.595	.557
DBP	80.36 (10.9)	77.93 (6.52)	.714	.481
HR	90.07 (12.7)	93 (7.48)	-.741	.467
FST	89.72 (5.22)	88.96 (3.5)	.537	.596
Stress	77.5 (11.4)	78.28 (13.5)	-.166	.869

Note. Exp. = experimental group; Cont. = Control group. * $p < .05$ alpha level.

Hypotheses Testing

First hypothesis. The first hypothesis was that "in the experimental group, APMR will decrease self-reports of stress, DBP, SBP, and HR, and will increase FST over time." RM ANOVA tests were thus conducted to examine whether the dependent variables of SBP, DBP, HR, FST, and self-reports of stress improved over time in the experimental group. However, additional RM ANOVA tests were conducted to examine whether these dependent variables significantly changed over time in the control group as well. Means and standard deviations on dependent variables by study groups are displayed in Table 3.5.

Table 3.5

Means and Standard Deviations on Dependent Variables by Study Groups

Variables	Means (SD)		
	Time 1	Time 2	Time 3
SBP			
Exp.	111.14 (17.2)	107.2 (11.9)	103.57 (12.4)
Cont.	107.71 (12.9)	113 (11.2)	113.64 (7.21)
DBP			
Exp.	80.36 (10.9)	71.63 (5.59)	72.50 (5.78)
Cont.	77.93 (6.52)	75.57 (5.9)	79.14 (5.7)
HR			
Exp.	90.07 (12.7)	86.21 (10.7)	76.46 (9.10)
Cont.	93.00 (7.48)	91.71 (10.7)	95.00 (8.4)
FST			
Exp.	89.72 (5.22)	86.48 (5.22)	85.99 (6.14)
Cont.	88.96 (3.5)	87.40 (3.4)	88.30 (4.14)
Stress			
Exp.	77.50 (11.4)	65.42 (16.1)	62.5 (9.09)
Cont.	78.28 (13.5)	80.28 (22.5)	82.57 (20.5)

Note. Exp. = experimental group, Cont. = control group.

First, the assumption of sphericity was evaluated for each RM ANOVA test, and the results of Mauchly's tests showed that the assumption of sphericity was met for all RM ANOVA tests used for each dependent variable in both groups, except for the HR variable in the control group, as shown below. The RM ANOVA results for each dependent variable are shown below (see Table 3.6 and Table 3.7):

SBP. In the experimental group, there was a significant main effect of time for SBP (F (2, 26) = 4.20, p = .026, partial eta squared= .244). However, there was no significant main effect

of time for SBP (F (2, 26) = 2.45, p = .106, partial eta squared= .159) in the control group. Pairwise comparisons in the experimental group indicated non-significant mean differences between SBP scores at Time 1 and Time 2 (*Mean difference* = 3.71, p= .574), Time 1 and Time 3 (*Mean difference*= 7.57, p= .073), and Time 2 and Time 3 (*Mean difference*= 3.86, p= .266). In the control group, pairwise comparisons showed that there were non-significant mean differences between SBP scores at Time 1 and Time 2 (*Mean difference*= -5.29, p= .519), Time 1 and Time 3 (*Mean difference*= -5.93, p= .162), and Time 2 and Time 3 (*Mean difference*= -.64, p= 1.00).

DBP. In the experimental group, there was a significant main effect of time for DBP (F (2, 26) = 6.62, p = .005, partial eta squared= .337). However, in the control group, there was no significant main effect of time for DBP (F (2, 26) = 2.15, p = .136, partial eta squared= .142). In the experimental group, pairwise comparisons indicated significant mean differences between DBP scores at Time 1 and Time 2 (*Mean difference* = 9.00, p= .013), but non-significant mean differences between DBP scores at Time 1 and Time 3 (*Mean difference*= 7.86, p= .101) or Time 2 and Time 3 (*Mean difference*= -1.14, p= 1.00). In the control group, pairwise comparisons indicated no significant mean differences between DBP scores at Time 1 and Time 2 (*Mean difference* = 2.36, p= .848), Time 1 and Time 3 (*Mean difference*= -1.21, p= 1.00), or Time 2 and Time 3 (*Mean difference*= -3.57, p= .206).

HR. In the experimental group, there was a significant main effect of time for HR (F (2, 26) = 7.84, p = .002, partial eta squared= .376). In the control group, Mauchly's test indicated that the assumption of sphericity was violated (x^2 (2) = 18.62, p= .00), therefore the degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε = .559). The results after Greenhouse-Geisser correction showed a non-significant main effect of time for HR (F (1.119, 26) = 1.37, p = .271, partial eta squared= .096) in the control group. In the experimental

group, pairwise comparisons showed significant mean differences between HR scores at Time 1 and Time 3 (*Mean difference* = 13.43, *p* = .018) and Time 2 and Time 3 (*Mean difference*= 9.57, *p* = .02), but there was a non-significant mean difference between Time 1 and 2 (*Mean difference*= 3.86, *p* = .799). In the control group, pairwise comparisons showed non-significant mean differences between HR scores at Time 1 and Time 2 (*Mean difference* = 1.29, *p* = 1.00), Time 1 and Time 3 (*Mean difference*= -2.00, *p*= .07), or Time 2 and Time 3 (*Mean difference*= -3.29, *p*= .471).

FST. In the experimental group, FST means decreased significantly over time, in contrast to what was hypothesized (*F* (2, 26) = 6.40, *p* = .006, partial eta squared= .33). However, in the control group, there was a non-significant main effect of time for FST (*F* (2, 26) = 1.12, *p* = .341, partial eta squared= .079). In the experimental group, pairwise comparisons showed significant mean differences between FST scores at Time 1 and Time 2 (*Mean difference* = 3.24, *p*= .049) and Time 1 and Time 3 (*Mean difference*= 3.73, *p*= .014), but there was a non-significant mean difference between FST scores at Time 2 and 3 (*Mean difference*= .49, *p*= 1.00). In the control group, pairwise comparisons showed non-significant mean differences between FST scores at Time 1 and Time 2 (*Mean difference* = 1.56, *p*= .645), Time 1 and Time 3 (*Mean difference*= .63, *p*= 1.00), and Time 2 and 3 (*Mean difference*= -.93, *p*= .745).

Self-reports of stress. In the experimental group, there was a significant main effect of time for self-reports of stress (*F* (2, 26) = 7.54, *p* = .003, partial eta squared= .386). However, in the control group there was a non-significant main effect of time for self-reports of stress (*F* (2, 26) = .24, *p* = .791, partial eta squared= .018). In the experimental group, pairwise comparisons showed significant mean differences between SSSI scores at Time 1 and Time 3 only (*Mean difference* = 15.85 , *p*= .001). However, the mean differences between SSSI scores at Time 1 and

Time 2 (*Mean difference*= 13.00, *p*= .094) and Time 2 and Time 3 (*Mean difference*= .2.85, *p*= 1.00) were not statistically significant. In the control group, pairwise comparisons showed non-significant mean differences between SSSI scores at Time 1 and Time 2 (*Mean difference* = -2.00 , *p*= 1.00), Time 1 and Time 3 (*Mean difference*= -4.286 , *p*= 1.00), or Time 2 and Time 3 (*Mean difference*= -2.29, *p*= 1.00).

Table 3.6

Results of RM ANOVA for Experimental Group (n= 14)

	Mauchly's Test			*F* test		Paired Comparisons		
Outcome	Epsilon	X^2	*p*	*f*	*p*	T1-T2	T1-T3	T2-T3
SBP	.855	1.88	.391	4.20	.026*	3.71	7.57	3.86
DBP	.766	4.36	.113	6.62	.005*	9.00**	7.86	-1.14
HR	.871	1.93	.381	7.84	.002*	3.86	13.43**	9.57**
FST	.992	.091	.992	6.40	.006*	3.24**	3.73**	.49
Stress	.742	4.70	.095	7.54	.003*	13.00	15.85**	2.85

*Statistically significant main effect of time at $p < .05$
**significance levels for Bonferroni's test comparing Time1 –Time2 (T1-T2), Time 1- Time 3 (T1-T3), and Time 2-Time 3 (T2-T3) paired comparisons: $p < .05$

Table 3.7

Results of RM Measures ANOVA for Control Group (n= 14)

	Mauchly's Test			*F* test		Paired Comparisons		
Outcomes	Epsilon	X^2	*p*	*f*	*p*	T1-T2	T1-T3	T2-T3
SBP	.736	5.32	.07	2.45	.106	-5.29	-5.93	.643
DBP	.769	4.29	.117	2.15	.136	2.357	1.214	-3.571
HR	.559	18.62	.000	1.37	.271	1.286	-2.00	-3.286
FST	.82	2.97	.227	1.12	.341	1.557	.629	-.929
Stress	.884	1.68	.431	.24	.791	-2.00	-4.286	2.286

*Statistically significant main effect of time at the $p < .05$,
**significance levels for Bonferroni's test comparing Time1 –Time2 (T1-T2), Time 1- Time 3 (T1-T3), and Time 2-Time 3 (T2-T3) paired comparisons: $p < .05$.

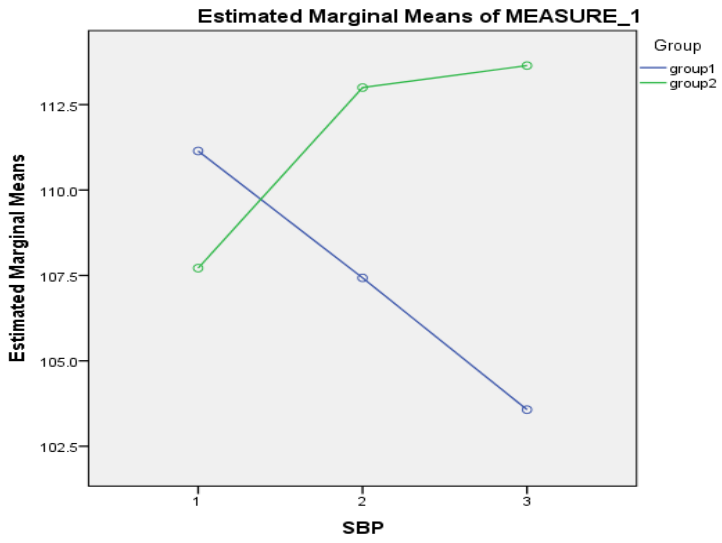
Second Hypothesis. The second hypothesis was that "when compared with the control group, the experimental group will do better over time in terms of SBP, DBP, HR, FST and self-reports of stress. Five 2X3 RM ANOVA (mixed model) were conducted to examine differences in each dependent variable by condition (experimental and control groups) and time (Time 1, Time 2, and Time 3). Table 3.5 presents the means and standard deviations for the three points of time by group.

SBP. A 2X3 RM ANOVA (Mixed model) test was conducted to examine differences in SBP by condition and time (see Table 3.8). The assumption of sphericity was not violated (x^2 (2) = 5.49, p = .064). Figure 3.4 shows that the SBP means demonstrated a downward trend for the experimental group; in contrast, the control group had increasing SBP means over time. Results revealed that there were no significant main effects of time (F (2, 52) = .33, p = .717, partial eta squared= .013) or conditions (F (1, 26) = .96, p = .336, partial eta squared= .036). However,

there was a significant effect of time by condition interaction (F (2, 52) = 6.12, p = .004, partial eta squared = .19). Pairwise comparisons indicated no significant mean differences between SBP scores at Time 1 and Time 2 (*Mean difference* = -.79, p= 1.00), Time 1 and Time 3 (*Mean difference*= .82, p= 1.00), and Time 2 and Time 3 (*Mean difference*= 1.61, p= .88).

