

UNIVERSITY OF WISCONSIN – LA CROSSE

Graduate Studies

THE ACUTE EFFECT OF LIFEMOVES™ ON BLOOD PRESSURE, HEART RATE,
RESPIRATORY RATE, AND PERCEIVED STRESS

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Science in Clinical Exercise Physiology

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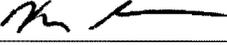
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By: Megan R. Knutson

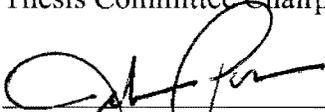
We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree of Master of Science in Clinical Exercise Physiology.

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ABSTRACT

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Chronic stress is a prevalent problem; stress management techniques such as yoga and meditation are advocated to reduce the detrimental effects of stress. LifeMoves™, a novel stress management technique, guides the participant through upper body movements choreographed to meditative music. The objective of this study was to quantify the acute effects of LifeMoves™ participation on psychological and physiological markers of stress. 27 volunteers completed the study. Participation included three, 20-minute practice sessions of LifeMoves™ and chair yoga and three testing sessions. During testing, subjects performed 10 minutes of LifeMoves™, chair yoga, or sitting quietly. Blood pressure, heart rate, and respiratory rate were measured and perceived stress assessed on a VAS prior to and following each testing session. Paired t-tests were conducted to assess the effects of each condition on markers of stress and repeated measures ANOVA to evaluate differences between conditions. Systolic BP, RR, and perceived stress decreased but HR and diastolic BP did not change with treatment. There were no differences in the pre-post changes of any variable among the conditions. This study demonstrates that a brief practice of LifeMoves™, chair yoga, or sitting quietly can acutely lower physiological and psychological measures of stress.

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INTRODUCTION

An employee being pushed by a deadline, a deer running away from a gunshot and a soccer mom running late to get her kids to practice on time share a common physiological state; all are experiencing the fight or flight response. The fight or flight response is the body's reaction to a stressor, with the goal of getting itself out of danger and returned to homeostasis. Hans Selye defined the term stress, "as the wear and tear on the body" in 1926, while he was a medical student at the University of Prague (Everly, 1990). A stressor is anything that poses a threat to psychological or physical well being and can be different for everyone (Benson & Stuart, 1992). When a stressor is perceived, the sympathetic nervous system activates, preparing the body to flee danger or attack an opponent. Heart rate, blood pressure and muscular tension increase in response to the sympathetic stimulation (Ornish, 1990). Up to a point, stress can be beneficial and increase performance, but when felt chronically it can become detrimental to health (Benson & Stuart, 1992). When there is no appropriate way to cope with the stress response, such as running away from danger or fighting, the stress is believed to exert a detrimental effect on health (Everly, 1990).

Health problems associated with stress include: peptic ulcers, ulcerative colitis, irritable bowel syndrome, esophageal reflux, essential hypertension, migraine headaches, Raynaud's Disease, allergies, bronchial asthma, hyperventilation, tension headaches, eczema, acne, psoriasis, alopecia areata (patchy hair loss), suppressed immune function, anxiety disorders and some cases of schizophrenia (Everly, 1990). Stress may cause or

augment disease processes, such as hypertension, atherosclerosis, and coronary artery disease (Esch et al., 2002). The United States Centers for Disease Control 2010 report showed a steady rise in hypertension (defined as average systolic blood pressure over 140 mmHg, an average diastolic pressure over 90 mmHg, or taking hypertensive medication), since the year 1988 through the year 2008 (National Center for Health Statistics 2010). Death rates directly related to hypertension increased 25.2% from 1995 to 2005, resulting in 57,356 American deaths. In 2009, costs directly and indirectly related to hypertension were \$93.4 billion (Aronow et al., 2011). Both the monetary cost of stress and the cost of stress on quality of life in the U.S. are unnecessarily high. There are many ways to cope with the ill effects of stress through various stress management techniques.

Several stress management techniques appropriate for all populations include: meditation, yoga, and tai chi. Meditation, the act of intentionally focusing awareness, has calming effects on the body and mind. One particular meditative practice, the Mindfulness Based Stress Reduction (MBSR) technique, created by Kabat Zinn and colleagues, is used in clinics to alleviate symptoms of illness. Research on MBSR demonstrated the ability of this practice to significantly lower levels of stress and increase self-efficacy and positive states of mind (Chang et al., 2004). Mohan, Sharma, and Ramesh reported reduced sympathetic response measured by galvanic skin response activity following 20 minutes of guided meditation in men with no prior experience in relaxation techniques. The physiological and psychological effects of practicing meditation were found to be opposite of stress (Mohan et al., 2011).

