Knitting is the new yoga? Comparing techniques; physiological and psychological indicators of the relaxation response.

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ABSTRACT

Herbert Benson (1975) proposed knitting and yoga can elicit the relaxation response based on their shared rhythmic repetitive nature. This theory has been captured by recent publications of the proposition ‘knitting is the new yoga’. The relaxation response repeated measures of decreased heart rate, decreased blood pressure, increased relaxation states and increased semantic relaxation were examined in the conditions of knitting and yoga. Effects of regular participation and skill on relaxation were also examined. 25 knitting and 25 yoga participants completed 2 baseline and 1 post experiment survey and consented to repeated measures of blood pressure and heart rate. It was hypothesized that 15 minutes of knitting or yoga would elicit the measured indicators of the relaxation response and that regularity of participation and skill would affect results. Support was found for the proposition “knitting is the new yoga” along with significant evidence supporting the hypotheses knitting and yoga can elicit the relaxation response.
1. INTRODUCTION

Herbert Benson (1975) in collaboration with Robert Keith Wallace (1970) found that transcendental meditation (TM) practitioners through meditation alone could bring about physiological changes that indicate relaxation. Heart rate (HR), breathing rate, metabolic rate would decrease and blood pressure (BP) would remain low at all times due to regular participation in TM. Herbert Benson labelled these effects the ‘Relaxation Response’ (RR).

Based on Herbert Benson’s (1975, 2000) RR, this research will seek evidence that supports the proposition ‘Knitting is the New Yoga’; using HR, BP, relaxation states and a semantic differential scale to measure relaxation evoked by practising yoga or knitting. Comparisons will be made between the two conditions to determine differences in the elicitation of the RR, differences in the extent to which the RR is subjectively experienced, and differences in the relaxation states experienced. Further investigation will examine the relationship between the regularity of participation in each condition and the effective elicitation of the RR; and the relationship between perceived expertise in each condition and the effective elicitation of the RR. Previous research indicates both Yoga and Knitting have a calming effect based on their rhythmic repetitive nature and their ability to evoke relaxation. (Benson 2000, Corkhill 2008 & 2010, Dittrich 2001, Duffey 2007, Gillespie 2005, Greer 2008, Jones 2012, Murphy 2002, Riley, Von Hecker, Rohrlich 2001, and Stannard 2011). Knitting and Yoga have been found to have health benefits especially in the area of primary and secondary care of hypertension caused by the Stress Response. (Alexander, Langer, Newman, Chandler and Davis 1989, Aivazyan, Zaitser, Salenko, Yoreven and Patrushera
Yoga has been researched in some depth in relation to its ability to elicit relaxation; however it appears little ground has been made on the effectiveness of knitting to elicit relaxation. The aim of this research is to add to the body of existing research and advocate the increasingly popular activity of knitting as a useful and fun health intervention tool.

### 1.1 The Stress Response and the Relaxation Response

Cannon (1932) introduced the stress response fight or flight whereby a threat to an organism produces physiological arousal. The sympathetic nervous system releases hormones, catecholamine, epinephrine and norepinephrine, which cause blood pressure and heart rate to increase (Taylor 2009). Cannon (1932) considered this an evolved survival mechanism preparing the body for attack or fleeing. Previously the fight or flight response was overcome by action that restored psychological changes back to their original state. Today physical action is rarely required in response to stress as sources of stress have shifted from more physical threat to psychological threat. If homeostasis is not achieved following the stress response it may have negative effects on health. Glaser (1991) found stress increased the occurrence of latent herpes virus, Steptoe and Kivimaki (2012) found stress can lead to an increased risk of cardiac events and long term stress can lead to recurrent cardiac events and mortality. Bland, Melton, Welle and Bigham (2012), and Dolbier and Rush (2012) posit long term stress can lead to insomnia, depression, anxiety and illness. Kiecolt – Glaser and Glaser (1988) found medical students who regularly elicited the RR during the examination period showed less immune-suppression than students that did not elicit the RR.
Herbert Benson (1975) said that the body is also innately equipped to induce physiological calm. Benson (1975) further states that the RR naturally counteracts the stress response of fight or flight and that physiological mechanisms and adjustments are elicited when engaged in repetitive activities while ignoring distracting thoughts. Should the stress response be prolonged it may have damaging effects on health. Seyles (1956 – 1976) general adaption theory posits that if the organism remains “mobilised for action” for a prolonged or continually repeated amount of time exhaustion will occur causing physiological damage that leads to disease and illness. Herbert Benson (1975, 2000) argues that the regular elicitation of the RR can relieve the symptoms of stress and benefit health; and suggests the RR response can reverse the effects of the stress response in as little as 3 minutes and if practised regularly can have a lasting effect. Benson (2000) said “the subjective feelings that accompany the relaxation response vary among individuals. Common feelings include a sense of calm and relaxation, refreshment and wellbeing. This current study hopes to illustrate the subjective feelings of relaxation experienced by the elicitation of the RR via knitting and yoga.

1.2 The Relaxation Response and Disease

Along with his collaborates Benson (1975, 2000) identified medical conditions that can be relieved or eliminated with the help of the RR as part of a multifaceted self care programme including: Angina pectoris, cardiac arrhythmias, anxiety, depression, herpes simplex, hypertension, insomnia, pain, and rheumatoid arthritis.
Esch, Fricchione and Stefano (2003) revised research examining the use of RR techniques to treat stress related diseases. They concluded that including RR techniques in stress management programmes and in treatment programmes for stress related diseases produced positive effects. However, they also recommend further research to gain more detailed knowledge. Esch et al (2002) also argue the relaxation response can be a therapeutic tool for the treatment of immunology, cardiovascular, neurodegenerative diseases and some mental disorders. Benson and Stuart (1993) argue that FMRI studies indicate subjects who elicit the relaxation response regularly have a thicker cortex in executive regions of the brain.

Melville, Chang, Colagiuri, Marshall and Cheema (2012) using one group exposed to three conditions Yoga, Meditation and a control measured for 15 minutes in an office environment found both Yoga and Guided Meditation can elicit a RR based on BP and HR measurements taken before, during and after the intervention. Williams and Carey (2003) posits that eliciting the RR can increase energy, decrease fatigue as well as lower stress hormone levels and BP. They describe the RR as “a mentally active process that leaves the body relaxed.” One can be trained to elicit the RR and it becomes more profound with practice. Aivazyan, Zaitser, Salenko, Yorenev and Patrushera (1988) posit that psychological factors have an important role in the development of hypertension and suggest eliciting the RR can improve psychological status and decreases BP. To test their theory they measured blood pressure and heart rate and quality of life (QoL) of 117, 20-45 year old men with mild hypertension before, during and after a 12 week intervention of breathing relaxation and biofeedback. The intervention was considered effective and BP dropped by 10%. Esch, Stefano, Fricchione and Benson (2002) linked chronic stress as a contributing factor in exacerbating chronic heart disease and suggest 10-20 minutes of using Bensons (1975) RR
technique may reduce symptoms associated with the stress response. (Increased BP, HR, anxiety, shallow breathing and muscle tension)

Benson (2000) said there are two basic components to the relaxation response technique focusing on a repetition behaviour and distraction from own thoughts by that task. Benson recommends the repetition of a word, sound, phrase, prayer or muscular activity to elicit the RR, to decrease HR, BP and muscle tension. (Dittrich 2001) In this current study both yoga and knitting provide repetition of movements along with the sound of clicking needles for knitters and the repetitive awareness of breath in yoga that will serve to elicit the relaxation response based on Bensons (1975) assumptions.

1.3 The Relaxation Response, Heart Rate and Blood Pressure

Benson (1975, 2000) posits that in whatever way the mind is focused through meditation or repetition the body will respond with decreases in HR and BP. Benson (1975) also suggests the relaxation response is the most beneficial in preventing hyper tension and further investigations are necessary to establish its preventative role.

Wallace (1970) found TM decreased oxygen consumption, respiratory rate, HR, muscle tension and BP more so than uninstructed rest. Pollock and Zeiner (1979, as cited by Orme – Johnson nd.) also found no differences in BP and HR between Benson’s technique and sitting quietly. Cork and Cox (1984) also found no differences in BP and HR between Benson’s technique and sitting quietly. Dillbeck and Orme-Johnson (1987) found HR did not change more during TM than rest. Alexander, Langer, Newman, Chandler, Davies (1989)
found BP in the elderly was decreased more significantly by TM than Benson’s technique or mindfulness meditation. Schneider, Staggers, Alexander, Sheppard, Rainworth, Kondwani, Smith and King (1995) found TM reduced BP to the same degree as anti-hypertension meditation and significantly more than Programme muscle relaxation or diet and exercise.