Figure 3.4

SBP Means for Experimental Group (group1) and Control Group (group2)

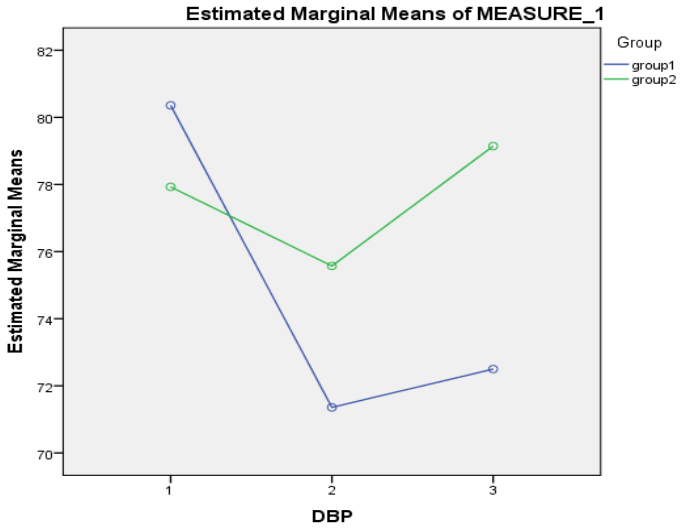


DBP. Changes in DBP scores over time were compared across conditions using a 2X3 RM ANOVA (mixed model) (see Table 3.8). The assumption of sphericity was not violated (x^2 (2) = 2.37, p = .305). Figure 3.5 shows that the DBP means decreased in the experimental and control groups at the middle of intervention; however, a greater decrease in the DBP mean occurred in the experimental group. The mean in both groups increased from Time 2 to Time 3, but the increase in DBP means was higher in the control group. Results showed a significant main effect of time (F (2, 52) = 6.31, p = .004, partial eta squared= .195) and time by condition interaction (F (2, 52) = 4.28, p = .019, partial eta squared= .141). However, there was no significant main effect of condition (F (1, 26) = 2.21, p = .149, partial eta squared= .078).

Pairwise comparisons showed a significant mean difference between DBP scores at Time 1 and Time 2 (*Mean difference* = 5.68, *p*= .007), but at Time 1 and Time 3 (*Mean difference*= 3.32, *p*= .214), or Time 2 and Time 3 (*Mean difference*= -2.36, p= .279).

Figure 3.5

DBP Means for Experimental Group (group1) and Control Group (group2)

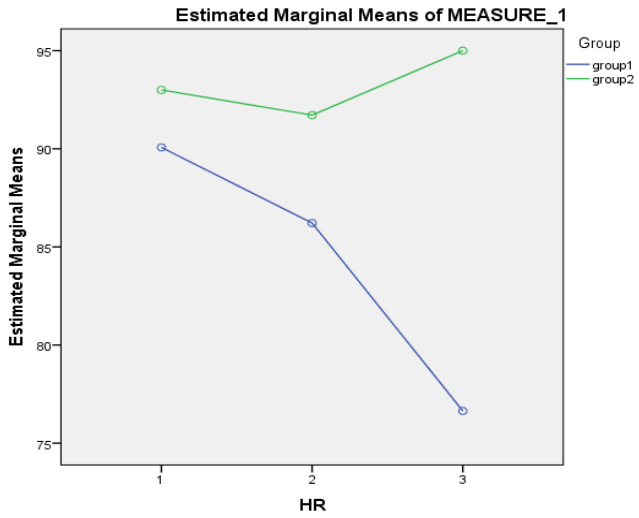


HR. A 2x3 repeated measures ANOVA (Mixed Model) was conducted to examine differences in DBP means by time and condition (see Table 3.8). The assumption of sphericity was not violated (x^2 (2) = .644, *p*= .725). Figure 3.6 demonstrates a downward trend in the HR means over time for the intervention group; however, the control group demonstrated fluctuated means of HR over time. The means of HR in the control group decreased from baseline to middle of intervention and then increased greatly at the end of intervention. The results (see table 3.8) showed that there were significant main effects of time (*F* (2, 52) = 4.05, *p* = .023, partial eta squared= .135) and condition (*F* (1, 26) =. 8.92, *p* = 006, partial eta squared= .255). There was also a significant time by condition interaction (*F* (2, 52) = 8.45, *p* = .001, partial eta squared= .245). Pairwise comparisons indicated that there was a significant mean difference

between HR scores at Time 1 and Time 3 (*Mean difference* = 5.71, *p*= .032), but not at Time 1 and Time 2 (*Mean difference*= 2.57, *p*= .694), or Time 2 and Time 3 (*Mean difference*= 3.14, *p*= .301).

Figure 3.6

HR Means for Experimental Group (group1) and Control Group (group2) including the subject with outlier in the analysis

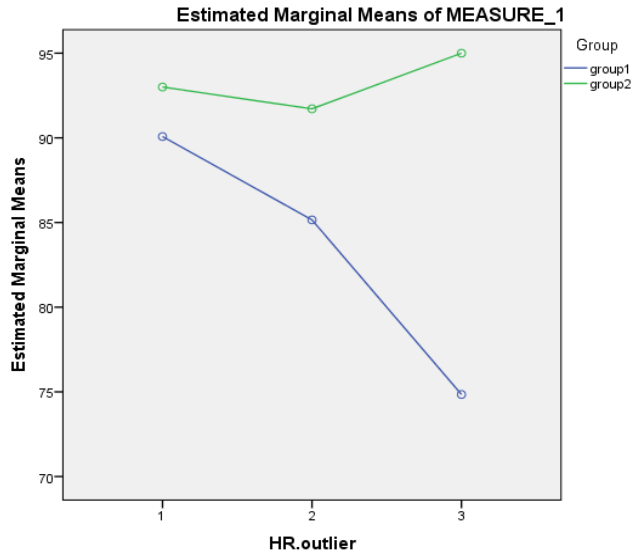


An outlier was identified in the experimental group within the third measurement of HR. This outlier was considered legitimate and assumed to reflect an accurate measure of HR because its value fell within the range of possible scores for the HR variable. Also, the identified participant did not vary on any demographic variables from other participants. However, to confirm that this outlier did not significantly affect the results, another 2X3 repeated measures ANOVA (Mixed Model) was conducted for the HR variable with the exclusion of this outlier from the analysis (see Table 3.8). After the outlier removal, 13 subjects in the experimental group were compared to 14 subjects in the control group. Figure 3.7 demonstrates the changes in the HR means for the experimental group and control groups, which were similar to mean changes when the subject with the outlier was included in the analysis. The means of HR

measure in the control group decreased from baseline to middle of intervention and then increased greatly at the end of intervention. The assumption of sphericity was not violated (x^2 (2) = .47, p = .79). The results (see Table 3.8) showed that mean effects of time (F (2, 50) = 5.58, p = .006, partial eta squared= .183) and condition (F (1, 25) = 11.24, p = 003, partial eta squared= .31) and the time by condition interaction (F (2, 50) = 10.50, p = .000, partial eta squared= .296) remained statistically significant.

Figure 3.7

HR Means for Experimental Group (group1) and Control Group (group2) excluding the subject with outlier from the analysis

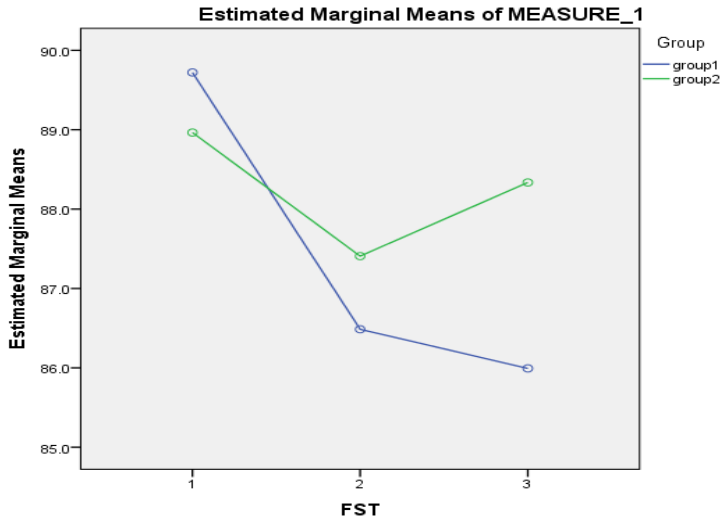


FST. Changes in FST scores over time were compared across conditions using a 2X3 RM ANOVA (Mixed Model) (see Table 3.8). The assumption of sphericity was not violated (x^2 (2) = 1.37, p = .505). Figure 3.8 showed that the experimental group demonstrated a downward trend in the FST means over time; however, the means of FST in the control group decreased from baseline to middle of intervention and then increased greatly at the end of intervention, not as hypothesized. Although there was a significant mean effect of time (F (2, 52) = 5.91, p =

.005, partial eta squared =.185), time by condition interaction was not statistically significant (F (2, 52) = 2.03, p = .14, partial eta squared =.072). Moreover, the main effect of condition was not statistically significant (F (1, 26) = .33, p= .569, partial eta squared = .013). Pairwise comparisons indicated significant mean differences between HR scores at Time 1 and Time 2 (*Mean difference* = 2.40, p = .025) and at Time 1 and Time 3 (*Mean difference*= 2.18, p = .03), but not at Time 2 and Time 3 (*Mean difference*= -.22, p = 1.00).

Figure 3.8

FST Means for Experimental Group (group1) and Control Group (group2)



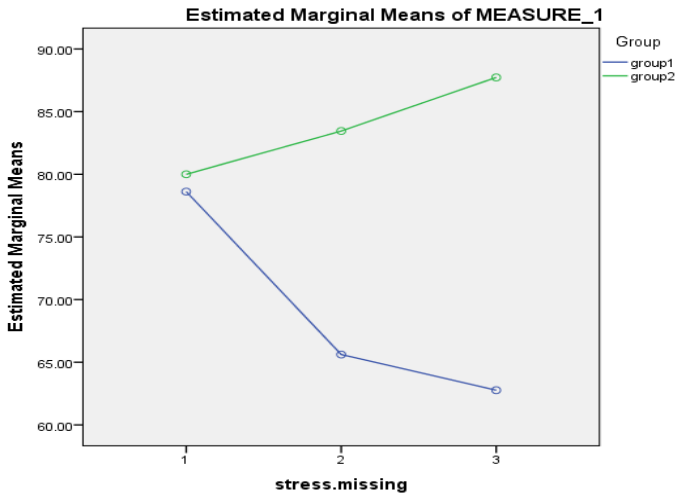
Self-reports of stress. The SSSI scores involved a small portion of missing data (less than 1 % of all SSSI and on Item level). The pattern of missing value was described as MCAR identified by the missing value analysis. Expectation of Maximization method was used to impute the missing values. It is a proper imputation method when missing values are described as small and MCAR (Tabachnick & Fidell, 2007). After the imputation, two outlines assumed to be illegitimate were identified. Different transformation strategies were used to remove the effects of these outliers but not successful. Thus, three analyses using 2X3 RM ANOVA (Mixed Model) were performed: 1) an analysis excluding the cases with missing values, 2) an analysis

including cases with missing values after imputing them, and 3) an analysis excluding outliers (see Table 3.8). These three analyses helped identify whether missing values and outliers affected the results.

Excluding the cases with missing values, 13 subjects in the experimental group were compared with 11 subjects in the control group. Means for self-reports of stress demonstrated a downward trend for the experimental group, but an upward trend for the control group (see Figure 3.9). The assumption of sphericity was not violated (x^2 (2) = 2.20, p = .333). There were no significant main effects of time (F (2, 44) = .75, p = .481, partial eta squared= .033). However, there were significant main effects of condition (F (1, 22) = 11.57, p = .003, partial eta squared =.345) and time by condition interaction (F (2, 44) = 4.11, p = .023, partial eta squared =.157). Pairwise comparisons indicated no significant mean differences between SSSI scores at Time 1 and Time 2 (*Mean difference* =4.77, p= .994), Time 1 and Time 3 (*Mean difference*= 4.06, P= .997), or Time 2 and Time 3 (*Mean difference*=.-.71, p= 1.00).