Asana and pranayama are two words not often used in the English language but are vital to the healing effects of a regular yoga practice. Asana means pose and

pranayama means breath. Yoga poses are beneficial to the body by strengthening and stretching muscles while yogic breathing, marked by long exhalations, relaxes the muscles and activates the parasympathetic nervous system (Vallath, 2010). McCaffrey (2005) demonstrated that a regular yoga practice decreased subjects' blood pressure (BP), heart rate (HR), body mass index (BMI), and self-assessment of stress when measured every two weeks at the same time of day throughout the study. Decreases in BP and HR were apparent after two weeks and decreases in BMI and stress scores were apparent after six and eight weeks (McCaffrey et al., 2005).

Chair yoga is a lower intensity form of yoga. By using the chair for assistance, the participant experiences minimal risk in the activity. It has been shown to reduce pain, improve movement, and elicit a sense of well-being in older adults (Park et al., 2011).

Research has also shown Tai Chi, also referred to as Tai Chi Chuan, to be a powerful stress management activity. Tai Chi currently consists of smooth, graceful relaxed movements originating from China's martial arts (Field, 2011). It is a moderate intensity form of exercise that is comparable in intensity to leisurely biking or raking the yard (Ainsworth et al., 2000).

Tsai and colleagues conducted a 12-week Tai Chi experiment to evaluate its effects on blood pressure, lipid profile, and anxiety status. Subjects participated in the Tai Chi exercises 50 minutes per day, three times per week for 12 weeks. Tsai found the Tai Chi group's blood pressure decreased significantly from a mean systolic value of 142.4 to 126.8 mm Hg and a mean diastolic value of 87.4 to 78.6. The control group's mean blood pressure levels increased from 148.2 to 154.6 mm Hg systolic and 86.2 mm Hg to 89.6 mm Hg diastolic. Total cholesterol levels of the Tai Chi group also significantly

decreased from 205.2 to 190.0 mg/dL compared to no change in the control group. The control group reported no change in anxiety, however, both state and trait anxiety lowered in the Tai Chi intervention group (Tsai et al., 2003).

The movements incorporated in LifeMoves™ are similar to the hand gestures practiced in Tai Chi. One intention of both practices is to calm the mind and body through physical movement. The purpose of this study is to investigate if LifeMoves™ can be an effective stress management technique. The program is affordable at \$59.95 per package, time efficient with three segments divided into three to four sub-segments that run approximately two minutes long, and convenient being in the form of a DVD which can be practiced at home or downloaded on the i-tunes application (MeMoves™, 2011). This study investigated the acute effect of participating in LifeMoves™ on blood pressure, heart rate, respiration rate and perceived stress levels.

METHODS

Subjects

Twenty-seven La Crosse, Wisconsin community members participated in the study. Individuals under the age of 50 and those with chronic atrial fibrillation were excluded from the study. Subjects were recruited by word of mouth and by a flyer distributed at the La Crosse Exercise and Health Program on the University of Wisconsin-La Crosse campus by the primary investigator. Following approval from the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects, subjects provided written informed consent prior to participating in the experiment.

Procedures

The 27 subjects were tested within six cohorts of four to five subjects per cohort during the study. All subjects participated in three practice sessions of the LifeMoves™ DVD and chair yoga routines for ten minutes per intervention to become familiar with the movements and avoid confounding the results due to the stress associated in learning a new activity. Cohorts participated in testing for one week on Monday, Wednesday and Friday. Each day tested a different condition: LifeMoves™, chair yoga, or sitting quietly. Order of condition was randomly assigned to each cohort. BP, HR, RR, and perceived stress were assessed after five minutes of sitting upon arrival. Blood pressure and heart rate were measured using Omron 10 Series + Upper Arm Blood Pressure Monitor oscillometric cuffs (Omron Healthcare, Kyoko, Japan). The cuffs were calibrated with a

DigiMano traceable calibrated manometer to ensure accurate readings (Netech, Farmingdale, NY, USA). Cuffs were labeled and each subject was measured with the same cuff at each session. Respiratory rate was measured by the investigator and study volunteers. Respiration rate was measured over the course of 30 seconds, however, subjects were not informed at the time of measurement that respiratory rate was being measured to control for alteration of the breathing rate. Subjects were told that heart rate was being checked for regularity on the radial pulse while the breathing rate was being measured by the recorders. Perceived stress was indicated by subjects on a 10 cm visual analogue scale before and after each intervention. “No Stress” was on one end of the line and “worst stress possible” was on the opposite end of the line. Perceived stress was measured before the other measurements both pre and post conditions so the subjective measurement would not be influenced by the objective measurements. After each activity the entire group had blood pressure, heart rate, respiration rate and perceived stress re-measured. All subjects’ post-test measurements were taken five minutes after the chair yoga and LifeMoves™ conditions and immediately following the ten minutes of sitting quietly. Undergraduate students assisted the researcher in obtaining data.