Smith (1999, 2001) suggests different relaxation techniques may produce physiological differences therefore a variety of relaxation techniques should be available for use. Orme-Johnson (nd) argues one cannot assume that all techniques will produce the same effect. If one technique effectively elicits relaxation it does not follow that others will to the same degree and likewise if one technique does not elicit relaxation it does not follow that all other techniques will not. Benson (1975, 2000) goes on to say the relaxation response can be elicited by a variety of techniques such as yoga breathing and knitting. This current research aims to explore the physiological changes in BP and HR; and subjective RR elicited by yoga and knitting based on Benson’s (1975, 2000) and Smith’s (1999, 2001) assumptions.

1.4 The Relaxation Response and Yoga

The stress decreasing benefits of Yoga have been widely accepted based on a wealth of research (Godfrey 2006). Researchers have compared physiological and psychological data from a variety of relaxation techniques with yoga and found significant evidence of its potential to elicit the RR. Chong, Tsunata, Tsany, Chan and Wai (2011) Reviewed literature on the effects of Yoga and stress and concluded more longitudinal research is required. Vancampfort, DeHert, Knapen, Wampers, Demunter, Deckx, Maurissen and Probst (2011) evaluated changes in state anxiety, psychological stress and subjective well being after a
single 20 minute yoga session and compared results with an aerobic exercise group and a no exercise control group. Results indicated yoga shows promise in treating stress and anxiety. Arias, Sternberg, Banga and Trestman (2006) stated that in the western world various forms of yoga are the most popular forms of meditation and found Hatha Yoga produces various levels of RR.

Ghoncheh and Smith (2004) compared PMR and Yoga in a repeated measures experiment measuring relaxation states before and after and three minutes post each session. Results found PMR produced higher levels of relaxation states, physiological relaxation and disengagement than in yoga, but similar results were found in relaxation states energized or aware. Results also found R-States only increased after four weeks suggesting regular participation in any relaxation technique maybe necessary to achieve a “beneficial relaxation response.” Chung, Brooks, Rai, Balk and Rai (2011) investigated the effects of Sahaja yoga on QoL, anxiety and blood pressure. 67 participants took part in a weekly 1 hour Sahaja Yoga session along with their usual hospital treatments. 62 other participants received only their usual hospital treatment. Results found significant increases in QoL and decreases in BP and anxiety in the yoga group.

Smith, Hancock, Blake-Mortimer and Eckert (2007) compared the effects of yoga and relaxation on stress, anxiety, BP and QoL, over ten 1 hour weekly sessions. Results indicated yoga may have a beneficial effect in reducing stress and anxiety but suggests further research is required. Malathi, Dunnodaran, Shah, Krishnamurthy, Namjoshi and Ghodke (1998) measured heart rate and blood pressure of medical students in three conditions, Yoga,
relaxation and a control group of no activity. Measurements were recorded 1 month prior to beginning experimental conditions and then directly pre and post taking part in conditions. Both yoga and relaxation were found to decrease heart rate and blood pressure. This current research aim record measurements BP, HR, and subjective relaxation similar to Malathi et al (1998) and predicts similar outcomes.

1.5 The Relaxation Response and Knitting

Brown, Courtney, Manford and Estes (2011) argue there is a lack of scientific research pertaining to the benefits of knitting. Sadlo (2011) advocates knitting as a popular and fun way to elicit the relaxation response and posits that when we express our creative self’s pleasure chemicals such as opioids and serotonin are produced. Creatively occupying the hands and mind transforms one into a flow state of relaxation. Wang, Karp, Winiblad and Fratiglioni (2002) found participating in stimulating activities such as knitting may protect against dementia. Gutmen and Schindler (2007) found both meditation and knitting can stimulate the neurological systems and enhance health and wellbeing.

MacDonald (1988) stated the sound of needles clicking combined with the flow of yarn is an alternative form of meditation. Prigoda and McKenzie (2007) posit that in addition to the meditative benefits of knitting there are physiological benefits such as a decrease in heart rate, breathing rate and an increase in manual dexterity.
Previous research on the benefits of knitting has relied on surveys, interviews and testimonials from knitters. Knitters frequently report their hobby is an excellent stress reliever. (Parkins 2004 and Stoller 2003). Some describe the calming effect of knitting as one of a meditative state. Knitting unwinds the mind while remaining productive and aware. Its soothing movement and mantra sounds acts as a meditative tool that can be practiced almost anywhere. Turney (2009)

Ferber (2012) interviewed 12 women in San Francisco aged 26 – 54 recruited from knitting networks, shops and classes. A further 50 women completed a QoL questionnaire and a demographic specifically designed knitting questionnaire designed to establish the regularity of knitting. Results indicated a sense of wellbeing, joy, self expression, self efficacy, competence and relaxation was experienced by women who knit. Results also suggest knitting may have a positive effect on mental health and quality of life.

Utsch Heike (2007) administered a specifically designed knitting questionnaire and the perceived stress 10 questionnaire to knitters. Results indicated knitting is most effective in relieving emotional and cognitive symptoms and effectively reduces stress. Further assumptions are made that knitting while beneficial for individuals may also be useful in group therapies. Duffey (2007) observed women in a drug and alcohol rehabilitation centre as they participated in two group therapy sessions per week. Knitting was used to facilitate discussions and modify stress and emotions. Duffey (2007) found knitting to be an effective tool in affect management and suggests this may be due to its soothing repetitive mantra like movements and sounds that, Benson (1975) argued evokes relaxation.
Jacobs (1991) found a repetitive movement in animals enhances the release of serotonin that may relieve symptoms of depression and pain. Baird (2009) supports the theory that knitting alters brain chemistry, lowering stress hormones and boosting the production of serotonin and dopamine. Dittrich (2001) argues while there are many health benefits associated with knitting there is also a health risk of the possible development of carpal tunnel syndrome. Research suggests knitting may also have an addictive quality that Corkhill (2008) considers to be a constructive addiction that may replace other more severe harmful addictions. Marer (2002) interviewed professional women who knit during lunch hours, and found a consistent theme of relief from anxiety and a sense of clear headedness at work. Marer (2002) also found patients with severe illnesses such as cancer experience a greater sense of coping when they knit. This current research hopes to highlight the ability of knitting to elicit the physiological and psychological relaxed state assumed to be achieved by the RR that may have a positive effect on health.

### 1.6 Knitting and Mindfulness

Jacobs (2001) suggest mind/ body interventions such as those that elicit the RR have benefits beyond improving symptoms of stress and posits RR techniques are inexpensive, easily accessible to individuals and groups and can be taught by paraprofessionals. Corkhill (2004) conducted an online survey collecting testimonials from knitters and posits the rhythmic repetitive movement that induces a mindful meditative state, and argues mindfulness is an effective treatment for chronic pain, depression and stress. Davidson (1976) found 8 weeks of daily mindfulness activity has a positive effect on brain function and
the immune system. Selhub cited Godfreys (2006) article posits that mind and body interventions encourage self care behaviours that address many medical issues. Techniques that serve best are those that elicit the RR.

1.7 Knitting is the New Yoga

Knitting is the New Yoga has been proposed by Marer (2002), Gillespie (2005), The National Online – Campus report in the USA (2004) and a BBC news report (2005). Marer (2002), said knitting was once considered an activity practised by senior citizens but is now referred to as “the new yoga”. In the last decade knitting has become increasingly popular as it moves from a domestic chore to a leisure activity. In 2004 statistics revealed that 1 in 3 knitters in America are age 25-34 and that knitting had increased by 150% between 2002 and 2004. (Craft yarn council of America 2005) Trenberth (2005) posits leisure has the potential to reduce stress. The National online – Campus report (2004) reports that one Ohio State University has a residence hall known as the knitting dorm as 50-75 of its residence learned how to knit. The residence hall director said “knitting is the new yoga, with its soothing nature”. A BBC news report in 2005 reported that women in Northern Ireland are describing the ancient craft of knitting as the ‘New Yoga’. This association is based on the common assumption that the repetitive rhythmic movement and the mantra like sound of clicking needles; shares the meditative qualities of yoga. As Benson proposed in 1975 both knitting and yoga appear to elicit a relaxation response. (Benson, 2000; Dittrich, 2001; Rohlich, 2001; Murphy, 2002; Corkhill, 2004; Greer, 2008; Stannard, 2011; and Jones, 2012) Greer 2008 said knitting allows the mind a break from the chaos of life and its meditative quality is a
result of its repetitive nature. Manning (2004, p.4) posits knitting is a mindful activity. “When we knit with attention we have an almost indescribable feeling of satisfaction and contentment. This is knitting as meditation.” The current research aims to find support for the assumption that knitting is the new yoga based on similarities in their ability to elicit the RR.