Figure 3.9

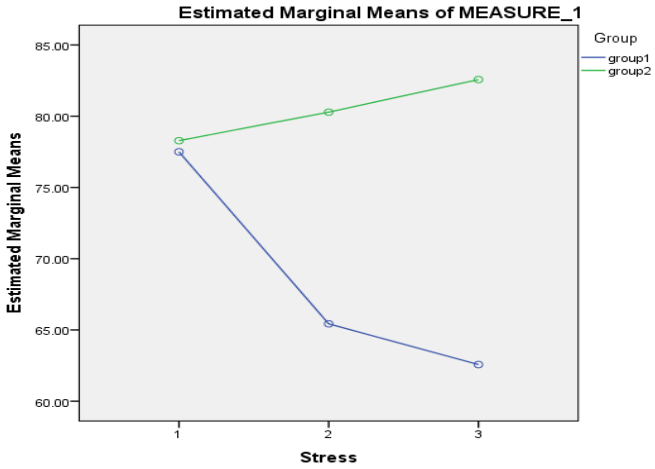
Means of Self-reports of Stress for Experimental (group1) and Control Group (group2) after Excluding Subjects with Missing Values



When the imputed values were included, 14 subjects in the experimental group were compared with 14 subjects in the control group. With imputed values, the results remained almost unchanged. As previously, means for self-reports of stress demonstrated a downward trend for the experimental group, but an upward trend for the control group (see Figure 3.10). The assumption of sphericity was again not significant (X^2 (2) = 2.24, p= .326). The main effects of time continued to be statistically non-significant (F (2, 52) = 1.29, p = .284, partial eta squared= .047). However, there were significant main effects of condition (F (1, 26) = 7.35, p = .012, partial eta squared =.220) and time by condition interaction (F (2, 52) = 3.56, p = .036, partial eta squared =.120). Pairwise comparisons indicated no significant mean differences between SSSI scores at Time 1 and Time 2 (*Mean difference* =5.04, p= .715), Time 1 and Time 3 (*Mean difference*= 5.32, p= .500), or Time 2 and Time 3 (*Mean difference*= .29, p= 1.00).

Figure 3.10

Means of Self-reports of Stress for Experimental (group1) and Control Group (group2) with Imputed Values



Two illegitimate outliers were identified on the self-reports of stress variable, as explained above. Therefore, another RM ANOVA (mixed model) was conducted excluding these

outliers from the analysis. After removing the outliers, 13 subjects in the experimental group were compared to 13 subjects in the control group. Similarly, as shown in figure 3.11, the means for self-reports of stress demonstrated a downward trend for the experimental group, but an upward trend for the control group. The assumption of sphericity was again tested and was not violated (X^2 (2) = 2.08, p= .354). The main effects of time continued to be statistically non-significant (F (2, 48) = 1.49, p = .236, partial eta squared= .058). Similarly, there were significant main effects of condition (F (1, 24) = 15.2, p = .001, partial eta squared =.338) and time by condition interaction (F (2, 48) = 4.61, p = .015, partial eta squared =.161). Pairwise comparisons indicated no significant mean differences between SSSI scores at Time 1 and Time 2 (*Mean difference* = 6.23, p= .47), Time 1 and Time 3 (*Mean difference*= 5.00, p= .627), or Time 2 and Time 3 (*Mean difference*=.-.1.23, p= 1.00).

Figure 3.11

Means of Self-reports of Stress for Experimental (group1) and Control Group (group2) after Excluding Subjects with Outliers

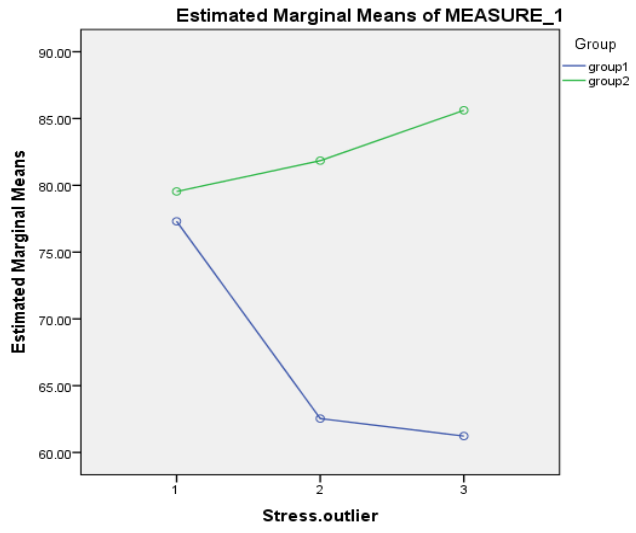


Table 3.8

Analyses of Variance on Dependent Variables Across Three Repeated Measures by Group: Experimental group Compared With Control group

Variable	Mauchly's Test			*F (p)*			η2
	Epsilon	X^2	*p*	Group	Time	G X T	
SBP	8.35	5.49	.064	.96 (.336)	.33 (.717)	6.11 (.004)*	.16
DBP	.917	2.37	.305	2.21 (.149)	6.31 (.004)*	4.28 (.019)*	.141
HR							
HR[1]	.975	.644	.725	8.91 (.006)*	4.05 (.023)*	8.44 (.001)*	.245
HR[2]	.981	.47	.79	11.2 (.003)*	5.58 (.006)*	10.5 (.00)*	.296
FST	.949	1.367	.505	.96 (.336)	.33 (.717)	2.02 (.142)	.072
Stress							
Stress [1]	.921	2.24	.326	7.35 (.012)*	1.29 (.284)	3.56 (.036)*	.120
Stress [3]	.910	2.20	.333	11.6 (.003)*	.745 (.481)	4.11 (.023)*	.157
Stress [2]	.920	2.08	.354	15.2 (.001)*	1.49 (.236)	4.61 (.015)*	.161

*Statistically significant at the $p < .05$ alpha level.
[1] RM ANOVA (mixed model) test with imputed values, [2] RM ANOVA (mixed model) test excluding outliers, [3] RM ANOVA (mixed model) test excluding cases with missing value, *Note*. GXT= group by time interaction, η2 = Partial eta squared for group by time interaction, Exp. = experimental group, Cont. = control group.

Post Hoc t-tests

T-tests were run to examine if there were significant mean differences between the two study groups on the scores of the dependent variables (SBP, DBP, HR, FST, and self-reports of stress) at the middle (Time 2) and end of the intervention (Time 3) separately (see Table 3.9). T-test results showed that there were not significant mean differences between the experimental

and control groups in Time 2 scores of SBP (*t* (26)= -1.27, *p*= .215), DBP (*t* (26)= -1.94, *p*= .064), HR (*t* (26)= -1.36, *p*=.186), FST (*t* (26)= -.55, *p*=.585), and self-reports of stress (*t* (26)= -2.00, *p*=.055). At the end of the intervention (Time 3), however, the experimental group showed significantly lower mean scores on SBP (*t* (26) = -2.62, *p*= .014), DBP (*t* (26) = -3.06, *p*= .005), HR (*t* (26) = -5.54., *p*= .00), and self-reports of stress (*t* (17.89) = -3.33, *p*= .004) than the control group. Although the control group showed a higher mean FST score than the experimental group at the end of the intervention, the mean score was not statistically significant (*t* (26)= -1.18, *p*= .25).

Table 3.9

Results of t-tests for dependent variables by group in time 2 and time 3 measurements.

	Means (SD)		t-test		
Outcomes	Exp.	Cont.	*t*	*df*	*p*
SBP					
Time 2	107.2 (11.9	113 (11.2)	-1.27	26	.215
Time 3	103.57 (7.21)	113.64 (7.21)	-2.62	26	.014*
DBP					
Time 2	71.63 (5.59)	75.57(5.9)	-1.94	26	.064
Time 3	72.5 (5.78)	79.14 (5.7)	-3.06	26	.005*
HR					
Time 2	86.21 (10.7)	91.71 (10.7)	-1.36	26	.186
Time 3	76.46 (9.10)	95.00 (8.4)	-5.54	26	.000*
FST					
Time 2	86.48 (5.22)	87.40 (3.4)	-.55	26	.585
Time 3	85.99 (6.14)	88.3 (4.14)	-1.18	26	.25
Stress					
Time 2	65.42 (16.1)	80.28 (22.5)	-2.00	26	.055
Time 3	62.5 (9.09)	82.57 (20.5)	-3.33	17.89	.004*

*p < .05.

Note. Exp. = Experimental group, Cont. = Control group.

Time 2: Measurements at the middle of intervention, Time 3: Measurements at the end of intervention

Experiences of APMR

The table (3.10) summarizes the participants' responses to the open-ended question, "what was your experience of practicing APMR?" Of the 14 participants in the experimental group, only 12 (85 %) participants responded to the open-ended question. The responses was analyzed and categorized into two major categories: *Accepting attitudes about APMR* (n= 9, 75 %) and *stress symptoms relief* (n= 12, 100 %). Under the category of stress symptoms relief, there were three sub-categories, including *physical symptoms relief* (n= 8, 66%), *emotional symptoms relief* (n= 9, 75%), and *cognitive symptoms relief* (n= 4, 33%).

Seventy five percent of participants accepted the idea of APMR as a beneficial stress-reduction technique. They showed a commitment to keep practicing it, and they recommended it for others because of its effectiveness in reducing stress. All participants reported that APMR was useful in reducing at least one symptom. In terms of physical symptoms of stress, some participants reported that APMR helped them fall asleep (16 %), regulate HR (8 %), improve breathing (8%), and reduce pain or headache (8 %). For the emotional symptoms of stress, anxiety was reduced (75%). In respect to cognitive symptoms of stress, some participants reported that APMR helped them to reduce worry (33 %) and negative thinking (25 %).

Table 3.10

Experience of APMR (N=12)

Categories (%)	Sub-Categories (%)	Examples
Stress Symptoms Relief (100)	Physical Symptom Relief (66)	• It was useful, especially when I was going to sleep at home. • It helped me to relax my muscles and decrease pain and headache. • I practiced it when I was feeling tense or fatigued • It helped to relax my muscles • It helped me decrease tension and worry and helped me fall asleep. • It helped to feel calm and relax muscles…. It decreased my fatigue after a long exhausting day. • "It helped remove tension and relax the muscle but not remove tension completely. It is useful in removing muscle tension for a short time. • "It helped decrease tension and worry, regulate heart beat….. It improved my breathing depth.
	Emotional Symptoms Relief (75)	• At the end of intervention, I found it (APMR) useful, especially in relieving anxiety… • When I was practicing it, I felt less anxious • It helped me to relax tense muscles and deal with stressful situations— especially anxiety related to exams. • It helped me decrease anxiety. • It was a useful and excellent experience, especially when I was anxious. • It was useful when I was anxious. • I benefited from it in decreasing anxiety too. • It helped me remove anxiety and relax the muscles, but not remove anxiety completely. • At first I did not think that it is effective, because I tried Yoga before and found it wasteful. However,

		at the end of intervention, I noticed how this technique was useful in relieving anxiety and tension.
	Cognitive symptoms Relief (33)	• I was practicing it when I was feeling worried and confused. • It helped me decrease tension and worry and helped me fall asleep. • I benefited from it in decreasing worry, tension, and became thoughtful before making decisions. • It was effective in decreasing tension and worry… and reducing negative thinking.
Accepting Attitudes about APMR (75)		• It was a new excellent experience. I never expected that this relaxation technique would be useful. It is a simple and effective technique, and I recommend it for everybody feeling distressed out. • It was useful for me. I think that it would be useful for patients if it is applied to them as well. • It was a new and fantastic experience, and I will keep practicing it in future. • It was an excellent experience and made me deeply relaxed; I taught it to people I know. • It was an excellent experience. I practiced it when I was feeling tense or fatigued. After I practiced, I got relaxed. • It was a useful and excellent experience, especially when I was stressed out. I recommend it for every student. • It was a useful and excellent experience, especially when I was tense. I will keep practicing it whenever I feel stressed out. • It was a good experience and study. I hope it will be applied in all universities.