STATISTICAL METHODS

Repeated Measures ANOVA was performed to screen for significant differences in the three days of pre-test values. Repeated Measures ANOVA was performed to determine if there was a significant difference in the effects of LifeMoves™, chair yoga, or sitting quietly in systolic and diastolic blood pressure, heart rate, respiratory rate and perceived stress. Paired t tests were performed to assess statistical significance of the changes in each variable for each condition. Alpha was set at $p < 0.05$ to achieve statistical significance.

RESULTS

Twenty-seven normotensive and well-controlled hypertensive men (8) and women (19) over the age of 50 completed the study (Table 1). No significant differences were observed among the three interventions for pre-test values of SBP, DBP, HR, RR, or stress (Table 2). There was a significant pre-post reduction in SBP, RR, and stress for the interventions. Although there was a trend toward a decrease in HR ($p=0.091$) and DBP ($p=0.05$), pre-post changes were not significant. No intervention reduced SBP, DBP, HR, RR, or stress to a greater extent than the other interventions. There were no differences between the responses of men and women to the interventions (data stratified by gender not shown).

Table 1: Descriptive Characteristics of the Subject Population

| | Mean | Range |
|--------------------|------------------|-------------|
| Age (years) | 68.1 \pm 12.5 | 50.0 – 86 |
| Height (in) | 65.7 \pm 3.9 | 59.5 – 73.2 |
| Weight (lb) | 176.1 \pm 46.1 | 119.0 – 283 |
| BMI | 28.5 \pm 5.9 | 18.8 – 42.5 |
| SBP (mmHg) | 118.5 \pm 17.5 | 89.0 – 159 |
| DBP (mmHg) | 71.4 \pm 13.3 | 40.0 – 91 |
| HR (beats per/min) | 67.2 \pm 9.1 | 42.0 – 81 |

Table 2. Pre/post measurements for SBP, DBP, HR, RR, and stress (mean \pm SD).

| | <i>LifeMoves™</i> | <i>Chair Yoga</i> | <i>Sitting Quietly</i> |
|-------------------------|-------------------------------|-------------------------------|-------------------------------|
| SBP mmHg | | | |
| Pre | 113.8 \pm 22.6 ^a | 115.1 \pm 16.9 ^a | 114.7 \pm 20.9 ^a |
| Post | 109.2 \pm 19.0 ^a | 110.7 \pm 15.4 ^A | 108.8 \pm 19.1 ^A |
| Change | -4.6 | -4.4 [*] | -5.2 [*] |
| DBP mmHg | | | |
| Pre | 70.2 \pm 11.4 ^b | 70.5 \pm 11.8 ^b | 70.4 \pm 11.5 ^b |
| Post | 68.2 \pm 11.0 ^b | 69.8 \pm 10.2 ^b | 67.6 \pm 12.5 ^b |
| Change | -2.0 | -0.7 | -2.9 |
| HR beats/min | | | |
| Pre | 69.2 \pm 12.8 ^c | 67.7 \pm 12.6 ^c | 67.7 \pm 10.3 ^c |
| Post | 67.6 \pm 12.6 ^c | 68.2 \pm 11.6 ^c | 66.9 \pm 10.0 ^c |
| Change | -1.6 | 0.5 | -0.8 |
| RR breaths/min | | | |
| Pre | 15.9 \pm 4.2 ^d | 16.1 \pm 3.8 ^d | 16.1 \pm 4.7 ^d |
| Post | 15.0 \pm 4.7 ^D | 14.3 \pm 4.3 ^D | 15.0 \pm 3.6 ^D |
| Change | -0.9 | -1.9 [*] | -0.6 |
| Stress cm on VAS | | | |
| Pre | 3.3 \pm 2.5 ^e | 2.9 \pm 2.1 ^e | 2.6 \pm 1.9 ^e |
| Post | 1.4 \pm 1.1 ^E | 0.98 \pm 1. ^E | 1.0 \pm 0.9 ^E |
| Change | -1.9 [*] | -1.9 [*] | -1.1 [*] |

Values with a different superscript letter are significantly different.

* $p < 0.05$

DISCUSSION

The results of this study demonstrated a significant reduction in systolic blood pressure, respiratory rate, and perceived stress following LifeMoves™, chair yoga, and sitting quietly. No significant reduction was found in diastolic blood pressure or heart rate following any of the interventions. No significant difference in reduction of markers of stress was found among the three conditions.

This is the first study conducted to examine the effects of LifeMoves™ on physiological and psychological markers of stress. Research has been conducted on MeMoves™, which is the program from which LifeMoves™ originated. MeMoves™ is a commercially available product designed to increase focus and attention for all ages (Leigh, 2010). MeMoves™ was first introduced in 2010 to improve attention and relieve stress by performing body movements paired with calming music (MeMoves, 2011). Research supports an improvement in behavioral outcomes in children following 12 weeks of performing five minutes of MeMoves™ per day (Leigh, 2010).