### 1.8 Rationale

Previous research indicates there is a need for further research in the area of relaxation to explore the various methods that may evoke the relaxation response, the different states of relaxation that may be evoked by different relation techniques and the different benefits each technique and their resulting relaxation states may provide.

Davidson and Schwartz (1976) postulated two mayor categories of arousal and relaxation, cognitive and somatic. They further assume meditation may better treat cognitive symptoms and progressive muscle relaxation and yoga may better treat physical symptoms. Smiths (1999) ABC theory argues different relaxation techniques evoke different relaxation states. Orme-Johnson (nd) reviewed 790 studies of relaxation techniques and concluded that different techniques are not equivalent and they have specific effects. Lehner, Carr, Sargunaraj and Woolfolk (1994) argue if relaxation techniques differ in their ability to elicit various relaxation states then more than one approach needs to be taught for optimum effectiveness.
Research investigating the benefits of yoga and its ability to elicit the relaxation response is extensive and takes a more scientific approach than research on the benefits of knitting. Yoga has been compared to other forms of relaxation as proposed by Benson (1975, 2000) however regardless of the associations made between yoga and knitting and their ability to elicit the relaxation response there is little scientific research based evidence that links the two activities or explores the extent to which they equally elicit the relaxation response.

This research aims to build on existing research that posits knitting and yoga both have health benefits related to their ability to elicit the relaxation response. Benson (1975, 2000) proposed Blood pressure and heart rate changes opposite to those elicited by the stress response act as an indicator of the RR. Based on the assumption that HR and BP decreases when the RR is elicited by means that include knitting and yoga (Benson 1975). This current research will use measurements of HR and BP to determine and compare the relaxation effects elicited by knitting and yoga. Subjective relaxation will be explored alongside HR and BP. It is anticipated that as blood pressure and heart rate decreases so will subjective relaxation increase. It is further anticipated that the expertise and regular participation in knitting and yoga will increase occurrence of the RR.

1.9 Hypothesis

This research hypothesises Yoga and knitting will both demonstrate the elicitation of the relaxation response both physiologically with significant decreases in blood pressure and heart rate post intervention and participants will report feelings of relaxation in-line with physiological changes and that relaxation states will be similar in both conditions. It is also
further hypothesised that those who practise yoga or knitting regularly will elicit significantly greater relaxation than those that do not; and participants that are advanced knitters or yoga practitioners will also elicit significantly greater relaxation. It is finally hypothesised that there will a correlation between baseline measurements of heart rate, systolic blood pressure, semantic relaxation, relaxation state, basic relaxation, mindfulness, positive energy and transcendence.
2. METHOD

2.1 Hypotheses

1) Knitting and yoga will both demonstrate the elicitation of the relaxation response based on significant decreases in heart rate and systolic blood pressure.

2) Knitting and yoga will both demonstrate the elicitation of the relaxation response based on significant increases in feelings of relaxation and relaxation state.

3) Regularity of participation in knitting and yoga will affect the elicitation of the relaxation response.

4) The Skill level of knitters and yoga participants will significantly affect the elicitation of the relaxation response.

5) Knitting and yoga participants will show an increase in relaxation states, positive energy and mindfulness following 15 minutes of knitting or yoga.

6) Knitting and yoga baseline measurements of heart rate, systolic blood pressure, semantic relaxation, relaxation state, basic relaxation, mindfulness, positive energy and transcendence will be significantly associated.

2.2 Design.

This research is a mixed design quasi experiment. Data was collected from 2 independent groups and analysed within and between groups. Both correlations and differences were measured. A survey design was used to collect quantitative data. Physiological measurements of blood pressure and heart rate were also collected. This
research examines the differences in the repeated measures of dependent variables heart rate, systolic blood pressure, semantic relaxation, relaxation state and the sub groups of Smiths relaxation states inventory 3, basic relaxation, mindfulness, positive energy and transcendence; when exposed to the independent variables knitting and yoga. Variables measured within groups were examined to compare results between groups. The dependent variables heart rate, systolic blood pressure, semantic relaxation and relaxation state and independent variables, regular participation and skill in conditions knitting and yoga, were recorded within groups and results compared between groups. All variables are used to determine 1. If the relaxation response is elicited in both conditions knitting and yoga and 2. what degree regular participation and skill affects the ability to elicit the relaxation response in both conditions.

2.3 Materials

Materials used consisted of a self administered paper and pen merged survey packs. The survey was administered on three occasions. First, prior to engaging in the activity of knitting or yoga one week prior to the experiment; second, prior to the experimental conditions of knitting and yoga; and last, directly following the experimental conditions of knitting and yoga. Materials also consisted of a wrist monitor that measures heart rate and blood pressure. Measures were recorded directly following baseline questionnaires and directly following 15 minutes of yoga or knitting prior to the post experiment questionnaire. Survey packs were introduced with a letter explaining the research being conducted, contact details for the author and the supervisor of the research and an explanation that filling in
questionnaires and allowing measurements to be recorded of blood pressure and heart rate would be deemed as consent to participate. (Appendix 1)

Questionnaire (a) contained 2 questions with a possible 3 responses for each question, based on regularity of participation in the activity of knitting or yoga and skill level of participants in the participation of knitting and yoga. This questionnaire was used in the first baseline measurement only. The purpose of the questionnaire was to examine the effect of regularity of participation and the skill status of participants on the elicitation of the relaxation response. See (Appendix 2) for full questionnaire pack.

Example: Select the response that best represents you.

1. How regularly do you hand knit?

   More than once a week

   Once a week

   Less than once a week

Questionnaire (b) contains one question presented as a semantic differential scale of feeling of relaxation right now. 0 marks not relaxed at all and 100 marks completely relaxed. The aim of the questionnaire was to examine how subjective reports of relaxation compare to physiological reports of relaxation.
Example:

How relaxed do you feel right now?

Mark your response on the line below.

0 represents not relaxed at all and 100 represents totally relaxed.

0 100

Not relaxed totally relaxed

At all

Questionnaire (c) contains the Smith relaxation states inventory 3 (SRS13). A revised and expanded version of the Smith relaxation states inventory. Reliability for the SRSI3 is still to be determined. This psychometric measure is of the state “how do you feel right now” using a 6 point Likert scale. The questionnaire measures the current relaxation state of the participant using 38 items. Sub states of relaxation are contained within the questionnaire, for a further break down of what relaxation state or states are prevalent. Reliability of this measure is yet to be determined as it is currently being tested. 3 items have been added to the original Smith relaxation states inventory which has been tested for reliability. Permission to use was granted by the author Dr John Smith via e-mail. (Appendix 3). Questions 2, 9, 17, 19, 23, 28, 30 and 34 measure stress and were re-coded. This questionnaire was used to examine changes in relaxation state pre and post experimental conditions; and to examine how relaxation state compares to physiological measures.
Scoring for the SSRI3 requires adding all scores and dividing by 38. Scoring for Sub relaxation states are as follows:

- **BASIC RELAXATION**: \( 4 + 13 + 11 + 26 + 7 + 21 + 35 + 31 + 3 + 10 + 33 / 11 \)
- **MINDFULNESS**: \( 6 + 36 + 1 + 29 + 15 + 37 + 20 + 25 + 22 / 9 \)
- **POSITIVE ENERGY**: \( 38 + 12 + 8 + 18 + 14 + 24 / 6 \)
- **TRANSCENDENCE**: \( 5 + 27 + 31 + 16 / 4 \)

Example of SSR13 question:

Right now I feel... Please check all items using this key.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>A lot</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

(1) (2) (3) (4) (5) (6) 35. My body is physically relaxed.

Smith (2005)

Participants were asked to answer all questions in their pack and to answer honestly based on how they were feeling in the present moment.