CHAPTER 5

Discussion

This chapter consists of five sub-sections: 1) results summary, 2) discussion of results, 3) limitations and recommendations for future research, 4) nursing implications, and 5) conclusion.

Results Summary

The purpose of this study was to examine the effects of APMR on stress in second-year Jordanian nursing students taking their first clinical training course. The main hypotheses tested are shown below.

Over time, among second-year Jordanian undergraduate nursing students:

1) In the experimental group, APMR will beneficially decrease self-reports of stress, DBP, SBP, and HR, and it will beneficially increase FST.

2) When compared with the control group, the experimental group will do better in terms of self-reports of stress, DBP, SBP, HR, and FST.

Regarding the first hypothesis, RM ANOVA results in the experimental group showed that APMR did in fact significantly decrease self-reports of stress, DBP, SBP, and HR, although not until Time 3. Yet, contrary to the hypothesis, APMR decreased FST in the experimental group, and this decrease occurred significantly at both Time 2 and Time 3. The control group watching documentary videos did not demonstrate any significant improvement in any outcome variables over time.

Regarding the second hypothesis, the subjects in the experimental group showed lower levels of self-reports of stress, DBP, SBP, and HR over time. However, unlike as hypothesized, they did not show more improvement in FST than those in the control group. Overall, post hoc t-

tests showed that the experimental group, compared with the control group, showed improvements at Time 3 for most of the dependent variables.

Discussion of Results

BP. SBP and DBP scores decreased significantly between baseline and the final measurement in the experimental group, but they did not decrease in the control group. In comparison to the control group, the experimental group showed a significant reduction in SBP and DBP over time. The results of the current study are consistent with previous studies. Sheu, Irvin, Lin, & Mar (2003) conducted a randomized controlled study to examine the effectiveness of 30-minute training in APMR, once a week for 4 weeks in Taiwanese patients with essential hypertension. Compared to the control group receiving usual care, subjects receiving PMR demonstrated a significant reduction in SBP and DBP after 4 weeks of intervention. Similarly, Nickel et al. (2010), in their randomized controlled study conducted in Helsinki, found that 30 minutes of PMR delivered three times a week over a period of 8 weeks reduced SBP significantly in asthmatic pregnant women.

This pattern of results supports Smith's ABC Relaxation Theory. Smith (2005) claimed that APMR involves physical and mental components. The physical component entails sequential tensing and relaxing of all muscle groups. The mental component requires that the PMR trainee focus on the distinction between the sensations of the tension and relaxation. The complex interaction of these two components involving the central and peripheral nervous system with the skeletal muscular system results in a reduction in skeletal muscular tone, or complete muscle relaxation. The reduction in skeletal muscular tone leads to reduction in sensory input to the hypothalamus, which consequently leads to loss of ergotropic tone of the hypothalamus, called sympathetic arousal, and dominance of the trophotropic system, called

parasympathetic activation. Parasympathetic activation is associated with reductions in the secretion of a variety of neurotransmitters and stress hormones, notably epinephrine, norepinephrine, and adrenaline, all responsible for increased BP (Smith, 2005).

Urech et al. (2010), when comparing the immediate effects from a session of PMR with those from a session of mental imaging on mental secretive and cardiac functions of pregnant women in Switzerland, did not find significant changes in SBP and DBP after one session of interventions. In the current study, BP changes reached a significant level at the end of intervention. This may support the explanation that a trainee could lack APMR skills at the beginning of an intervention and that more sessions are required to develop these skills (Smith, 2005). This explanation is supported by a subject in our experimental group who reported that, "at the beginning, it was hard to focus on muscle sensations because I was easily distracted by thoughts about my assignments and exams. However, over the study period, I started getting rid of these thoughts easily and refocusing on my body." Smith (1999) explained that the access skills of PMR develop through practice, permitting greater abilities of liberation from distraction and a sustained focus on the stimulus, which are the sensations of the tense up-let go exercise in PMR.

HR. In the current study, APMR significantly decreased HR over time in the experimental group in isolation and also in comparison to the control group. The reduction in HR, however, was not significant until the end of intervention. These findings are consistent with those of other studies. For example, Nickel et al. (2006), in their randomized control trial conducted in Austria, found that 30-minute PMR sessions provided three times a week for 8 weeks significantly decreased HR in pregnant women with asthma. Similarly, results from the current study are in agreement with Chaudhuri et al. (2016) who found in a one-group study that

three months of PMR training significantly reduced HR among young Indian female health care professionals. Furthermore, Khanna, Paul and Sandhu, (2007) found that PMR was more effective than galvanic skin resistance biofeedback in reducing HR among distressed.

This study's findings support the theoretical claim by Smith (1999) that APMR is effective in reducing HR. With APMR, one attends to a group of skeletal muscles, deliberately creates muscle tension, and then lets the muscle relax and the tension go. This strategy helps the skeletal muscles become more relaxed. Moreover, skeletal muscle relaxation is associated with a loss of associated worried thoughts, resulting in a reduction of sensory input to the hypothalamus. Consequently, the parasympathetic system is activated, leading to a reduction in stress hormones and neurotransmitters responsible for increased HR (Smith, 1999, 2005).

Urech et al. (2010) compared the immediate effects of two stress-reduction techniques, PMR and guided imagery, on perceived and physiological indicators of stress among healthy pregnant women in Switzerland. They found that one session of both PMR and guided imagery was more effective at decreasing HR as compared to the control group. Although Urech et al. (2010) found that just one session of PMR was effective in decreasing HR, it is important to note that our findings showed that HR did not significantly improve until the end of intervention. Still, at the theoretical level, this difference is potentially congruent with the ABC Relaxation Theory which asserts that attitudes toward PMR and beliefs in its efficacy are key determinants of its effects (Smith, 1999, 2005). Thus, some students in the experimental group may not have been serious about performing APMR at the beginning of the study because of their unawareness of PMR's benefits and their beliefs that it is ineffective. Over the study period, however, if students began to experience the benefits of PMR, they may have demonstrated more seriousness in performing APMR, ultimately leading to improved HR. This potential explanation is

supported by a student who said, "At first, I did not think that it [APMR] is effective, because I tried Yoga before and found it wasteful. However, at the end of intervention, I noticed how this technique [APMR] was useful in relieving anxiety and tension." Smith (2001) claimed that the evoked relaxation states (benefits) during a relaxation technique increase positive attitudes toward PMR and the adherence to its practice.

FST. In the current study, contrary to its hypothesis, FST decreased over time in the experimental group. Yet, FST in the control group decreased from baseline to the middle of intervention and then increased greatly at the end of intervention. Our findings, however, can be seen to align with the results of several other studies. For example, in a one-group experimental study (Prato, 2013), nursing students were exposed to a series of weekly relaxation training techniques, with one session each for PMR, autogenic training, and diaphragmatic breathing. Findings showed that autogenic training was most effective in increasing FST (Prato, 2013). Similarly, in an older study among nurses (Murphy, 1983), 8 sessions of biofeedback training were more effective in increasing hand skin temperature than 8 sessions of PMR (Murphy, 1983).

The above studies' findings suggest that stress-reduction techniques are not equally effective in increasing FST. Yet, this is inconsistent with Benson's (1975) relaxation response hypothesis which states that all techniques have the same impact in reducing stress arousal. The above findings do support, however, the specificity theories of relaxation in their claim that specific types of relaxation can improve specific arousal signs or symptoms (Davidson & Schwartz, 1976; Smith, 1999). For example, autonomic symptoms (e.g. cold hands) might respond well to autonomic techniques, including breathing exercises, autogenic standard exercises, and autogenic organ-specific formulas. Skeletal muscular symptoms might respond to

muscle techniques, including PMR and Yoga (Davidson & Schwartz, 1976). Based on the specificity theories of relaxation (Davidson & Schwartz, 1976; Smith, 1999), one can conclude that PMR may not be the best stress-reduction technique to improve FST.

Another possible explanation for the non-significant results of FST in the current study is that other behavioral and physiological factors may have affected FST. Tranel (2014) found that eating habits, sleep, physical exercise, physical fitness, body composition, metabolic syndrome factors, smoking habits and many other factors can affect peripheral vascular perfusion and its output, such as FST. It may be that the subjects in the experimental and control groups were affected by one of those factors during the study, thus contributing to decreases and fluctuations of FST levels in both groups. Another explanation may be our use of short term PMR intervention and small sample size, attenuating statistical power. Edmund Jacobson (1974), who initially developed PMR, suggested that at least 30 to 60 minutes, several times a week, for more than a year are required to get the full benefits of PMR. Thus, 5 sessions of PMR may not have been enough to increase FST in the current study.

Self-reports of stress. In the current study, the experimental group students showed a significant reduction in self-reports of stress in isolation and in comparison to the students in the control group. In response to the question asking experimental group subjects about their experiences of practicing APMR, they described it as beneficial in terms of improved physical, cognitive, and physical symptoms, supporting this quantitative study's findings. The findings in the current study support findings of previous studies. Jarasiunaite, Perminas, Gustainiene, Peciuliene, and Kavaliauskaite-Keserauskiene (2015) compared the effects of biofeedback-assisted relaxation and PMR on distress tolerance in female undergraduate students. They found that 4 sessions of PMR were more effective in increasing students' distress tolerance level and

their abilities to tolerate negative emotions. Similarly, Murphy (1983) found that 6 weekly sessions of PMR training were more effective in decreasing nurses' self-reports of stress than biofeedback. In a one-group experimental pilot study, Chaudhuri et al. (2016) found that 3 months of training in PMR reduced perceived stress significantly among Indian female health care professionals of 25-35 years old, in line with the current study's findings. Furthermore, in congruence with the current study, Sheu, Irvin, Lin, & Mar (2003), in a randomized controlled study, found that 30 minutes of training in PMR once a week for 4 weeks significantly improved perceived stress in Taiwanese hypertensive patients. Comparably, Isa, Moy, Abdul Razack, Zainuddin, and Zainal (2013), in their quasi-experimental study, found that 6 months of training in PMR was effective in decreasing stress in Malaysian patients with prostate cancer.

Matsumoto and Smith (2001) compared the effects of 5 weekly sessions of APMR and breathing exercise on stress and relaxation states in U.S. undergraduate college students. Stress was measured by the Smith Quick Stress Test, a short version of the Smith Stress Symptoms Inventory (SSSI), including items that measure cognitive (worry), emotional, and physical stress symptoms. APMR was found to be more effective than breathing exercise in reducing emotional stress symptoms in this study. Overall, stress decreased overtime in both groups (Matsumoto and Smith (2001), supporting the current study results. Using the Smith Somatic Stress Scale, Rausch, Gramling, and Auerbach (2006) found also that undergraduate students receiving one session of PMR demonstrated greater declines in physical stress symptoms than students receiving one session of meditation or nothing, providing some support to the findings of the current study.

The findings of the previous studies and the current study support Smith's ABC Relaxation Theory in its claim that emotional states are absent in the presence of complete

relaxation of skeletal muscles and mind. With stress-related muscle tension, distressed individuals usually experience various physical symptoms (e.g. fatigue, discomfort, stiffness, pain, tension headache, and backache). Sometimes distressed individuals become habituated to or unconsciously worry about the negative effects of muscle tension and associated physical symptoms, so that negative emotional states are evoked. With APMR, the trainee deploys and develops the skills of *tensing up-letting go* and *sustained simple focus*, with these skills working together to evoke complete muscle and mental relaxation states. These relaxation states are in opposition to the subjective experiences of stress symptoms, including physical, emotional, and cognitive symptoms.