The control day of sitting quietly could be compared to the practice of meditation. Subjects sat in a dimly lit room and refrained from speaking for ten minutes. Most subjects chose to close their eyes for the duration of the time. Although the subjects did not receive any instruction on specific meditative techniques, subjects were withdrawn from sources of stimulation and appeared to relax during the time period. The design of the study created an atmosphere of relaxation for subjects which could have further reduced their levels of stress during the testing sessions. The initial week of the study was

comprised of practicing the LifeMoves™ and chair yoga routines so subjects associated the site of the study with feelings of relaxation, which may have influenced the stress response over the course of the second week. Coppola and Spector (2009) studied the relationship between Natural Stress Relief (NSR) meditation and reductions in stress and anxiety. Subjects participated in NSR Meditation for 15 minutes twice a day over the course of four weeks. The 31 participants demonstrated a significant reduction in trait anxiety measured by the State-Trait Anxiety Inventory, and a significant increase in self-actualization measured by the Jones and Crandall Short Index of Self-Actualization (Coppola & Spector 2009).

Chu studied the effects of mindfulness meditation on emotional intelligence (EI), perceived stress, and negative mental health. The meditation group participated in eight, 20-minute sessions over the course of eight weeks. These subjects were instructed to focus on their breath and return their attention to their breath with a non-judgmental attitude if it had wandered during the meditation. The control group did not receive any relaxation training; these subjects were instructed to sit and simply relax their mood and body. The meditation group displayed higher scores in optimism and mood regulation and social skills in post-test measurements measured by way of the Emotional Intelligence Scale. The meditation group also had a statistically significant reduction in perceived stress, measured by the Perceived Stress Scale, anxiety, insomnia, social dysfunction, and decreased depression scores, compared to the control group (Chu, 2009).

Research on a regular yoga practice supports positive outcomes. A reduction in blood pressure and stress was found with an hour of yoga training three times a week for eight weeks. Subjects used yoga training cassettes which guided them through deep

breathing, deep relaxation and yoga postures. The researchers observed a decrease in systolic and diastolic blood pressure and heart rate after two weeks and a reduction in stress scores (measured by the Stress Assessment Questionnaire), after six weeks in the study. Blood pressure and heart rate were measured at the same time of the day and were recorded every two weeks along with stress scores which were measured and recorded pre/post intervention (McCaffrey et al., 2005). A long-term yoga investigation demonstrated an increase in quality of life (WHOQoL-old questionnaire) after two 60-minute yoga classes per week for fourteen weeks (Goncalves et al., 2010). These findings support the current results that yoga can decrease perceived stress.

The current study found an acute decrease in stress after one 10-minute bout of a chair yoga routine. Congruent with this study is Park and colleagues' finding that chair yoga improved subjects' sense of well-being (Park et al., 2011). Park assessed participants' pain, physical limitation, stiffness, physical functions, and emotions before and after an eight-week chair yoga intervention. No measurements were reported for heart rate, blood pressure, and respiratory rate in the publication.

Chair yoga is less active than routines without the chair and therefore does not have the same physiological effect on hemodynamics during and post-exercise, (i.e. change in heart rate and decreased blood pressure) as would a more dynamic practice. This also may explain why no significant change occurred in DBP and HR in the current study. More active yoga training and Tai Chi training may reduce blood pressure and resting heart rates due to a training effect and changes in the cardiovascular system because of the moderate intensity nature of these activities. LifeMoves™ and chair yoga's

potential ability to reduce blood pressure may be related with activation of the parasympathetic nervous system (i.e. turning off the fight or flight response).

The nature of LifeMoves™ is similar to the practice of Tai Chi because both practices incorporate slow, meditative, gestures. Participation in Tai Chi has been shown to significantly reduce physical and psychological markers of stress, similar to the response found with participation with the LifeMoves™ routine.

A 14-week study monitored the effects of Tai Chi on saliva cortisol, blood pressure, heart rate, and perceived mental stress. Subjects participated in 12, 90-minute Tai Chi training sessions led by a certified instructor. Measurements were recorded immediately prior to Tai Chi sessions and after a five minute resting period of sitting post intervention. A significant reduction in saliva cortisol and perceived mental stress was found pre to post session and was still significant during follow-up testing four weeks after the 14-week study. Measurements were recorded by a visual analogue scale with no stress and maximum stress on either end. There was no reduction in blood pressure or heart rate following Tai Chi training (Esch et al., 2007).

In contrast, Tsai and colleagues found a reduction in blood pressure when studying Tai Chi training. Subjects participated in 12 weeks of Tai Chi training, meeting three times a week for 50 minutes per session. The treatment group experienced a significant decrease in both systolic and diastolic blood pressure and a reduction in state and trait anxiety after the 12 week period. Blood pressure was measured after a ten minute rest period before subjects took part in each Tai Chi session and was measured along with heart rate every 15 minutes within the session to ensure participant safety (Tsai et al., 2003).