A Santitas blood pressure wrist monitor SBC27 was used to monitor blood pressure and heart rate. The monitor records up to 60 participants in 2 conditions. Participants were informed that the recordings are solely to observe changes in measurements and that no diagnostic would be given. Participants were asked to sit while wearing the monitor on their left wrist, with their left arm resting comfortably with the wrist level with their heart.
For some of the yoga group standard office chairs were used, a large screen television and a DVD player to play the 15 minute instructed seated yoga session: Yoga on a chair with Jessica Hatchet. The DVD was sourced from www.youtube.com/watch?v=eakHov-XGlE.

All measurements were transferred first to a paper recording sheet for ease of data input to Statistic Package for Social Sciences, SPSS 18 on an Acer Extensa 5230E laptop. (Appendix 4) For the purpose of matching repeated questionnaires initials we used to identify participants once all measures were completed and data was entered on to SPSS 18, the recording sheet with initials was destroyed.

### 2.4 Participants.

Participants were sourced from a convenience sample. Knitting participants currently belong to one of two knitting groups; one in rural Ireland and one in urban Ireland. All measurements were administered in the natural setting of the knitting groups. 11 Yoga participants currently attend a yoga class in rural Ireland, and 14 participants with experience of yoga, attended 4 individual small groups specifically created for the experiment in Urban Ireland. Yoga participants currently attending a yoga class were administered measures in the natural setting of their yoga class. Specifically created groups of yoga participants were administered measures in a laboratory setting.

In total 50 participants took part in the experiment, 25 participants in the knitting group and 25 participants in the yoga group. Participants in the knitting group include 2
males, 8% of the sample, mean 1.00 (SD = 0.00), and 23 females 92% of the sample, mean 2.00 (SD = 0.00). Participants in the yoga group were made up of 8 males 32% of the sample, mean 1.00 (SD = 0.00) and 17 females 68% of the sample, mean 2.00 (SD = 0.00). The age range of participants in the knitting group was 23 – 81, mean 48.20 (SD = 15.76), and the age range of yoga participants was 18 – 48, mean 30.16 (SD = 9.45).

2.5 Procedure.

Yoga instructors and knit group organisers were contacted via email to gain access to groups of participants. (Appendix 5) One small group of 11 yoga participants in rural Ireland agreed to take part and two small groups of 9 and 16 knitting participants, one in rural Ireland and one in urban Ireland agreed to take part. Further yoga participants were sourced from a convenience sample of individuals with experience of yoga by posting a message on facebook requesting yoga participants for an undergraduate experiment.

All participants were age 18 and over; and no disability was present that presented any difficulty in understanding instructions, therefore no exclusions were required. All participants were given verbal and written information regarding the experiment. (Appendix 1) No deception was used for this experiment. Confidentiality was assured and the opportunity to withdraw was explained, to only be available at the time of the experiment, as no identifiable data would be available once last measures were recorded. Participants were given the opportunity to examine the wrist monitor before the measures were taken for the first time to overcome any anxiety regarding its use. Participants were also informed that there were no medical personnel available to give any diagnosis of heart rate and blood
pressure measurements. However participants were offered the opportunity to write down their own measures if desired. No participants availed of this option. After each administration of all measure participants were asked if they had any questions and if were they happy to continue. All participants were happy to continue on all occasions.

All participants in their normal class or group meetings were administered measurements one week before taking part in their usual activity of knitting or yoga in its usual location and environment; and then again one week later under normal conditions prior to 15 minutes of yoga or knitting and lastly following 15 minutes of either knitting or yoga. Time taken to complete each individual set of questionnaire took approximately 5 – 10 minutes. Each measure of heart rate and blood pressure took 30 seconds. Heart rate and Blood pressure was recorded at the time of measurement on a recording sheet. (Appendix 4) Additional yoga participants were divided into 3 groups of 4 and one group of 2. The four small groups were invited to a DBS laboratory in Balfe street Dublin to take part in 15 minutes of chair yoga instructed by a DVD on a large screen television. Each group of participants were administered measures identically to those administered to the pre existing groups. All groups of participants were thanked for their participation and for any inconvenience caused to normal class group conditions. All groups were informed that data would be entered onto SPSS for analysis and saved on a secure memory stick. Groups were also informed that questionnaires and recording sheets would be stored in a locked filing cabinet until final grades were awarded for the research before being destroyed.
3. RESULTS

3.1 Data Analysis.

All data collected from participants was entered on the statistical package for the social sciences SPSS 18. Data from the Smiths relaxation states inventory 3 (SSRI3) was re-coded prior to running analysis. Normality was tested using Shapiro-Wilk and on inspection revealed non normality in variable measures in all hypotheses. Therefore all non parametric tests were used to analyze data. Hypotheses 1-5 look for differences between repeated measures and a Wilcoxon signed rank sum test was used. Hypotheses 6 looked for associations between repeated baseline measures and a Spearman rho correlation test was used. (Normality histograms appendix 7)

3.2 Frequencies:

A frequency test was run to determine the age range of participants in conditions knitting and yoga. Figures 1 and 2 illustrate the age range in knitting participants (23 – 81) is wider than the age range in yoga participants (18 – 48).

Figure 1. Distribution of age of knitting participants.

Figure 2. Distribution of age of yoga participants.
A frequency test was run to determine the gender differences within groups. Participants in the knitting group include 2 males 8% of the sample, mean 1.00 (SD = 0.00), and 23 females 92% of the sample, mean 2.00 (SD = 0.00). Participants in the yoga group include 8 males 32% of the sample, mean 1.00 (SD = 0.00) and 17 females 68% of the sample, mean 2.00 (SD = 0.00)

3.3 Descriptive Statistics

Table 1 provides a summary of the means and standard deviations of all the measured variables for hypothesis 1 and 2. The mean and standard deviation differences between pre and post knitting and yoga measures of heart rate, systolic blood pressure are inconsistent with hypothesis 1. The mean and standard deviation differences between pre and post knitting and yoga measures of semantic relaxation and relaxation state are consistent with hypothesis 2.

Table 1. Means and standard deviations of measured variables for Hypotheses 1 & 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knitting Mean</th>
<th>SD</th>
<th>Yoga Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Heart rate</td>
<td>75.56</td>
<td>11.52</td>
<td>78.56</td>
<td>12.75</td>
</tr>
<tr>
<td>Post Heart rate</td>
<td>72.60</td>
<td>10.69</td>
<td>75.40</td>
<td>19.83</td>
</tr>
<tr>
<td>Pre systolic Blood pressure</td>
<td>131.20</td>
<td>19.11</td>
<td>117.80</td>
<td>14.52</td>
</tr>
<tr>
<td>Post systolic Blood pressure</td>
<td>132.64</td>
<td>21.50</td>
<td>122.08</td>
<td>17.29</td>
</tr>
<tr>
<td>Pre semantic relaxation</td>
<td>69.24</td>
<td>18.64</td>
<td>57.16</td>
<td>20.29</td>
</tr>
<tr>
<td>Post semantic relaxation</td>
<td>84.28</td>
<td>11.98</td>
<td>74.16</td>
<td>20.31</td>
</tr>
<tr>
<td>Pre relaxation state score</td>
<td>3.66</td>
<td>0.74</td>
<td>3.07</td>
<td>0.59</td>
</tr>
<tr>
<td>Post relaxation state score</td>
<td>4.03</td>
<td>0.67</td>
<td>3.74</td>
<td>0.78</td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
<td></td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>
Knitting: Minimum score is 61, maximum 109 for pre heart rate and minimum 56, maximum 102 for post heart rate, suggesting a weak result. Minimum score is 102 and maximum 167 for pre systolic blood pressure and minimum 103, maximum 182 for post systolic blood pressure, moderate result. Minimum score for pre semantic relaxation is 19 and maximum 95, Minimum for post semantic relaxation is 47 and maximum 98, suggesting a strong result. Minimum score is 1.74 for pre relaxation state and maximum 4.68, maximum for post relaxation state is 2.68 and maximum 5.05, suggesting a strong result.

Yoga: Minimum score is 52, maximum 95 for pre heart rate and minimum 2, maximum 102 for post heart rate, suggesting a moderate to strong result. Minimum score is 92 and maximum 148 for pre systolic blood pressure and minimum 85, maximum 149 for post systolic blood pressure, moderate result. Minimum score for pre semantic relaxation is 12 and maximum 82, Minimum for post semantic relaxation is 30 and maximum 98, suggesting a strong result. Minimum score is 2.11 for pre relaxation state and maximum 4.18, maximum for post relaxation state is 1.92 and maximum 5.03, suggesting a moderate result.