Limitations and Recommendations for Future Research

The current study had some limitations as explained below. In light of these limitations, recommendations are made for future investigations.

In the current study, a convenience sampling method was used to select the study subjects, resulting in increased sampling bias and under-representation of groups of subjects, such as males and students from other religions. Thus, it is difficult to generalize the findings across the general population. Because groups vary in many aspects, such as socioeconomic variables, attitudes, and coping behaviors, an effort should be made to include a more adequate representation of students in future studies using appropriate random sampling methods.

Moreover, the subjects in the current study were nursing students from the same academic year and public university. Therefore, the results cannot be generalized to students from other academic years and other public or private universities. Experience and effects of stress on students can vary according to different academic years and different settings (Burnard et al., 2008; Khater, Akhu- Zaheya, & Shaban, 2014). Therefore, future studies should be

conducted with nursing students selected from different academic years and other public and private Jordanian universities to ascertain whether the results could be generalized to other Jordanian nursing students.

In the current study, potentially FST did not significantly improve because of the use of an abbreviated version of PMR or small sample size, thus attenuating statistical power. Therefore, effects of PMR on FST may be more pronounced in longitudinal studies with a longer intervention of PMR and a larger sample size. Further studies are necessary to determine how many sessions are needed to improve each indices of stress (dosing) and test the effects of PMR dosing on these outcomes. Future follow-up studies on the impact of PMR on stress among nursing students will help nurse educators to better understand the long-term efficacy of PMR. Another possible explanation for the non-significant results of FST in the current study is that other behavioral and physiological factors (e.g., eating habit, sleep, physical exercise, and smoking habits), not controlled for in the current study, may have affected FST, thus contributing to decreases and fluctuations of FST levels in both groups. Future studies could include these behavioral and physiological factors to measure their roles in FST change.

The current study showed that APMR was effective in improving self-reports of stress, DBP, SBP, and HR, but not FST, potentially supporting the specificity hypothesis of relaxation, which claims that specific relaxation techniques can improve specific arousal signs or symptoms. Therefore, it will be beneficial to examine different combinations of stress management strategies in terms of their different potential outcomes in order to provide more holistic health care. Again, with the sample size of 28 participants, results from the study may not be stable, suggesting future research with larger sample sizes.

Smith (1999, 2001) has emphasized that relaxation beliefs and attitudes are influential in terms of stress relief outcomes. Future studies could include beliefs and attitudes about stress reduction techniques to measure their roles in increasing or decreasing the benefits of PMR on stress. Also, Smith (2005) claimed that PMR deploys and develops two access skills, the exercises of *tense up-let go* and that of *sustained simple focus*, both of which mediate the benefits of PMR on stress. He claimed that more training in PMR should lead to greater competency in these skills, presumably leading to better outcomes (Smith, 1999, 2001, 2005). In the current study, these skills were not measured, so it is unknown whether the improvement in stress was associated with the development of these skills. Thus, further studies are needed to investigate the mediating roles of competency in these PMR skills on stress and health outcomes using appropriate measurement tools.

The current study has indicated that APMR was effective overall in reducing stress among nursing students. Because stress has been found to negatively affect academic achievement, critical thinking, and problem solving abilities (Peterson et al, 2008), future studies should also examine the effects of APMR on these important variables in addition to stress reduction.

Also, participants' awareness of their participation may have affected their attitude in either the experimental or control group, potentially contaminating the results. Thus, blinded experimental studies should be considered in the future.

Nursing Implications

Jordanian nursing students taking their first clinical training course tend to experience tremendous stress due to their multi-faceted responsibilities, and stress among those who report underserved psychological and mental health needs can have a negative impact on all aspects of

their lives (Hamdan-Mansour, Pusak, & Bandak, 2009). Stress in nursing students can be directly or indirectly related to physical ailments, depression, and suicide (Ross, Boonyanuk, & Stopper, 2014; Ross, et al., 2005; Sheu, Lin, Hwang, 2002). Stress can also have deteriorating effects on nursing students' academic performance by impeding their memory, concentration, critical thinking and problem solving skills, thus affecting negatively their ability to perform their clinical nursing duties at optimum levels and, in turn, the quality of their patient care (Chan, So, & Fong, 2009; Deary, Waston, & Hogston, 2003; Evans & Kelly, 2004; Peterson et al, 2008; Sheu, Lin, Hwang, 2002).

Research clearly shows that Jordanian undergraduate nursing students identify their initial clinical training as the most stress-provoking component of their nursing education (Shaban, Khater, & Akhu-Zaheya, 2012; Sheu, Lin, Hwang, 200). Therefore, a significant concern for this time point on the part of clinical nursing faculty should be the potentially devastating effects of stress on students' future learning and academic performance. Although some stress can act as a motivator improving student's academic and clinical performance, high levels of stress can be debilitating, jeopardizing students' success in the nursing program. For example, students who consistently experience stress during clinical training may display poor critical thinking and problem solving abilities, resulting in unsatisfactory clinical grades and increased dropout rate (Peterson et al, 2008).

Nursing faculty and administrators should be proactive in addressing students' stress in the clinical and academic learning environment. Nursing students are the future of the nursing profession. If nursing faculty do not take reasonable and realistic steps to help students manage the overwhelming demands of a nursing education, the nursing profession could fail to thrive (Shipton, 2002). With the nursing profession facing continuing pressures to recruit and retain

nursing students, nursing faculty and administrators should assume more responsibility to help students be more aware of self-care modalities, in part by teaching them evidence based stress-reduction techniques. These techniques can contribute to the reduction of students' stress, thus increasing the overall health, learning outcomes, success, and improved retention of students (Chan, So, & Fong, 2009; Deary, Waston, & Hogston, 2003; Evans & Kelly, 2004; Peterson et al, 2008; Sheu, Lin, Hwang, 2002).

The current study's findings indicate that APMR is generally effective in reducing stress among Jordanian nursing students taking their first clinical training course. The positive results of APMR shown by this study offer nursing educators in Jordan a promising tool to teach nursing students APMR as a way to decrease their stress while they begin their clinical training. APMR is a simple stress-reduction technique that can be taught to students within thirty minutes. However, there is currently no mandated stress management program for nursing students in Jordan through which APMR can be taught and applied. Thus, developing and incorporating APMR training into Jordanian nursing curricula can be beneficial to improve the psychological, physical, and social health of Jordanian nursing students. Such programs can help students to be more aware of how the body works and how the body and mind are linked, ultimately providing them with a more comprehensive and participatory understanding of their patients. Further potential benefits of such programs include increased student retention rates and decreased attrition. Later, nursing students may well teach APMR as a stress reduction method to their patients as a complimentary or alternative technique of psychopharmacology.

Conclusions

APMR is a simple, safe, and inexpensive stress-reduction technique that has been demonstrated to be effective in reducing stress among several populations. The current study's

results generally support the use of APMR as a coping tool for second-year Jordanian undergraduate nursing students to manage stress, as evidenced by students' decreased self-reports of stress, DBP, SBP, and HR at the end of intervention. That FST measures did not improve may potentially be attributed to the small sample size and abbreviated version of PMR in the study.

Overall, the study's findings add new knowledge to the stress/coping field that can be used to guide nursing practice, education, and health care policies in Jordan, and potentially in other Arab countries. Further studies are needed to investigate the effects of APMR on health and educational outcomes using larger sample sizes, longer PMR training, and multiple settings and populations. Additionally, further studies should compare different stress-reduction techniques to learn more about how these techniques can combine to affect stress and health differently.

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Appendix A: Informed Consent to Participate in a Research Study (English Version)

Study Title: Effects of Abbreviated Progressive Muscle Relaxation on Stress in Jordanian Nursing Students

Principal Investigator: Ratchneewan Ross
Co-Investigator: Hossam Alhawatmeh (Will conduct the study)

You are being invited to participate in this study. This consent form will provide you with information on the research project, what you will need to do, and the associated risks and benefits of the research. Your participation is voluntary. Please read this form carefully. It is important that you ask questions and fully understand the research in order to make an informed decision. You will receive a copy of this document to take with you.

Purpose:

The purpose of this study is to examine the effects of a stress-reduction strategy, abbreviated progressive muscle relaxation (APMR), on subjective reports of stress, blood pressure, heart rate, and finger skin temperature in Jordanian second-year undergraduate nursing students.

Procedures:

You are being invited to participate in the study because you are second -year undergraduate nursing students taking your first clinical rotation and studying at Jordan University of Science and Technology. If you have any muscle injury, practice any stress-reduction technique, or take certain medications such as anxiolytic, sedative, antidepressant, or anti-hypertensive drugs, you may not be eligible. If you are eligible and agree to take part, you will be asked to sign this consent form.

At the first session (week 1), you will fill in a 15-minute questionnaire asking about demographic data, smoking behavior, coping behavior, and subjective reports of stress, followed by two measurements of your blood pressure, heart rate, and finger skin temperature. The total expected time of taking the subjective and objective measurements in the first session is about 20 minutes for each participant. Based on the baseline measurements of subjective reports of stress (main outcome variable), you will be randomly assigned to either the control or experimental group using a stratified random assignment (matching participants with similar stress scores and randomly assigned them into either group using a coin flip).

Experimental participants will receive five consecutive weekly group–based sessions of abbreviated progressive muscle relaxation (APMR), while the control group will be shown three 30-minute documentary videos (at baseline, week 2, and week 5). The APMR involves a tense-let go exercise of 11 muscle groups including hand, arm, arm and sides, back, shoulder, face,

front of neck, stomach, chest, leg, and foot. This tense-let go exercise is performed twice for each muscle group. The tensing up phase for each muscle group should last for 5 to 10 seconds and the letting go phase for 20-30 seconds. Simultaneously, the subjects will be asked to pay attention to the sensations of muscle tension and relaxation. After the tense-let go exercise, subjects are asked to systematically scan the muscle groups to notice and let go any remaining muscle tension. The entire exercise should take around 30 minutes, not counting instructions and times of measurement. In the first session of relaxation training, I (co-investigator) will present to subjects in the experimental group the rationale and procedures of APMR including a demonstration of how the tense-let go exercise for each muscle group is performed. So the first session will be longer than the subsequent sessions by 30 minutes for the experimental group. Subsequently, the actual relaxation training begins. Before each intervention session, I will briefly demonstrate to the subjects in the experimental group how the intervention is performed. I will teach APMR to the subjects in the experimental group in a private, quiet, comfortable, and spacious room at the university. Each APMR session will be performed at the end of a weekday because lectures and school assignments during the day could affect your attention during the intervention sessions and, in turn, potentially affect the quality of APMR practice. The subjects in the experimental group will be asked not to share any information related to the study with subjects in the control group so that the true effects of APMR can be examined. I will lead APMR in all sessions. I am an experienced APMR practitioner who received a 4-day APMR training at the Psychology Department, Kent State University three years ago. Since then, I have been practicing APMR daily.

The students in the control group will be shown 30- minute documentary videos as a group in a different room at the university, concurrent with the first, second, and fifth sessions of the APMR.

At week 2 and 5 and after the both groups finish the assigned experimental conditions, they will be asked again to fill in a 5-minute questionnaire focusing on subjective report of stress, followed by two measurements of blood pressure, heart rate, and finger skin temperature. However, an open-ended question asking “what was your experience of practicing the abbreviated APMR?” will be added to the questionnaire packet in week 5. The expected time of completing the subjective and objective measurements at week 2 is about 10 minutes and at week 5 is about 15 minutes for each participant. The total estimated time of participation in the study is sex hours for participants in the experimental group and three hours for participants in the control group.