Limitations of the current study include single trials and the markers of stress were only measured before and one time after each condition. The design of this study does not explain what the long-term effects of practicing a regular LifeMoves™ routine may be in terms of stress reduction. Only acute changes were recorded five minutes after the intervention in this experiment. Each condition could have been assessed multiple times over the course of the study to verify results and physiological markers could have been measured at different times during the day to infer if the reduction in stress had a lasting effect on the subject outside of the testing times. Also, measurement of respiratory rate may be inaccurate due to measurement error. Respiratory rate was assessed by the investigator and student assistants counting the rise and fall of the subject's chest. The records may vary with each measurer and how deeply the subject was breathing.

Future Research

Further research is needed to learn if a regular practice of LifeMoves™ has a sustained effect on markers of stress, and the duration of the effects. The current study required participants to practice stress management techniques in six sessions over the course of two weeks and measured acute markers of stress five minutes prior to and post intervention. Much of the current literature written on stress management techniques is focused on interventions between four and 12 weeks in duration. Future research focused on performing the LifeMoves™ routine regularly for at least four weeks is needed to determine the lasting effects of this activity on objective and subjective markers of stress. Follow-up research could also be focused on subjects diagnosed with hypertension. This study included a heterogeneous sample over the age of 50, including subjects with low blood pressure (i.e. 92/50 mmHg). Reduction of a blood pressure reading that begins low

is not desirable. Some subjects in this study were on blood pressure lowering medications and may have experienced a diminished response. Further research investigating the effects of LifeMoves™ in individuals with borderline hypertension who have opted out of pharmacologic treatment and who therefore may not have a blunted hemodynamic response due to medication would contribute useful information to this area of knowledge.

CONCLUSION

No significant differences in the degree of reduction of stress markers were found between LifeMoves™, chair yoga, and sitting quietly. Each of the three conditions lowered markers of stress and may be used as stress management techniques. This study demonstrates that there are many different ways to lower stress and encourages the healthcare provider to tailor recommendations to the needs and preferences of the client.

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APPENDIX A
INFORMED CONSENT

INFORMED CONSENT

1. Informed consent for "LifeMoves™ effect on Perceived Stress, Blood Pressure, Resting Heart Rate and Respiratory Rate."

2. I _____, give my informed consent to participate in the study designed to test the effects of LifeMoves™ on perceived stress, blood pressure, resting heart rate and respiratory rate at the University of Wisconsin-La Crosse. I understand that LifeMoves™ is a DVD of people of all ages and cultures performing slow hand movements in geometric shapes with meditative music. I have been informed that the study is under the direction of Megan Knutson, a graduate student at the University of Wisconsin - La Crosse in the Exercise and Sport Science Department. I have been informed that John Porcari, Ph.D., who is a professor at the University of Wisconsin - La Crosse in the department of Exercise and Sport Science, will also be helping with the study. I have been informed that the results of this study may be published in scientific literature or presented at professional meetings using grouped data.

3. I have been informed that my participation in the study will require me to do the following:

a. Participate in three practice sessions of LifeMoves™ and chair yoga for approximately 10 minutes per activity per session, for a total of 20 minutes.

b. Participate in three separate 10-minute testing sessions consisting of, sitting quietly (control), a chair yoga class, and the LifeMoves™ routine.

c. Have blood pressure, heart rate, respiratory rate and perceived stress measured and recorded prior to and after each testing session.

4. I have been informed that there is minimal risk associated with this study. I have been informed that the investigator conducting the study is trained in CPR and Advanced Cardiac Life Support.

5. I have been informed that the only direct benefit to me is the possibility of experiencing lowered blood pressure, resting heart rate, respiratory rate, perceived stress and exposure to a new stress management activity.

6. I have been informed that the investigator will answer questions regarding procedures of the experiment throughout the study. I have also been informed that I can withdraw from the study at any time for any reason.

7. If I have any other questions that arise, I may feel free to contact Megan Knutson, the principal investigator, at (715)-222-9414, or her supervisor, John Porcari, at (608)-785-8646. Questions in regard to the protection of human subjects may be addressed to the University of Wisconsin - La Crosse Institutional Review Board for the Protection of Human Subjects at (608) 785-8124.

Subject _____

Date _____

Investigator _____

Date _____

APPENDIX B
HEALTH SCREEN

HEALTH SCREENING QUESTIONNAIRE

“Acute Effects of LifeMoves™ on Blood Pressure, Heart Rate, Respiratory Rate and Perceived Stress”

Please complete your name and age, check Yes or No for each question, and provide additional information where requested. Thank you for your time and participation.

Name: _____ Age: _____ Gender: _____

Height: _____ Weight: _____ Time of session: _____

Blood Pressure: _____ Heart Rate: _____ Respiratory Rate: _____

Cardiac Rehabilitation or Adult Fitness (please circle one)

1. Do you have any chronic health conditions? Yes No

Asthma

High blood pressure

Diabetes

Metabolic disorder

Heart condition (murmur, irregular heartbeat, etc.)