Table 2 provides a summary of the means and standard deviations of all the measured variables for hypothesis 3. The mean and standard deviation changes between pre and post knitting conditions of heart rate, systolic blood pressure, semantic relaxation and relaxation state based on regularity of knitting is consistent with hypothesis 3. No cases are reported for less than once a week as N = 1.
Table 2. Means and standard deviation of measures of measured variables for Hypothesis 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>More than once a week</th>
<th>Once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Pre Heart rate</td>
<td>76.32</td>
<td>11.79</td>
</tr>
<tr>
<td>Post Heart Rate</td>
<td>72.86</td>
<td>11.24</td>
</tr>
<tr>
<td>Pre systolic Blood pressure</td>
<td>129.91</td>
<td>19.99</td>
</tr>
<tr>
<td>Post systolic Blood pressure</td>
<td>132.95</td>
<td>22.95</td>
</tr>
<tr>
<td>Pre semantic relaxation</td>
<td>70.18</td>
<td>17.73</td>
</tr>
<tr>
<td>Post semantic relaxation</td>
<td>84.18</td>
<td>12.73</td>
</tr>
<tr>
<td>Pre relaxation state score</td>
<td>3.61</td>
<td>0.75</td>
</tr>
<tr>
<td>Post relaxation state score</td>
<td>3.97</td>
<td>0.69</td>
</tr>
<tr>
<td>Number</td>
<td>22</td>
<td>2</td>
</tr>
</tbody>
</table>

*More than once a week:* Minimum score is 61, maximum 109 for pre heart rate and minimum 56, maximum 102 for post heart rate, suggesting a moderate result. Minimum score is 102 and maximum 167 for pre systolic blood pressure and minimum 103, maximum 182 for post systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic relaxation is 19 and maximum 95, Minimum for post semantic relaxation is 47 and maximum 98, suggesting a strong result. Minimum score is 1.74 for pre relaxation state and maximum 4.68, maximum for post relaxation state is 2.68 and maximum 5.05, suggesting a strong result.

*Once a week:* Minimum score is 67, maximum 80 for pre heart rate and minimum 64, maximum 72 for post heart rate, suggesting a weak to moderate result. Minimum score is 139 and maximum 147 for pre systolic blood pressure and minimum 131, maximum 133 for post systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic...
relaxation is 77 and maximum 80. Minimum for post semantic relaxation is 81 and maximum 90, suggesting a moderate result. Minimum score is 4.05 for pre relaxation state and maximum 4.58, maximum for post relaxation state is 4.55 and maximum 4.99, suggesting a moderate result.

Table 3 provides a summary of the means and standard deviations of all the measured variables for hypothesis 3 in the yoga condition. The mean and standard deviation changes between pre and post yoga conditions of heart rate, systolic blood pressure, semantic relaxation and relaxation state based on regularity of yoga is consistent with hypothesis 3. No cases for less than once a week are reported as N=1.

Table 3. Means and standard deviation of variables measured for Hypothesis 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>More than once a week</th>
<th>Once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Yoga</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre Heart rate</td>
<td>76.86</td>
<td>14.69</td>
</tr>
<tr>
<td>Post Heart Rate</td>
<td>74.29</td>
<td>13.11</td>
</tr>
<tr>
<td>Pre systolic Blood pressure</td>
<td>116.00</td>
<td>15.25</td>
</tr>
<tr>
<td>Post systolic Blood pressure</td>
<td>113.14</td>
<td>11.75</td>
</tr>
<tr>
<td>Pre semantic relaxation</td>
<td>62.86</td>
<td>24.55</td>
</tr>
<tr>
<td>Post semantic relaxation</td>
<td>81.43</td>
<td>16.37</td>
</tr>
<tr>
<td>Pre relaxation state score</td>
<td>3.25</td>
<td>0.63</td>
</tr>
<tr>
<td>Post relaxation state score</td>
<td>3.83</td>
<td>0.68</td>
</tr>
<tr>
<td>Number</td>
<td>7</td>
<td>17</td>
</tr>
</tbody>
</table>

*More than once a week:* Minimum score is 52, maximum 90 for pre heart rate and minimum 56, maximum 95 for post heart rate, suggesting a moderate result. Minimum score is 92 and maximum 130 for pre systolic blood pressure and minimum 99, maximum 134 for
post systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic relaxation is 12 and maximum 82, Minimum for post semantic relaxation is 52 and maximum 97, suggesting a strong result. Minimum score is 2.39 for pre relaxation state and maximum 4.18, maximum for post relaxation state is 3.13 and maximum 4.97, suggesting a low to moderate result.

Once a week: Minimum score is 56, maximum 95 for pre heart rate and minimum 2, maximum 102 for post heart rate, suggesting a moderate result. Minimum score is 101 and maximum 148 for pre systolic blood pressure and minimum 85, maximum 149 for post systolic blood pressure, suggesting a low to moderate result. Minimum score for pre semantic relaxation is 20 and maximum 74, Minimum for post semantic relaxation is 30 and maximum 93, suggesting a moderate result. Minimum score is 2.11 for pre relaxation state and maximum 4.18, maximum for post relaxation state is 1.92 and maximum 5.03, suggesting a moderate result.

Figure 3 illustrates the distribution of regular participation in knitting, revealing a majority of ‘more than once a week’ participation. However Figure 4 reveals the majority of ‘once a week’, participation in yoga. Both knitting and yoga reveal a low occurrence of less than ‘once a week’ participation.
Table 4 provides a summary of the means and standard deviations of all the measured variables for hypothesis 4 in the knitting condition. The mean and standard deviation changes between pre and post knitting conditions of heart rate, systolic blood pressure, semantic relaxation and relaxation state based on skill is consistent with hypothesis 4.

Table 4. Means and standard deviation of variable measured for Hypothesis 4.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Skill</th>
<th>Beginner</th>
<th>Intermediate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Pre Heart rate</td>
<td>78.67</td>
<td>26.27</td>
<td>75.80</td>
</tr>
<tr>
<td>Post Heart Rate</td>
<td>73.67</td>
<td>12.66</td>
<td>73.20</td>
</tr>
<tr>
<td>Pre systolic Blood pressure</td>
<td>114.67</td>
<td>18.58</td>
<td>137.67</td>
</tr>
<tr>
<td>Post systolic Blood pressure</td>
<td>122.33</td>
<td>15.53</td>
<td>140.40</td>
</tr>
<tr>
<td>Pre semantic relaxation</td>
<td>55.67</td>
<td>28.92</td>
<td>77.60</td>
</tr>
<tr>
<td>Post semantic relaxation</td>
<td>82.67</td>
<td>12.06</td>
<td>87.40</td>
</tr>
<tr>
<td>Pre relaxation state score</td>
<td>3.80</td>
<td>0.26</td>
<td>3.83</td>
</tr>
<tr>
<td>Post relaxation state score</td>
<td>3.91</td>
<td>0.71</td>
<td>4.2</td>
</tr>
<tr>
<td>Number</td>
<td>3</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

*Beginner:* Minimum score is 63, maximum 109 for pre heart rate and minimum 60, maximum 85 for post heart rate, suggesting a low to moderate result. Minimum score is 102 and maximum 136 for pre systolic blood pressure and minimum 105, maximum 135 for post
systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic relaxation is 30 and maximum 87, Minimum for post semantic relaxation is 70 and maximum 94, suggesting a moderate result. Minimum score is 3.53 for pre relaxation state and maximum 4.05, maximum for post relaxation state is 3.11 and maximum 4.45, suggesting a low to moderate result.

*Intermediate:* Minimum score is 61, maximum 97 for pre heart rate and minimum 56, maximum 102 for post heart rate, suggesting a low to moderate result. Minimum score is 108 and maximum 167 for pre systolic blood pressure and minimum 103, maximum 182 for post systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic relaxation is 60 and maximum 95, Minimum for post semantic relaxation is 70 and maximum 98, suggesting a moderate result. Minimum score is 3.08 for pre relaxation state and maximum 4.68, maximum for post relaxation state is3.29 and maximum 5.05, suggesting a moderate result.