Benefits

Findings from this study will help nursing faculty to understand and establish stress reduction strategies for nursing students and potentially other students at JUST and elsewhere.

Risks and Discomforts

You will spend about three or six hours of your time to participate in the study which may detract you from your school work. Also, you may experience slight discomfort during blood pressure and heart rate measurements. However, you can ask me to stop the procedures anytime.

Privacy and Confidentiality

All meetings and data collection sessions will be conducted in a JUST private room. Identifiable data (your name) will be used to match your data over time and will not be used in research findings. You will be assigned a specific number. A separate sheet with your name and number will be created and saved on a password protected laptop computer accessible only by me. This sheet will be deleted from the computer after completion of data collection. Research findings will be presented in an aggregate manner. No one will be able to identify you

Compensation

You will receive four and a half Jordanian Dinars (JDs) if you participate fully in this study. The payments will be provided in three periods (1 JD at baseline, 1.5 JDs in week 2, and 2 JDs in week 5). If I find that you have abnormal blood pressure or heart rate, I can refer you to the University Health Center for further evaluation and treatment. You or your medical insurance will be billed for this service.

Voluntary Participation

Taking part in this research study is entirely up to you. You may choose not to participate or you may discontinue your participation at any time. Your decision to refuse to participate in the study or discontinue your participation will not affect your academic achievements and benefits to which you are otherwise entitled. You will be informed of any new, relevant information that may affect your health, welfare, or willingness to continue your study participation.

Contact Information

If you have any questions or concerns about this research, you may contact me *Hossam Alhawatmeh* at *(+96227201000*) or the principal Investigator Dr. *Ratchneewan Ross* at *(+1* 330-672-8785). This project has been approved by the Kent State University Institutional Review Board (KSU IRB) and the Jordan University of Science and Technology Institutional Review Board (KSU IRB). If you have any questions about your rights as a research participant or have complaints about the research, you may call the KSU IRB at +13306722704 or the JUST IRB at +962 2 720060.

Consent Statement and Signature

I have read this consent form and have had the opportunity to have my questions answered to my satisfaction. I voluntarily agree to participate in this study. I understand that a copy of this consent will be provided to me for future reference.

_____	_____	_____
Participant Name Printed	**Participant Signature**	**Date**

_____	_____	_____
Person Obtaining Consent Name Printed	**Person Obtaining Consent Signature**	**Date**

Appendix B: Informed Consent to Participate in a Research Study (Arabic Version)

عنوان الدراسة: آثار استرخاء العضلات التدريجي على التوتر الذي يعاني منه طلاب التمريض الأردني.

الباحث الرئيسي: راتشينوان روس.
الباحث المساعد: حسام الحواطمه.

آنت مدعو للمشاركه في هذه الدراسة. هذا نموذج موافقة يوفر لك معلومات عن البحث، و ما تحتاج القيام به، والمخاطر والفوائد المرتبطة بالبحث. مشاركتكم طوعية. يرجى قراءة هذا النموذج بعناية. من المهم أن تسأل الأسئلة وتفهم البحث كاملاً من أجل
اتخاذ قرار صحيح. سوف تحصل على نسخة من هذه الوثيقة و تأخذها معك.

الهدف من هذه الدراسة

الهدف من هذه الدراسة هو دراسة تأثيرات "استراتيجية استرخاء العضلات التدريجي" على الآعراض الموضوعية للتوتر، و ضغط الدم، و معدل ضربات القلب، ودرجة حرارة الجلد لدى طلاب بكالوريوس التمريض الأردني-_ السنة الثانية.

الإجراءات

يتم دعوتك للمشاركة في هذه الدراسة لأنك طالب بكالوريوس تمريض سنة ثانية في جامعة العلوم والتكنولوجيا الأردنيه و تأخذ مساق سريري. إذا كان لديك أي اصابة في العضلات، أو تمارس أي تقنية للحد من التوتر، أو تاخذ بعض الأدوية مثل مزيل القلق، أو مهدئ،أو مضاد اكتئاب، أوالأدوية المضادة لارتفاع ضغط الدم، قد لا تكون مؤهل للاشتراك في هذه الدراسة. إذا كنت مؤهلا و وافقت على المشاركة في الدراسة سوف تحتاج لتوقع على نموذج الموافقة هذا.

في الجلسه الأولى (الأسبوع ١)، سوف يطلب منك ملء استبيان مدته ١٥ دقيقة. هذا الاستبيان يسأل عن البيانات الديموغرافية، سلوك التدخين، سلوك التكيف، الآعراض الموضوعية للتوتر. بعد ذلك سوف يتم اخذ قياسين من ضغط الدم، و معدل ضربات القلب، و درجة حرارة الجلد. نتوقع أن يستغرق ملء الاستبيان و أخذ القياسات في الجلسه الأولى حوالي ٢٠ دقيقه لكل مشارك.استنادا إلى قياسات الآعراض الموضوعية للتوتر (المتغيرالرئيسي)، سوف يوزع المشاركين الى مجموعتين بطريقه عشوائيه. مجموعة سوف تتلقى خمس جلسات أسبوعية من استراتيجية استرخاء العضلات التدريجي (المجموعة التجريبية) والأخرى سوف تشاهد فلم و ثائقي لمدة ٣٠ دقيقة (مجموعة المقارنة) في الاسابيع التاليه من الدراسة: الإسبوع ١، و الإسبوع ٢، و الإسبوع ٥. استراتيجية استرخاء العضلات التدريجي تتالف من شد و ارخاء ١١ مجموعة من العضلات بما في ذلك اليد، و الذراع، و الذراع والجانبين، والظهر، والكتف، والوجه، والجبهة، والعنق، والبطن، والصدر، والساق، والقدم. يتم تنفيذ هذه العملية مرتين لكل مجموعة من العضلات. مرحلة شد مجموعة العضلات يجب أن تستمر لمدة ٥ إلى ١٠ ثوان و مرحلة الارخاء من ٢٠ إلى ٣٠ ثانية. في هذه الاثناء، سيطلب منك التركيز على شد و ا سترخاء العضلات. بعد ذلك، سيطلب منك تأدية فحص شامل لمجموعات العضلات كلها لاكتشاف أي شد متبقي للتخلص منه. ينبغي أن تأخذ العملية برمتها حوالي ٣٠ دقيقه غيرالوقت المخصص للتعليمات و قياس المتغيرات.

في الجلسه الأولى من استراتيجية استرخاء العضلات التدريجي، أنا (المدرب) سوف آشرح الطريقه للمشاركين مع التطبيق قبل بدأ التمرين الفعلي. لذلك الجلسة الأولى ستكون أطول من الجلسات اللاحقة. قبل كل جلسة، سوف آري ا لمشاركين في المجموعة التجريبية لفترة وجيزة كيف يتم تنفيذ استراتيجية استرخاء العضلات التدريجي. سوف يتم ممارسه استراتيجية استرخاء العضلات التدريجي وعرض الفيديوالوثائقي لمجموعة المقارنة في غرف مغلقة، وهادئة، و مريحة في الجامعة. سوف يتم تنفيذ كل الجلسات في نهاية أيام الدوام لان المحاضرات والواجبات المدرسية خلال اليوم يمكن أن تؤثرعلى انتباه المشاركين في المجموعة التجريبية خلال الجلسات وعلى نوعية الممارسة. سيطلب من المشاركين في المجموعة التجريبية عدم

مشاركة أي معلومات تتعلق بالدراسة مع المشاركين في مجموعة المقارنة. أنا سوف أشرف على جميع الجلسات. أنا تلقيت تدريب لمده ٤ أيام على أستراتيجية استرخاء العضلات التدريجي في قسم علم النفس في جامعة كينت الحكوميه قبل ٣ سنوات. ومنذ ذلك الحين، أنا أمارس استراتيجية استرخاء العضلات التدريجي يوميا.

في نهايه الجلستين ٢ و ٥، سوف يطلب من المشاركين مرة أخرى ملء أستبيان يسال عن أعراض التوتر، تليها قياسين من ضغط الدم، ومعدل ضربات القلب، و درجة حرارة الجلد. في الأسبوع ٥، ستتم إضافة سؤال مفتوح إلى الاستبيان يسأل "ماذا كانت تجربتك من ممارسة استراتيجية استرخاء العضلات التدريجي ؟". الوقت المتوقع لاستكمال الاستبيان و القياسات في الأسبوع ٢ حوالي ١٠ دقائق وفي الأسبوع ٥

حوالي ١٥ دقيقه لكل مشارك. الوقت الإجمالي المقدر للمشاركة في هذه الدراسة هو ٦ ساعات للمشاركين في المجموعة التجريبية وثلاث ساعات للمشاركين في مجموعةالمقارنة.

فوائد

نتائج هذه الدراسة تساعد كلية التمريض في فهم و تآسيس استراتيجيات للحد من التوتر الذي يعاني منه طلاب التمريض وطلبة آخرين في جامعة العلوم والتكنولوجيا الأردنيه وجامعات أخرى.

المخاطر والمضايقات

سوف تنفق حوالي ٣ أو ٦ ساعات من وقتك للمشاركة في الدراسة التي يمكن أن تاثر على وقت دراستك. أيضا، قد تعاني من آلم طفيف خلال قياس ضغط الدم ومعدل ضربات القلب. ومع ذلك، يمكنك أن تطلب مني وقف قياس ضغط الدم و معدل ضربات القلب في أي وقت.

الخصوصية والسرية

ستجرى جميع الجلسات و قياس متغيرات الدراسة في غرف خاصة و مغلقه وسيتم استخدام البيانات التعريفية (اسمك) لمطابقة البيانات الخاصة بك ومع ذلك لن يتم استخدامها في نتائج البحث. سوف يتم تخصيص رقم محدد لك لاستخدامه بدل اسمك. سيتم إنشاء قائمة تحتوي آسماء المشاركين مع الارقام المخصصه لكم و سوف يتم حفظها على جهاز كمبيوتر محمي بكلمة سر ولا يمكن لآحد مشاهدتها غيري. سيتم حذف هذه القائمة من جهاز الكمبيوتر بعد الانتهاء من الدراسة. سوف يتم عرض نتائج البحث بحيث لا أحد يكون قادرعلى التعرف على المشاركين.

تعويض

سوف تتلقى أربع دنانير ونصف بدل المشاركة في هذه الدراسة. سيتم دفع المبلغ على ثلاث دفعات (١ دينار في الأسبوع ١، و دينار و نصف في الأسبوع ٢، و دينارين في الأسبوع ٥ من الدراسة). إذا اكتشفت أنك تعاني من ضغط دم أو معدل ضربات قلب غير طبيعي خلال الدراسة، يمكنني أن أحيلكم إلى المركز الصحي بالجامعة لمزيد من التقييم والعلاج. أنت أو التأمين الطبي الخاص بك سيدفع بدل هذه الخدمة.

المشاركة الطوعية

المشاركة في هذه الدراسة أو وقف المشاركة فيها متروك لك. قرارك في رفض المشاركة في الدراسة أو وقف المشاركة فيها لن يؤثر على تحصيلك الأكاديمي. سيتم إعلامك عن أي معلومات جديدة قد تؤثر على صحتك أو الرغبة في مواصلة المشاركة في هذه الدراسة.

معلومات الاتصال

إذا كان لديك أي أسئلة أو استفسارات حول هذا البحث، يمكنك الاتصال بي انا حسام الحواطمه على الرقم التالي (٠٠٩٦٢٢٧٢٠١٠٠٠) أو الباحث الرئيسي الدكتوره راتشينوان روس على الرقم التالي (٠٠١٨٧٨٥٦٧٢٣٣٠). قد تمت

الموافقة على هذا البحث من قبل لجنة آخلاق البحث في جامعة كينت الحكومية و جامعة العلوم والتكنولوجيا الأردنية. إذا كان لديك أي أسئلة حول حقوقك كمشارك في البحث أو لديك شكاوي حول البحث، يمكنك الاتصال بلجنة اخلاق البحث في جامعة ولاية كينت على الرقم التالي (٠٠١٣٣٠٦٧٢٢٧٠٤) أوجامعة العلوم والتكنولوجيا الأردنيه علي الرقم التالي (٠٠٩٦٢٧٢٠٠٦٠٢).