Claustrophobia

Other (please describe): _____

2. Have you had any recent changes in medications, recent health problems or experienced any unusual situations?

Yes No If so, please list: _____

3. Do you currently practice stress management techniques?

Yes No If so, please list: _____

4. Do you consume caffeine (coffee, tea, caffeinated pop, other sources)?

Yes No If so, please describe amount and frequency of each: _____

5. Do you smoke or use other forms of nicotine?

Yes No If so, please describe type, amount, and frequency: _____

6. How many minutes per week do you exercise? _____

APPENDIX C
CHAIR YOGA ROUTINE

Deep Breathing

Inhale through the nose, exhale through the nose. Allow your belly to expand on the inhale and compress back toward your spine on the exhale.

Neck Movements

Move your neck up and down to look up to the sky and down to tuck the chin toward your chest. As if saying 'yes'.

Move your head side to side as if saying 'no'.

Lean your ear toward your shoulder, back and forth from side to side.

Shoulder Rotations

Keep the arms and hands relaxed at your sides as you draw your shoulders in a circular movement forward and backwards.

Seated Chest Opener (cobra)

Sit up tall toward the front of the chair, bring your hands to the back sides of the chair or your low back. Look up and allow your shoulders to roll open and your chest to expand.

Seated Forward Fold

Hinge forward from your hips and hug your thighs as your belly rests on the tops of your thighs. Relax your neck and allow your head to rest between your knees.

Seated Twist

Sit up tall and revolve. Hold onto the back of the chair to twist.

Seated Sun Salute series

Inhale arms over head,

Exhale forward fold,

Inhale hands to thighs, look up and expand chest,

Exhale round the back, tuck the chin into the chest and stretch the shoulder blades apart,

Inhale arms up,

Exhale Namaste hands.

Seated Warrior One Pose

Move to the right side of the seat and extend your right leg behind you. Reach back long through the right leg. Ground down firmly through the left heel. Let your left knee come to a 90-degree angle over the left ankle. Allow your hands to rest lightly on your left knee or extend the right arm over head while keeping the shoulders relaxed. Feel the stretch in the right side of your body along the ribs and the right hip flexor.

Resting

Sit with ease. Allow your breath to be even and fluid. Bring your focus to the breath and feel the warm air pass through your nose and the cool air pass out. Feel calm and centered.

APPENDIX D
VISUAL ANALOGUE SCALE

APPENDIX E
REVIEW OF THE LITERATURE

Components of Health

There are many ways to address health. Exercise is an important component to physical health. Much research over the last 20 years has supported physical activity to benefit the cardiovascular system, cholesterol profile, blood sugar levels, blood pressure, maintenance or loss of weight, sleep habits, and the digestive system. On the other hand, inactivity is associated with obesity, osteoporosis, back pain, inability to cope effectively with stress, increased risk of depression, decreased work productivity, decreased muscle mass, increased body fat, decreased strength and flexibility, decreased sexual performance and decreased mental performance (Benson & Stuart, 1992). Nutrition is another aspect of health. The Dietary Guidelines for Americans were created in the 1980's and are continually revised every five years. The 2010 Dietary Guidelines for Americans contain key recommendations to follow to improve public health. These recommendations include: balancing calories to manage weight, foods and food components to reduce, foods and nutrients to increase, and tips for building a healthy eating pattern to meet needed nutrients over time and to avoid foodborne illnesses. A few foods to limit include: alcohol, refined grains, trans-fats, sugar, dietary cholesterol, saturated fats, and sodium. The Dietary Guidelines recommend Americans: increase consumption of a variety of fruits and vegetables, consume at least half of grains as whole grains, use fat free or low fat dairy products, eat a variety of protein foods low in solid fat, increase seafood consumption, and increase dietary fiber, calcium, and vitamin intake, with an emphasis on vitamin B12 in adults over the age of 50 (Dietary Guidelines for Americans, 2010). Exercise and nutrition are important to living a healthy life, but

they are not the only factors. Often times overlooked, the emotional and mental component of health is also important to good health.

The World Health Organization defines health as, “a state of complete physical, mental and social well-being, not merely the absence of disease” (World Health Organization, 1997). Taken from this viewpoint, it is understood that mental and emotional health are as important to health as physical activity and nutrition and there is an interaction among all these variables inside the body. Mental or physical stress has a physiologic impact on the body; this is explained with the body’s fight or flight response.

The Stress Response

Hans Selye coined the term stress, as the wear and tear in the body in 1926 while he was a medical student at the University of Prague (Everly, 1990). The fight or flight response is the body’s reaction to a stressor with the goal of getting itself out of danger and returned to homeostasis. A stressor is anything that poses a threat to psychological or physical well-being and can be different for everyone (Benson & Stuart, 1992). When a stressor is perceived, the sympathetic nervous system activates, preparing the body to flee danger. Increased heart rate, increased blood pressure, increased breathing rate, and adrenaline secretion are all results of the fight or flight response (Ornish, 1990). Up to a point, stress can be beneficial and increase performance, but when it is chronic it can become detrimental to health (Benson & Stuart, 1992). When there is no appropriate way to cope with the stress response, such as running away from danger, the stress is believed to contribute to increased risk of hypertension, heart attack and stroke (Benson & Allen 1980).