Table 5 provides a summary of the means and standard deviations of all the measured variables for hypothesis 4 in the yoga condition. The mean and standard deviation changes between pre and post yoga conditions of heart rate, systolic blood pressure, semantic relaxation and relaxation state based on skill is consistent with hypothesis 4.
Table 5. Means and standard deviation of variables measured for Hypothesis 4.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beginner</th>
<th>Intermediate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>Pre Heart rate</td>
<td>80.00</td>
<td>12.03</td>
</tr>
<tr>
<td>Post Heart Rate</td>
<td>75.23</td>
<td>24.73</td>
</tr>
<tr>
<td>Pre systolic Blood pressure</td>
<td>115.53</td>
<td>12.07</td>
</tr>
<tr>
<td>Post systolic Blood pressure</td>
<td>124.07</td>
<td>20.08</td>
</tr>
<tr>
<td>Pre semantic relaxation</td>
<td>51.46</td>
<td>19.45</td>
</tr>
<tr>
<td>Post semantic relaxation</td>
<td>65.54</td>
<td>22.49</td>
</tr>
<tr>
<td>Pre relaxation state score</td>
<td>2.81</td>
<td>0.46</td>
</tr>
<tr>
<td>Post relaxation state score</td>
<td>3.50</td>
<td>0.86</td>
</tr>
<tr>
<td>Number</td>
<td>13</td>
<td>12</td>
</tr>
</tbody>
</table>

**Beginner:** Minimum score is 56, maximum 95 for pre heart rate and minimum 2, maximum 101 for post heart rate, suggesting a strong result. Minimum score is 101 and maximum 145 for pre systolic blood pressure and minimum 85, maximum 149 for post systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic relaxation is 20 and maximum 74, Minimum for post semantic relaxation is 30 and maximum 92, suggesting a moderate result. Minimum score is 2.11 for pre relaxation state and maximum 3.76, maximum for post relaxation state is 1.92 and maximum 5.08, suggesting a moderate result.

**Intermediate:** Minimum score is 52, maximum 92 for pre heart rate and minimum 56, maximum 102 for post heart rate, suggesting a low to moderate result. Minimum score is 92 and maximum 148 for pre systolic blood pressure and minimum 99, maximum 147 for post systolic blood pressure, suggesting a moderate result. Minimum score for pre semantic relaxation is 12 and maximum 82, Minimum for post semantic relaxation is 52 and maximum 97, suggesting a moderate result. Minimum score is 2.39 for pre relaxation state and
maximum 4.18, maximum for post relaxation state is 3.13 and maximum 5.00, suggesting a moderate result.

Figure 5 illustrates the distribution of skill of yoga participants in the condition of yoga. A relatively even spread of skill between beginner and intermediate is revealed with no cases of advanced skill. Figure 6 demonstrates the distribution of skill in the knitting condition and reveals a majority of intermediate skill, followed by advanced skill and a minority of beginners.

Table 6 provides a summary of the means and standard deviations of all the measured variables for hypothesis 5 in the knitting and yoga condition. The mean and standard deviation changes between pre and post knitting and yoga conditions of basic relaxation, mindfulness, positive energy, and transcendence are consistent with hypothesis 5.
Table 6. Means and standard deviation of variables measured for Hypothesis 5.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knitting Mean</th>
<th>Knitting Standard Deviation</th>
<th>Yoga Mean</th>
<th>Yoga Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Basic relaxation</td>
<td>3.08</td>
<td>0.91</td>
<td>2.43</td>
<td>0.70</td>
</tr>
<tr>
<td>Post Basic relaxation</td>
<td>3.48</td>
<td>0.74</td>
<td>3.27</td>
<td>0.85</td>
</tr>
<tr>
<td>Pre Mindfulness</td>
<td>3.50</td>
<td>0.94</td>
<td>2.79</td>
<td>0.76</td>
</tr>
<tr>
<td>Post Mindfulness</td>
<td>3.50</td>
<td>0.94</td>
<td>2.79</td>
<td>0.76</td>
</tr>
<tr>
<td>Pre Positive energy</td>
<td>3.85</td>
<td>0.96</td>
<td>3.28</td>
<td>1.01</td>
</tr>
<tr>
<td>Post Positive energy</td>
<td>4.24</td>
<td>0.89</td>
<td>3.85</td>
<td>1.03</td>
</tr>
<tr>
<td>Pre Transcendence</td>
<td>2.56</td>
<td>0.93</td>
<td>2.28</td>
<td>1.00</td>
</tr>
<tr>
<td>Post Transcendence</td>
<td>2.85</td>
<td>0.96</td>
<td>2.43</td>
<td>0.96</td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
<td></td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

**Knitting:** Minimum score is 1.27, maximum 4.73 for pre basic relaxation and minimum 2.77, maximum 4.82 for post basic relaxation, suggesting a low to moderate result. Minimum score is 1.44 and maximum 4.89 for pre mindfulness and minimum 1.44, maximum 4.89 for post mindfulness, suggesting a moderate result, however scores remain identical in repeated measures. Minimum score for pre positive energy is 1.50 and maximum 5.17, Minimum for post positive energy is 2.00 and maximum 5.50, suggesting a moderate result. Minimum score is 1.00 for pre transcendence and maximum 4.25, maximum for post transcendence state is 1.00 and maximum 4.25, suggesting a moderate result.

**Yoga:** Minimum score is 1.36, maximum 3.73 for pre basic relaxation and minimum 1.82, maximum 5.00 for post basic relaxation, suggesting moderate result. Minimum score is 1.67 and maximum 4.11 for pre mindfulness and minimum 1.67, maximum 4.11 for post mindfulness, suggesting a moderate result’ however scores remain identical in repeated measures. Minimum score for pre positive energy is 1.50 and maximum 500, Minimum for post positive energy is 2.00 and maximum 5.50, suggesting a moderate result. Minimum
score is 1.00 for pre transcendence and maximum 4.25, maximum for post transcendence state is 1.00 and maximum 4.25, suggesting a moderate result.

Table 7 provides a summary of the means and standard deviations of all the measured variables for hypothesis 6 in the knitting and yoga conditions. The means and standard deviations demonstrate the associations between all of the variables. This is consistent with hypothesis 6.

Table 7. Means and standard deviation of variables measured for hypothesis 6.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knitting Mean</th>
<th>Knitting Standard Deviation</th>
<th>Yoga Mean</th>
<th>Yoga Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline heart rate</td>
<td>81.48</td>
<td>15.23</td>
<td>79.72</td>
<td>8.99</td>
</tr>
<tr>
<td>Pre heart rate</td>
<td>75.56</td>
<td>11.52</td>
<td>78.56</td>
<td>12.75</td>
</tr>
<tr>
<td>Baseline systolic blood pressure</td>
<td>128.16</td>
<td>19.10</td>
<td>114.28</td>
<td>13.59</td>
</tr>
<tr>
<td>Pre systolic blood pressure</td>
<td>131.20</td>
<td>19.11</td>
<td>117.80</td>
<td>14.52</td>
</tr>
<tr>
<td>Baseline semantic relaxation</td>
<td>67.76</td>
<td>22.66</td>
<td>51.28</td>
<td>17.19</td>
</tr>
<tr>
<td>Pre semantic relaxation</td>
<td>69.24</td>
<td>18.64</td>
<td>57.16</td>
<td>20.29</td>
</tr>
<tr>
<td>Baseline relaxation state score</td>
<td>3.58</td>
<td>0.77</td>
<td>3.07</td>
<td>0.55</td>
</tr>
<tr>
<td>Pre relaxation state score</td>
<td>3.66</td>
<td>0.74</td>
<td>3.07</td>
<td>0.59</td>
</tr>
<tr>
<td>Baseline basic relaxation</td>
<td>2.97</td>
<td>0.89</td>
<td>2.32</td>
<td>0.63</td>
</tr>
<tr>
<td>Pre basic relaxation</td>
<td>3.08</td>
<td>0.91</td>
<td>2.42</td>
<td>0.70</td>
</tr>
<tr>
<td>Baseline mindfulness</td>
<td>3.33</td>
<td>0.94</td>
<td>2.80</td>
<td>0.76</td>
</tr>
<tr>
<td>Pre mindfulness</td>
<td>3.49</td>
<td>0.94</td>
<td>2.79</td>
<td>0.76</td>
</tr>
<tr>
<td>Baseline positive energy</td>
<td>3.99</td>
<td>1.08</td>
<td>3.34</td>
<td>0.81</td>
</tr>
<tr>
<td>Pre positive energy</td>
<td>3.84</td>
<td>0.96</td>
<td>3.28</td>
<td>1.01</td>
</tr>
<tr>
<td>Baseline transcendence</td>
<td>2.64</td>
<td>0.99</td>
<td>2.06</td>
<td>0.89</td>
</tr>
<tr>
<td>Pre transcendence</td>
<td>2.56</td>
<td>0.93</td>
<td>2.28</td>
<td>1.00</td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
<td></td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>
**Knitting:** Minimum score is 51, maximum 134 for pre heart rate and minimum 61, maximum 109 for post heart rate, suggesting a moderate result. Minimum score is 96 and maximum 170 for pre systolic blood pressure and minimum 102, maximum 167 for post systolic blood pressure, moderate result. Minimum score for pre semantic relaxation is 9 and maximum 100, Minimum for post semantic relaxation is 19 and maximum 95, suggesting a strong result. Minimum score is 1.61 for pre relaxation state and maximum 4.82, maximum for post relaxation state is 1.74 and maximum 4.68, suggesting a strong result. Minimum score is 1.36, maximum 5.09 for pre basic relaxation and minimum 1.27, maximum 4.73 for post basic relaxation, suggesting a moderate result. Minimum score is 1.33 and maximum 5.22 for pre mindfulness and minimum 1.44, maximum 4.89 for post mindfulness, suggesting a moderate result. Minimum score for pre positive energy is 1.50 and maximum 5.83, Minimum for post positive energy is 1.50 and maximum 5.17, suggesting a moderate result. Minimum score is 1.00 for pre transcendence and maximum 4.25, maximum for post transcendence state is 1.00 and maximum 4.25, suggesting a moderate result.