بيان موافقة والتوقيع

لقد قرأت هذا النموذج وأتيحت لي الفرصة لتجاب كل أسئلتي. أنا أوافق طوعا للمشاركة في هذه الدراسة. أنا أفهم أن نسخة من هذه الموافقة ستقدم لي للرجوع إليها في المستقبل.

اسم المشارك في البحث	التوقيع	التاريخ
اسم الشخص الذي حصل على الموافقة	التوقيع	التاريخ

Appendix C: Self-reporting Questionnaire (English Version)

ID: _____

Part 1: Demographic variables

Instruction. Please fill in blanket or check one answer for each question

1. What is your gender?

   ☐ Male ☐ Female

2. What is your age? _____

3. What is your marital status?

   ☐ Married ☐ Single ☐ Engaged to be married

   ☐ Divorced ☐ Widowed

   ☐ other, please specify _____

4. What is your religion?

   ☐ Christian ☐ Hindu ☐ Jewish ☐ Muslim

   ☐ Sikh ☐ Buddhist ☐ No religion

   ☐ other, please specify _____

5. Do you smoke cigarettes?

   ☐ Yes ☐ No

6. What is your nationality?

   ☐ Jordanian ☐ Saudi ☐ Palestinian

   ☐ Israeli ☐ Iraqi

   ☐ other, please specify _____

7. Are you currently employed?

   ☐ Yes ☐ No

Part 2: Coping Behaviors Inventory

Here is a list of ways that some nursing students use to deal with stressful situations. Please read each statement, and then check how often you use these ways using this key.

0 = Not at all; 1 = Rarely; 2 = Sometimes; 3 = Most of the time; 4 = Always

Item #	Item	0	1	2	3	4
1.	To avoid difficulties during clinical practice					
2.	To adopt different strategies to solve problems					
3.	To keep an optimistic and positive attitude in dealing with everything in life					
4.	To avoid teachers					
5.	To set up objectives to solve problems					
6.	To see things objectively					
7.	To quarrel with others and lose temper					
8.	To have large meals and sleep for long time					
9.	To have confidence in overcoming difficulties					
10.	To expect miracles so one does not have to face difficulties					
11.	To find the meaning of stressful incidents					
12.	To save time for sleep and maintain good health to face stress					
13.	To expect others to solve the problem					
14.	To have confidence in performing as senior schoolmates					
15.	To make plans, list priorities, and solve stressful events					
16.	To employ past experience to solve problems					
17.	To attribute to fate					
18.	To cry, to feel moody, sad and helpless					
19.	To relax via TV, movies, a shower, or physical exercises (ball playing, Jogging)					

Part 3. Smith Stress Symptoms Inventory

To what extent do the following statements fit how you feel right now at the present moment? Please check all the items using this key.

1 = Doesn't fit me at all; 2 = Fits me a little; 3 = Fits me moderately well; 4 = Fits me very well.

Item #	Item Name	1	2	3	4
1.	I have a nervous stomach				
2.	I am easily distracted				

3.	I feel like I am losing my memory and forgetting things				
4.	I feel like I am losing sleep				
5.	I worry too much about things that do not really matter				
6.	My breathing is hurried, shallow, or uneven				
7.	I have conflicts with others				
8.	I find myself thinking in narrow, rigid ways				
9.	My heart is beating fast, hard, or irregularly				
10.	I have difficulty controlling negative thoughts				
11.	I feel distressed (discouraged or sad)				
12.	I have lost my appetite				
13.	I am depressed				
14.	I am anxious				
15.	I feel distaste or disgust				
16.	I feel cynical or hostile				
17.	My shoulders, neck, or back are tense				
18.	I have difficulty keeping troublesome thoughts out of mind.				
19.	I feel confused				
20.	My muscles feel tight, tense, or clenched up (furrowed brow, tightened fist, clenched jaws)				
21.	I feel less sensitive or caring to others				
22.	I feel fatigued				
23.	I have a backache				
24.	I feel like I am losing my concentration				
25.	I am afraid				
26.	My mouth feels dry				
27.	I feel like I might make mistakes				
28.	I perspire or feel too warm				
29.	I feel disorganized				
30.	I feel the need to go to the rest room unnecessarily				
31.	I find myself thinking unimportant, bothersome thoughts				
32.	I have a headache				
33.	I feel less cooperative with others				
34.	I feel restless and fidgety				
35.	I feel irritated or angry				

Part 4. Experience of practicing APMR

1. What was your experience of practicing the abbreviated progressive muscle relaxation in this study?

Appendix D: Self-reporting Questionnaire (Arabic Version)

الجزء الأول: الصفات الديموغرافية أو الإجتماعية

الجزء الأول من الإستبيان يتضمن ٩ أسئلة حول الصفات الديموغرافية أو الإجتماعية المتعلقة بك. الرجاء فحص كل سؤال بدقة و من ثمّ الإجابة عليه بوضع χ داخل المربع (☐) الذي يسبق الإجابة.

١. ما هو جنسك؟
☐ ذكر ☐ أنثى

٢. كم عمرك _____

٣.ما هي حالتك الزوجية؟
☐ متزوج / متزوجة ☐ أعزب/ عزباء ☐ خاطب / مخطوبة
☐ مطلّق / مطلّقة ☐ أرمل / أرملة
☐ أخرى، يرجى التحديد _____

٤. ما هي ديانتك؟
☐ الإسلام ☐ المسيحية ☐ الهندوسية ☐ اليهودية
☐ السيخ ☐ البوذية ☐ لا دين
☐ أخرى، يرجى التحديد _____

٥. هل تدخن السجائر؟
☐ نعم ☐ لا

٦.ما هي جنسيتك؟
☐ الأردنية ☐ السعودية ☐ الفلسطينية ☐ الإسرائيلية ☐ العراقي
☐ أخرى، يرجى التحديد_____

٧. ما هي السنة الأكاديمية الملتحق فيها الان؟
☐ العام الدراسي الأول ☐ العام الدراسي الثاني ☐ العام الدراسي الثالث ☐ العام الدراسي الرابع

٨.هل تعمل حاليا؟
☐ نعم ☐ لا

٩. هل لديك الرغبة بالعمل في مهنة التمريض؟
☐ نعم ☐ لا

الجزء ٢: مقياس سلوك التكيف

يحتوي هذا المقياس على عبارات تتعلق باستراتيجيات التكيف التي تستخدمها للتعامل مع الضغوط التي قد تعاني منها. الرجاء فحص كل عبارة بدقة، واستخدام المقياس المقابل لها للدلالة إلى الرقم الذي يشير على السلوك الذي ينطبق عليك. ويجدر الإشارة بأنه ليس هناك إجابة صحيحة أو خاطئة، لذلك الرجاء اختيار الإجابة الأفضل التي تصف حالتك. الرجاء اللإجابة على ال١٩ بند.

0 = أبدا أو على الاطلاق 1= نادرا جدا 2 = أحيانا 3 = في معظم الأحيان 4 = دائما

الرقم	العبارة	0 أبدا	1 نادرا جدا	2 أحيانا	3 في معظم الأحيان	4 دائما
1	المحافظة على روح التفاؤل والإيجابية في التعامل مع كل شيء في الحياة					
2	المحافظة على تخصيص وقت مناسب للنوم والمحافظة على صحتي لمواجهة الضغوط					
3	رؤية الأشياء بموضوعية (بعقلانية)					
4	إيجاد معنى للأحداث التي تسبب الضغوط					
5	وضع أهداف تسعى إلى حل المشكلات					
6	استعمال استراتيجيات متنوعة لحل المشكلات					
7	التحلي بالثقة اللازمة لممارسة العمل تماما كالزملاء المتقدمين في الدراسة					
8	محاولة الاسترخاء وذلك بمشاهدة التلفاز أو الاغتسال أو ممارسة الرياضية (كالجري أو لعب الكرة)					
9	تناول وجبات كبيرة والنوم طويلا					
10	البكاء والمزاجية والشعور بالحزن واليأس					
11	استخدام الخبرات السابقة لحل المشكلات.					
12	المشاجرة مع الآخرين وفقدان السيطرة					
13	التخطيط وإدراج الأولويات لحل الأحداث المسببة للضغوطات					
14	توقع حدوث المعجزات لتجنب مواجهة الصعوبات					
15	توقع حل المشكلة من قبل الآخرين					
16	الايمان (الاعتماد) على القدر (المصير)					
17	تعزيز الثقة بالنفس للتغلب على الصعوبات					
18	تجنب الصعوبات خلال التدريب العملي					
19	تجنب المدرسين					

الجزء ٣: مقياس اعراض التوتر

يحتوي هذا المقياس على عبارات تتعلق باعراض التوتر التي تعاني منها. الرجاء فحص كل عبارة بدقة، واستخدام المقياس المقابل لها للدلالة إلى الرقم الذي يشير على كيف تشعر الآن. ويجدر الإشارة بأنه ليس هناك إجابة صحيحة أو خاطئة، لذلك الرجاء اختيار الإجابة الأفضل التي تصف حالتك. الرجاء اللإجابة على ال٣٥ بند.

لا تنطبق علّي على الإطلاق ٢. تنطبق علّي قليلاً ٣. تنطبق علّي بشكل متوسط ٤. تنطبق علّي تماماً ١.

	العباره	١. لا تنطبق علّي على الإطلاق	٢. تنطبق علّي قليلاً	٣. تنطبق علّي بشكل متوسط	٤. تنطبق علّي تماماً
١	لدي معدة متهيّجة				
٢	بسهوله أصبح مشتت				
٣	أفقد ذاكرتي و أنسى الأشياء				
٤	أفتقد للنوم				
٥	أقلق كثيراً حول الأشياء التي في الحقيقة غير مهمة				
٦	تنفسي سريع، ضحل، وغير منتظم				
٧	أملك صراعات مع الآخرين				
٨	أجد نفسي أفكر بطريقة ضيقة و غير متكيفة مع المستجدات				
٩	قلبي ينبض بشكل سريع، قوي، وغير منتظم				
١٠	أملك صعوبة بالسيطره على الأفكار السلبية				
١١	أشعر بالتوتر (حزين و مثبط العزيمة)				
١٢	أنا فاقد للشهية				
١٣	أنا مكتئب				
١٤	أنا قلق				
١٥	أشعر بالنفور أو الإشمئزاز من الطعام				
١٦	أصبحت عيّاب و عدائي				
١٧	أكتافي و رقبتي و ظهري مشدودات				
١٨	أجد صعوبة بالتخلص من الأفكار المزعجة				
١٩	أشعر أنّي مشوش				

٢٠	أشعر أن عضلاتي مشدودة، متشنجة أو مقبوضة (جبين مجعد، قبضة مشدودة، الفك (مطبق بقوة				
٢١	أشعر بأقل حساسية أو إهتمام بالآخرين				
٢٢	أشعر بالإرهاق				
٢٣	لدي ألام بالظهر				
٢٤	أفقد تركيزي				
٢٥	أنا خائف				
٢٦	أشعر بجفاف بالفم				
٢٧	أنا أرتكب أخطاء				
٢٨	أتعرّق و أشعر أني دافئ جداً				
٢٩	أشعر أنّي غير منظَم				
٣٠	أشعر بالحاجة للذهاب إلى الحمام دون داعي				
٣١	أجد نفسي أفكر بأمور غير مهمة و مزعجة				
٣٢	لدي صداع				
٣٣	أشعر أنّي أقل تعاوناً مع الآخرين				
٣٤	أشعر بالإضطراب و التململ				
٣٥	أشعر بالإنزعاج أو الغضب				

"ماذا كانت تجربتك من ممارسة استراتيجية استرخاء العضلات التدريجي?