Blood pressure can surge and fluctuate throughout the day in response to stress. When stress is perceived the pituitary gland stimulates the adrenal cortex to produce cortisol. If this reaction occurs excessively it can lead to a number of cardiovascular disease risk factors including: weight gain, increased total serum cholesterol and decreased high density lipoprotein cholesterol, increased platelet count, increased angiotension levels, decreased stimulation threshold level of the brain, retention of fluid and sodium, raised blood pressure, and increased myocardial excitability as a result of the loss of potassium and magnesium (Eliot, 1993).

Approximately 25% of all Americans suffer the harmful effects of an over-abundance of stress in their lives and up to 60-90% of all general medical patients suffer from health problems related to or exacerbated by stress (Esch et al., 2009). These problems include: peptic ulcers, ulcerative colitis, irritable bowel syndrome, esophageal reflux, essential hypertension, migraine headaches, Raynaud's Disease, allergies, bronchial asthma, hyperventilation, tension headaches, eczema, acne, psoriasis, alopecia areata (patchy hair loss), suppressed immune function, anxiety disorders and some cases of schizophrenia (Everly, 1990).

The United States Centers for Disease Control 2010 report showed a steady rise in hypertension (average systolic blood pressure over 140mmHg, an average diastolic pressure over 90mmHg, or taking hypertensive medication), from the year 1988 through the year 2008 (National Center for Health Statistics 2010).

Hypertension is a risk factor for coronary heart disease. 550,000 new cases of heart failure are diagnosed each year and half of those patients die within five years of the onset of the disease. These patients also experience diminished quality of life due to the

symptoms of stress, depression, anxiety, and anger. Inducing the parasympathetic response is necessary for these people to alleviate their symptoms (Pollard 2011).

Stress related health concerns cost the United States \$300 billion per year (Stetz et al., 2009). The monetary cost of stress and the cost of stress on quality of life in the U.S. is unnecessarily high. There are many ways to cope with the ill effects of stress through various stress management techniques.

Stress Management Techniques

A few stress management techniques that are appropriate for all populations include: meditation, yoga, and tai chi. Meditation, intentionally focusing awareness, has calming effects on the body and mind. Mindfulness meditation asks the participant to focus their awareness on the moment to moment experiences with a non-judgmental attitude (Adams, 2011).

The origins of meditation can be traced to many different religions and spiritual practices including Buddhism, Christianity, Hinduism, Islam, and Taoism (Jensen, 2011). Kabat Zinn and colleagues created Mindfulness Based Stress Reduction (MBSR) for use in clinics to alleviate symptoms from various illnesses in their patients. MBSR is without religious or spiritual doctrines, although this technique is based on several Buddhist Principles (Adams, 2011). Science has verified when individuals cultivate compassion and awareness, let go of judgments and focus on the present they can change their relationships with themselves and others. Practiced meditators increase their gamma brainwave activity which results in an increased sensory perception of the world. The increased gamma waves are also associated with decreased stress related to cortisol, reduced cardiovascular disease, asthma, type II diabetes, chronic pain states, insomnia,

anxiety, and phobias. The increase in gamma waves also improved immune system function (Jensen, 2011). Mohan, Sharma, and Ramesh (2011) found reduced sympathetic response with 20 minutes of guided meditation in 32 males with a mean age of 27.3 ± 1.8 years, with no prior experience in relaxation techniques. They found the physiological and psychological effects of practicing meditation to be opposite of stress (Mohan et al., 2011). The National Institute of Health reported meditation to be safe for healthy people. There have been reports that meditation could negatively affect people who have psychiatric problems, however, this has not been fully researched (Jensen, 2011).

Research has also shown Tai Chi, sometimes referred to as Tai Chi Chuan, to be a powerful stress management activity. Tai Chi today consists of smooth, graceful relaxed movements that can be classified as a moderate intensity form of exercise comparable in intensity to sub-maximal treadmill walking (Fields, 2011, Tsai et al., 2003). Different types of Tai Chi include: Yang, Chen, Sun, Wu (Jian Qian) and Wu (He Qin). Each of these forms originated from Chinese martial arts and incorporates relaxation, concentration and movement coordination. They differ in the focus on posture and position of the body's center of gravity (Esch et al., 2007). A study conducted by Esch, Duckstein, Welke, Stefano and Braun offered Tai Chi training led by a certified teacher, one time per week for 90 minutes. Physiological (blood pressure, heart rate and free saliva cortisol) and psychological measures (short form health survey (SF-36)) were recorded. These tools measured quality of life and subjective health status, meaning, quality of life being affected by stress. After 12 sessions were offered over the course of 14 weeks, physiological changes included significant reductions in the saliva cortisol values. Blood pressure and heart rate were unchanged by the Tai Chi intervention.