**Yoga:** Minimum score is 61, maximum 90 for pre heart rate and minimum 52, maximum 95 for post heart rate, suggesting a moderate result. Minimum score is 94 and maximum 146 for pre systolic blood pressure and minimum 92, maximum 148 for post systolic blood pressure, moderate result. Minimum score for pre semantic relaxation is 21 and maximum 82, Minimum for post semantic relaxation is 12 and maximum 82, suggesting a strong result. Minimum score is 1.76 for pre relaxation state and maximum 4.11, maximum for post relaxation state is 2.11 and maximum 4.18, suggesting a moderate result. Minimum score is 1.36, maximum 3.45 for pre basic relaxation and minimum 1.36, maximum 3.73 for post basic relaxation, suggesting moderate result. Minimum score is 1.44 and maximum 4.11
for pre mindfulness and minimum 1.67, maximum 4.11 for post mindfulness, suggesting a moderate result. Minimum score for pre positive energy is 1.83 and maximum 4.50, Minimum for post positive energy is 1.50 and maximum 5.00, suggesting a moderate result. Minimum score is 1.00 for pre transcendence and maximum 4.00, maximum for post transcendence state is 1.00 and maximum 4.25, suggesting a moderate result.

Differences in the direction of changes between the pre and post conditions can be observed in tables, 1 – 8. Bar charts of mean differences before and after knitting and yoga can be seen in appendix 6.7

3.4 Inferential Statistics.

Wilcoxon signed rank sum test revealed similarities in the significant differences found in the conditions of knitting and yoga. Both hypothesis 1 which examined differences in repeated measures of heart rate and systolic blood pressure in knitting and yoga conditions; and hypothesis 2 which examined differences in repeated measures of semantic relaxation, and relaxation state, yielded significant results in repeated measures of semantic relaxation and relaxation state, and non significant results in systolic blood pressure. Differences were revealed between knitting and yoga in the significant result for repeated measures of heart rate in the knitting condition and the non significant result of repeated heart rate in the yoga condition. Table 9 displays the comparisons of results from hypothesis 1 and 2.

Hypothesis 1 and 2.
A Wilcoxon signed rank sum test was used to analyse repeated measures of heart rate, systolic blood pressure, semantic relaxation and relaxation state in the conditions of knitting and yoga. Inspection of the test results in the knitting condition show statistically significant results in semantic relaxation ($Z = -3.55$, $p = 0.00$, 2 tailed) and relaxation state ($Z = -4.01$, $p = 0.00$, 2 tailed). However no statistically significant difference was found in systolic blood pressure. ($Z = -1.63$, $p = 0.10$, 2 tailed) and heart rate ($Z = 0.03$, $p = 0.98$, 2 tailed). Inspection of test results in the yoga condition show statistically significant differences in heart rate ($Z = -2.49$, $p = 0.01$, 2 tailed), semantic relaxation ($z = -3.75$, $p = 0.00$, 2 tailed) and relaxation state ($Z = -2.96$, $p = 0.003$, 2 tailed). However no statistically significant difference was found in systolic blood pressure. ($Z = 0.41$, $p = 0.69$, 2 tailed)

Table 9. Comparing findings of Wilcoxon results for Hypotheses 1 and 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>l</th>
<th>Knitting</th>
<th></th>
<th>Yoga</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$Z$</td>
<td>Sig</td>
<td>$Z$</td>
<td>Sig</td>
</tr>
<tr>
<td>Pre and post systolic blood pressure</td>
<td>-0.41</td>
<td>0.69</td>
<td>-1.63</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Pre and post semantic relaxation</td>
<td>-3.75</td>
<td>0.00</td>
<td>-3.55</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Pre and post relaxation state score</td>
<td>-2.96</td>
<td>0.00</td>
<td>-4.01</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis 3.

A Wilcoxon signed rank sum test was used to analyse differences in heart rate, systolic blood pressure, semantic relaxation and relaxation state in the pre and post experimental conditions of knitting and yoga; based on regularity of participation in either condition. Results indicate little comparison between results of measures in the conditions of
knitting and yoga based on participation once a week. However more comparisons of repeated measures are revealed in the more than once a week condition between groups knitting and yoga. Table 10 displays comparisons of similar results of repeated measures in all conditions.

In the knitting condition 2 participants knit once a week. A Wilcoxon test revealed statistically significant differences in heart rate ($Z = -2.74$, $p = 0.01$, 2 tailed), semantic relaxation ($Z = -3.43$, $p = 0.00$, 2 tailed) and relaxation state ($Z = -2.63$, $p = 0.01$, 2 tailed). However the Wilcoxon revealed no statistically significant differences in systolic blood pressure ($Z = -1.25$, $p = 0.21$, 2 tailed). In the yoga condition 17 participants practise yoga once a week. A Wilcoxon test revealed statistically significant differences in systolic blood pressure ($Z = -2.11$, $p = 0.04$, 2 tailed) semantic relaxation ($Z = -2.63$, $p = 0.00$, 2 tailed) and relaxation state ($Z = -3.10$, $p = 0.00$, 2 tailed). However the Wilcoxon test found no statistically significant differences in heart rate ($Z = -0.23$, $p = 0.82$, 2 tailed).

In the knitting condition 22 participants knit more than once a week. A Wilcoxon test found statistically significant differences in repeated measures of heart rate ($Z = -2.74$, $p = 0.06$, 2 tailed) semantic relaxation ($Z = -3.43$, $p = 0.01$, 2 tailed) and relaxation state ($Z = -2.63$, $p = 0.01$, 2 tailed). However the Wilcoxon test also found no statistically significant difference in systolic blood pressure ($Z = -1.25$, $p = 0.21$, 2 tailed). In the yoga condition 7 participants practise yoga more than once a week. A Wilcoxon test found statistically significant differences in semantic relaxation ($Z = -2.20$, $p = 0.03$, 2 tailed) and relaxation state ($Z = -2.38$, $p = 0.02$, 2 tailed). However the Wilcoxon test also found no significant
differences between heart rate ($Z = 0.254$, $p = 0.80$, 2 tailed) and systolic blood pressure ($Z = -0.676$, $p = 0.50$, 2 tailed).

Table 10. Comparing findings of Wilcoxon results for Hypothesis 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knitting</th>
<th>Yoga</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$Z$</td>
<td>$Z$</td>
</tr>
<tr>
<td></td>
<td>Sig 2 tailed</td>
<td>Sig 2 tailed</td>
</tr>
<tr>
<td><strong>Once a week</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre and post heart rate</td>
<td>-1.34</td>
<td>-0.23</td>
</tr>
<tr>
<td></td>
<td>0.18</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>More than once a week</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre and post semantic relaxation</td>
<td>-3.43</td>
<td>-2.20</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Pre and post relaxation state</td>
<td>-2.63</td>
<td>-2.38</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Pre and post systolic blood pressure</td>
<td>-1.25</td>
<td>-0.68</td>
</tr>
<tr>
<td></td>
<td>0.21</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Hypothesis 4.