Appendix E: Omron Blood Pressure/Heart Rate Monitor (BP786) (HEM-7321T-Z)

Brand: OMRON

Model: BP786 (HEM-7321T-Z)

Manufacturer: OMRON HEALTHCARE Co., Ltd

Location: Upper Arm

Method: Oscillometry

Purpose: Clinic Measurement, Self/ Home Measurement

Operation: Fully Automatic

Arm Cuff: Standard Adult: 22.0 cm to 42.0 cm

Other Features: The function to guide cuff wrapping, memory capacity for 100 readings for 2 users, morning/evening average, the indicator for blood pressure level, the function to detect body motion, the function to detect heart rate & irregular heartbeat.

Validation: Met the required standards of the European Society of Hypertension International Protocol revision 2010.

Uses: recommended for clinical and personal use in a general population

References:

1. Ormon Healthcare, Inc. (2015). Retrieved from http://omronhealthcare.com/service-and-support/clinical-validation/
2. Takahashi, H. &Yokoi, T. (2014). Validation of the OMRON M6 Comfort (HEM-7321-E) upper arm blood pressure monitor, in oscillometry mode, for clinic use and self-measurement in a general population, according to the European Society of hypertension International Protocol revision 2010. Dublin: dablEducational Trust.

Appendix F: Finger Skin Temperature Thermometer (SC911)

- LCD display, 3/4" high. Displays temperature to the nearest 0.1. Thermistor wire length - 10 ft.
- Monitors both body temperature and room temperature.
- Temperature reading updates every 2 seconds.
- Displays Fahrenheit or Celsius Temp.
- This temperature device uses a high sensitivity small bead thermal sensor.
- FAST SENSOR - Quickly see how thoughts and feelings change your temperature. Every 2 seconds a new temperature will flash.
- It is often used in research focusing stress management and relaxation.

  Reference: Stress Market.com. Retrieved from: http://www.cliving.org/stressthermometer.htm

Appendix G: APMR Protocol (Smith, 2002)

Study Title: The Effects of Abbreviated Progressive Muscle Relaxation (PMR) on Stress in Jordanian Nursing Students
Intervention: Abbreviated PMR
Trainer: Hossam Alhawatmeh
Time of intervention: After clinical Training Day at the end of the spring, 2016 semester
Duration of intervention: 30-minute session without counting instructions and measurements.
Frequency of intervention: Two sessions a week for three week
Setting: College of Nursing at Jordan University of Science and Technology.

Number	Item	Yes	No	N/A
Preparation				
1.	Check If any participant has any injuries, or a history of physical problems that may cause muscle pain.			
2.	Minimize the distraction to your five senses. Such as using soft lighting and adjusting room temperature.			
3.	Use comfortable chairs			
4.	Trainer and participants wear loose clothing and take off shoes			
Instructions (Co-investigator will provide instructions for participants)				
6.	Explain the rationale of doing PMR in the first session			
7.	Demonstrate the basic idea of tensing up and letting go with the shoulder muscles and perform a full shoulder exercise			
8.	Quickly show the 11 muscle groups to be targeted. Name each muscle while briefly tensing and letting go that group.			
9.	Emphasize the importance of focusing attention on sensations of tense up-let go exercise.			
10.	Instruct participants that you will speak two "tense up" followed by four “let go" phrases. This will result in a properly timed sequence, 5 or so seconds for the "tense up" phase and at least 20-30, and no more seconds for the "let go" phase. In the "let go" phase, a 3 - to 5- second pause should precede each statement. Also, It is equally important to introduce a longer pause between each complete 2-4 segment.			
11.	Instructs participants that after presenting a "tense-let go" cycle twice, and before moving on to the next muscle group, they will be asked whether they are relaxed (by gently shaking head "yes or no," If not relaxed, the exercise up to three more times will be repeated.			
12.	Makes sure that participants are seated upright in a comfortable position with avoiding crossing legs, placing feet flat on the floor, resting arms easily in the lap and bowing head slightly.			
13.	Instruct participants that they can discontinue the intervention at any time.			

Progressive Muscle Relaxation scripts				
	In this exercise, we are going to relax by gently squeezing a letting go of various muscle groups with focusing on sensation tense-let go exercise.			
Hand				
	Let's begin by focusing on the right hand.			
13.	Let the tension grow			
14.	And let go. Release the tension.			
15.	Let your muscles begin to go limp. Let the tension begin to flow out As your hand sinks into relaxation			
16.	[REPEAT ONCE FOR RIGHT HAND AND TWICE FOR LEFT HAND]			
Arm				
17.	This time, focus on your right arm.			
18.	Squeeze your lower and upper arm together			
19.	Touching your wrist to your shoulder. Do this now. Press tighter and tighter.			
20.	Notice the feelings of tension.			
21.	And let go. Let the tension go.			
22.	Let the rest of your body remain relaxed. Tighten up the muscles.			
23.	The tension melts away. Let the muscles become more deeply relaxed.			
24.	[REPEAT ONCE FOR RIGHT ARM AND TWICE FOR LEFT ARM]			
Arm and side				
25.	This time, rest your hands in your lap			
26.	Focus your attention on your arm and side and press them together, now.			
27.	Tighten up the muscles. Let the tension grow.			
28.	And let go. Let the muscles go completely limp			
29.	Let tension flow away. Let yourself relax.			
30.	[REPEAT ONCE FOR RIGHT ARM AND SIDE AND TWICE FOR LEFT ARM SIDE]			
Back				
31.	This time focus your attention on the back muscles that are below the shoulders			
32.	Tense up your lower back, now.			
33.	Let the tension build. Let the muscles get nice and hard			
34.	And let go. Let the tension go.			
35.	Feelings of tightness melt and flow away.			
36.	Let yourself feel more relaxed. Let feelings of tightness go			
37.	[REPEAT FOR BACK]			
Shoulders				
38.	This time, focus on your shoulder muscles.			
39.	Squeeze your shoulders, now. Create a nice good shrug			
40.	Let the feelings of tightness grow			
41.	And let go.			
42.	Let the tension flow out.			
43.	Let your tension begin to unwind. Let the muscles begin to smooth out			
44.	Let the muscles become more deeply relaxed.			
45.	[REPEAT FOR SHOULDERS]			

Back of Neck				
46.	Focus on the muscles in the back of the neck.			
47.	Gently tilt your head back and gently press the back of your head against your neck, now.			
48.	Tighten up the muscles. Squeeze the muscles more and more.			
49.	And let go. Let the muscles become more deeply relaxed.			
50.	Let your entire body become loose and limp			
51.	Let yourself sink deeper and deeper into relaxation			
52.	Far away from the world.			
53.	[REPEAT FOR BACK OF NECK]			
Face				
54.	This time, focus on the muscles of your face			
55.	Squeeze them all together, now.			
56.	Squeeze your jaws, tongue, lips, nose, eyes, eyebrows, and forehead all together			
57.	Squeeze your entire face together.			
58.	Let the feelings of tightness grow.			
59.	And let go.			
60.	Feel calm and relaxed.			
61.	Let the tension smooth out.			
62.	You begin to feel more and calmer.			
63.	As you relax, you feel more at ease.			
64.	REPEAT FOR FACE			
Front of Neck				
65.	Focus on the muscles of the neck.			
66.	Bow your head and gently press your chin down to your chest			
67.	Tighten up the muscles. Let the tension grow.			
68.	And let go. Let tension begin to melt into liquid.			
69.	Let the rest of your body remain relaxed. Let yourself sink deeper and deeper into relaxation			
70.	Like a tight wad of paper, slowly opening up			
71.	[REPEAT FOR FRONT OF NECK]			
Stomach and Chest				
72.	Focus on the muscles of your stomach and chest.			
73.	Tighten them up, now.			
74.	Tense your stomach and chest in whatever way feels best. By pulling your stomach in. . . . Pushing it out. . . . or tightening it up.			
75.	Let the muscles get nice and hard			
76.	And let go. Feelings of tension dissolve			
77.	Let yourself feel more detached.			
78.	Tension begins to melt into liquid			
79.	Far away from the world			
80.	[REPEAT FOR STOMACH AND CHEST]			
Legs				

81.	Focus on the muscles in your right leg.			
82.	Tense the muscles in the leg, now.			
83.	Push your leg against the leg or back of your chair or press your leg tightly against the other leg			
84.	Tighten up the muscles. Let the tension grow			
85.	And let go. Relax. Let yourself feel more at ease.			
86.	Your muscles become heavier and heavier. As you sink deep into relaxation.			
87.	[REPEAT ONCE FOR RIGHT LEG AND TWICE FOR LEFT LEG)			
Feet				
88.	Focus on your right foot.			
89.	Tense up the muscles of the right foot and toes, now			
90.	Curl your toes into the floor while pushing down			
91.	Tighten the muscles. Tense up only the muscles of your right foot.			
92.	And let go. Let the tension flow out.			
93.	And you become more completely relaxed, at ease.			
94.	Completely passive and indifferent. Far away from the world.			
95.	[REPEAT ONCE FOR RIGHT FOOT AND TWICE FOR LEFT]			
Review				
96.	Quietly attend to how you feel			
97.	Your hands and arms			
98.	If you feel any leftover tension, just let go. Go limp			
99.	Your back and shoulders. If you feel any leftover tension, just let go. Go limp.			
100.	Sink deeper and deeper into relaxation.			
101.	Your shoulders and neck. Completely If you feel any leftover tension, just let go. Go limp			
102.	Relax more and more. Far away from the world.			
103.	The muscles of your face. Completely If you feel any leftover tension, just let go. Go limp			
104.	Sink into a state of deep relaxation, indifferent to the world.			
105.	The muscles of your legs and feet. Completely If you feel any leftover tension, just let go. Go completely limp			
106.	Distant and far away. Deep into relaxation. And your entire body			
107.	Is there any of your body where you feel even the slightest bit of tension?			
108.	Just let go. Go completely limp. Sink deeper and doeper, far away into relaxation.			
Ending				
109.	Let go of what you are attending to.			
110.	Open your eyes all the way.			
111.	Take a deep breath and stretch.			
112.	This completes our exercise.			

Appendix H: Tests of Normality

Group Variable		Shapiro-Wilk		
		Statistic	*df*	*p*
group1	SBP1	.926	14	.267
	SPB2	.940	14	.417
	SBP3	.940	14	.418
	DBP1	.939	14	.411
	DBP2	.947	14	.522
	DBP3	.967	14	.829
	HR1	.921	14	.229
	HR2	.914	14	.178
	HR3	.900	14	.114
	FST1	.935	14	.353
	FST2	.947	14	.518
	FST3	.847	14	.020
	COP.	.907	14	.143
	Stress1	.945	14	.487
	Stress2	.840	14	.016
	Stress3	.979	14	.972
group2	SBP1	.961	14	.745
	SPB2	.958	14	.693
	SBP3	.971	14	.884
	DBP1	.922	14	.233
	DBP2	.974	14	.922
	DBP3	.919	14	.214
	HR1	.988	14	.998
	HR2	.971	14	.891
	HR3	.975	14	.933
	FST1	.907	14	.143
	FST2	.960	14	.724
	FST3	.965	14	.802
	COP.	.895	14	.095
	Stress1	.973	14	.917
	Stress2	.978	14	.959
	Stress3	.960	14	.723

*P < .01

Note. Group1= Experimental group, group2= Control group, COP. Self-directed coping behaviors, ST= self-report of stress. 1-3= the three measurement times