Psychological changes experienced by the subjects, gathered by the SF-36, were an improvement in general health perception, social functioning, vitality and psychological well-being (Esch et al. 2007).

Tsai and colleagues (2003) conducted a 12-week Tai Chi experiment to evaluate its effects on blood pressure, lipid profile, and anxiety status. Subjects participated in the Tai Chi exercises 50 minutes per session, three times per week for 12 weeks. Tsai found the Tai Chi groups' resting blood pressure lowered significantly from a mean systolic value of 142.4 to 126.8 mm Hg and a mean diastolic value of 87.4 to 78.6. The control groups' mean blood pressure levels increased from 148.2 to 154.6 mm Hg systolic and 86.2 mm Hg to 89.6 mm Hg diastolic (Tsai et al., 2003). The Tai Chi's group also significantly lowered their cholesterol from 205.2 to 190.0 mg dL and recorded lower scores in both state and trait anxiety, whereas the control group showed no improvement in blood lipid profile or anxiety level (Tsai et al., 2003). This activity has a MET level of 4.0 per hour of activity. One MET is equivalent to the resting metabolic rate of 1.0 kcal.Kg. A value of 4.0 METS is considered in the range of moderate intensity physical activity (Ainsworth et al., 2011).

The word yoga means union of the mind with the divine intelligence of the universe. A commonly practiced type of yoga, Hatha Yoga, has three main elements: the body, the mind, and the breath, which relates the body to the mind (Raub, 2002). Yoga poses are beneficial to the body by strengthening muscles while yogic breathing, marked by long exhalations, relaxes the muscles and activates the parasympathetic nervous system (Vallath, 2010).

A study conducted on Hatha Yoga showed that two, 60-minute classes per week improved subjects' flexibility and quality of life within 14 weeks. Flexibility was measured by goniometry on shoulder abduction, horizontal shoulder extension, lumbar spine flexion, hip flexion, hip extension and knee flexion. Quality of life was measured by the WHOQoL-old questionnaire (Goncalves et al., 2010). Asana and pranayama are two words not often used in the English language but they are vital to the healing effects of a regular yoga practice. Asana means pose and pranayama means breath. McCaffrey, Ruknui, Hatthakit, and Kasetsoomboon showed these two components decreased subjects' self-assessment of stress, BP, HR, and BMI and created feelings of peacefulness and calmness (McCaffrey et al., 2005). Decreases in blood pressure and heart rate were apparent after two weeks and decreases in BMI and stress scores were apparent after six and eight weeks (McCaffrey et al., 2005).

Chair yoga is a more gentle form of yoga which uses a chair for assistance and support. A study conducted by Park, McCaffrey, Dunn, and Goodman, looked at chair yoga's influence on managing osteoarthritis. Participants who took part in the chair yoga intervention reported a sense of well being, reduced pain and improved movement. This study noted because chair yoga imposes minimal risk to the participants and does not require an extensive background in the practice to participate, it is a beneficial activity to reduce pain and stiffness in older adults with osteoarthritis (Park et al., 2011).

Meditation, Tai Chi and yoga are all scientifically researched methods to reduce stress. Another noteworthy form of stress reduction is music therapy. This topic is relevant to the study on LifeMoves™ and its effect on stress reduction because

LifeMoves™ consists of slow coordinated, rhythmic hand movements guided by multi-racial individuals with meditative music in the background.

Music has been known to have healing effects as early as 4000 B.C. when priests and frescos played for medicinal reasons. Music has the power to bring the body back to homeostasis and induce relaxation. It has been shown to lower epinephrine and other components of the stress response and increase growth hormone plasma concentration in a group of critically ill patients (Conrad, 2010).

Music therapy is an established health care profession that uses music to help patients with their physical, emotional, cognitive and social needs. A recent study conducted by Pollard researched music therapy in relation to cardiac rehabilitation patients. Within the rehabilitation process, the patient's physical needs are addressed. These patients also have psychosocial needs regarding stress management, depression, anxiety, anger and hostility. Pollard's experiment consisted of six weeks of weekly music therapy sessions instructed by a Board Certified Music Therapist among cardiac rehabilitation patients. The results showed a music therapy support group decreased total mood disturbance and anxious mood while it increased the vigor of adults with coronary heart disease, at least in the short-term (Pollard, 2011).

Summary

Due to the prevalence of stress experienced by Americans today, stress management techniques must be researched and validated. Learning new ways to relieve stress can lead to a lowered disease state prevalence in America. It is important to the body's physical, mental and emotional health state to learn how to manage stress and incorporate relaxation techniques into day-to-day life.

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