A Wilcoxon signed rank sum test was used to analyse differences in heart rate, systolic blood pressure, semantic relaxation and relaxation state in the pre and post experimental conditions of knitting and yoga; based on skill status of participation in either condition. Results indicate little comparison between results of measures in the conditions of knitting and yoga based on the beginner skill status of participants. However more comparisons of repeated measures are revealed in the intermediate condition between groups knitting and yoga. Table 11 displays comparisons of similar results of repeated measures in all conditions.
In the yoga condition 13 participants reported a beginner’s skill status. A Wilcoxon test revealed statistically significant differences in systolic blood pressure ($Z = -2.06$, $p = 0.04$, 2 tailed) semantic relaxation ($Z = -1.96$, $p = 0.05$, 2 tailed) and relaxation state ($Z = -2.69$, $p = 0.01$, 2 tailed). However the Wilcoxon test found no statistically significant differences in heart rate ($Z = -0.70$, $p = 0.94$, 2 tailed) in the knitting condition 3 participants reported a beginner’s status of skill. A Wilcoxon test revealed no statistically significant differences in heart rate and systolic blood pressure ($Z = -0.54$, $p = 0.59$, 2 tailed), semantic relaxation ($Z = -1.60$, $p = 0.11$, 2 tailed) and relaxation state ($Z = 0.00$, $p = 1.00$, 2 tailed).

In the knitting condition 15 participants reported an intermediate skill status. A Wilcoxon test revealed statistically significant differences in heart rate ($Z = -2.02$, $p = 0.04$, 2 tailed), semantic relaxation ($Z = -2.48$, $p = 0.01$, 2 tailed) and relaxation state ($Z = -2.61$, $p = 0.01$, 2 tailed). However the Wilcoxon test found no statistically significant result for systolic blood pressure ($Z = 0.98$, $p = 0.33$, 2 tailed). In the yoga condition 12 participants reported an intermediate skill status. A Wilcoxon test revealed statistically significant differences in semantic relaxation ($Z = -2.98$, $p = 0.00$, 2 tailed), and relaxation state ($Z = -2.98$, $p = 0.00$, 2 tailed). However the Wilcoxon test found no statistically significant differences in heart rate ($Z = -0.13$, $p = 0.89$, 2 tailed) and systolic blood pressure ($Z = -0.39$, $p = 0.69$, 2 tailed).

In the knitting condition 7 participants reported an advanced skill status. However in the yoga condition 0 participants reported an advanced skill status therefore no results can be compared and will not be reported.
Table 11. Comparing findings of Wilcoxon results for Hypothesis 4

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knitting</th>
<th>Yoga</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Z</td>
<td>Sig 2 tailed</td>
</tr>
<tr>
<td><strong>Beginner</strong></td>
<td></td>
<td></td>
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<tr>
<td>Pre and post heart rate</td>
<td>-0.54</td>
<td>0.59</td>
</tr>
<tr>
<td><strong>Intermediate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre and post systolic blood pressure</td>
<td>-0.98</td>
<td>0.33</td>
</tr>
<tr>
<td>Pre and post semantic relaxation</td>
<td>-2.48</td>
<td>0.01</td>
</tr>
<tr>
<td>Pre and post relaxation state score</td>
<td>-2.61</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Hypothesis 5

A Wilcoxon signed rank sum test was used to analyse measures of sub relaxation states identified in the Smith relaxation states inventory 3, basic relaxation, mindfulness, positive energy and transcendence, pre and post the experimental conditions knitting and yoga. Results reveal comparisons between results of repeated measures in the conditions of knitting and yoga. Table 12 displays comparisons of similar results of repeated measures in all conditions.

Inspection of test results in the knitting condition shows statistically significant differences in basic relaxation ($Z = -2.39$, $p = 0.02$, 2 tailed), positive energy ($z = -2.90$, $p = 0.00$, 2 tailed) and transcendence ($Z = -2.49$, $p = 0.01$, 2 tailed). However the Wilcoxon test found no statistically significant difference in mindfulness. ($Z = 0.00$, $p = 1.00$, 2 tailed)
Inspection of test results in the yoga condition shows statistically significant differences in basic relaxation ($Z = -3.57$, $p = 0.00$, 2 tailed), positive energy ($z = -3.63$, $p = 0.00$, 2 tailed). However, the Wilcoxon test found no statistically significant difference in mindfulness ($Z = 0.00$, $p = 1.00$, 2 tailed) and transcendence ($Z = -1.21$, $p = 0.23$, 2 tailed).

Table 12. Comparing findings of Wilcoxon results for Hypothesis 5

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Yoga</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$Z$</td>
<td>$Sig$</td>
<td>$Z$</td>
<td>$Sig$</td>
</tr>
<tr>
<td>Pre and post Basic relaxation</td>
<td>-2.39</td>
<td>0.02</td>
<td>-3.57</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre and post Mindfulness</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Pre and post Positive energy</td>
<td>-2.90</td>
<td>0.00</td>
<td>-3.63</td>
<td>0.00</td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis 6

Baseline measurements were recorded one week prior to participation in this experiment and again directly preceding 15 minutes of knitting or yoga. It was assumed that the two measurements of variables pre natural and experimental condition would show a statistically significant correlation. A Spearman rho correlation test was run to test this assumption in both conditions of knitting and yoga. Results reveal comparisons between results of repeated measures in the conditions of knitting and yoga. Both groups reveal significant associations in 6 of the 8 variables. Table 13 displays comparisons of similar results of repeated measures in all conditions.

Inspection of Spearman test results in the knitting condition reveal statistically significant associations between repeated measures of systolic blood pressure ($rho = 0.54$, $p =$
0.01, 2 tailed), relaxation state (rho = 0.59, p = 0.00, 2 tailed), basic relaxation (rho = 0.51, p = 0.01, 2 tailed), mindfulness (rho = 0.60, p = 0.00, 2 tailed), positive energy (rho = 0.61, p = 0.00, 2 tailed) and transcendence (rho = 0.61, p = 0.00, 2 tailed). However the Spearman test revealed no statistically significant associations between repeated measures of heart rate (rho = 0.37, p = 0.07, 2 tailed) and semantic relaxation (rho = 0.22, p = 0.29, 2 tailed).

Inspection of Spearman test results in the yoga condition reveal statistically significant associations between repeated measures of heart rate (rho = 0.79, p = 0.00, 2 tailed), systolic blood pressure (rho = 0.76, p = 0.00, 2 tailed), semantic relaxation (rho = 0.46, p = 0.03, 2 tailed), relaxation state (rho = 0.95, p = 0.00, 2 tailed), basic relaxation (rho = 0.93, p = 0.00, 2 tailed), mindfulness (rho = 0.88, p = 0.00, 2 tailed), positive energy (rho = 0.90, p = 0.00, 2 tailed) and transcendence (rho = 0.91, p = 0.00, 2 tailed).

Table 13. Comparing findings of Spearman Rho Correlation results for Hypothesis 6

<table>
<thead>
<tr>
<th>Variable</th>
<th>Knitting Rho</th>
<th>Sig 2 tailed</th>
<th>Yoga Rho</th>
<th>Sig 2 tailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre and baseline systolic Blood pressure</td>
<td>0.54</td>
<td>0.01</td>
<td>0.76</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre and baseline relaxation state score</td>
<td>0.59</td>
<td>0.00</td>
<td>0.95</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre and baseline basic relaxation</td>
<td>0.51</td>
<td>0.01</td>
<td>0.93</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre and baseline mindfulness</td>
<td>0.60</td>
<td>0.00</td>
<td>0.88</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre and baseline positive energy</td>
<td>0.61</td>
<td>0.00</td>
<td>0.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre and baseline transcendence</td>
<td>0.61</td>
<td>0.00</td>
<td>0.91</td>
<td>0.00</td>
</tr>
<tr>
<td>Number</td>
<td>25</td>
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</tr>
</tbody>
</table>
4. DISCUSSION

4.1 Aims.

The aim of this research is to examine the validity of the proposition: “Knitting is the new Yoga”, based on their ability to elicit the relaxation response, while accounting for the possible effects of additional factors, regular participation and skill.

4.2 Summary of Findings

Hypothesis 1

It was hypothesized that the elicitation of the relaxation response would be demonstrated by a significant decrease in heart rate and systolic blood pressure in the conditions of knitting and yoga. Descriptive statistics found that heart rate decreased following fifteen minutes of knitting: pre-mean 75.56, (SD = 11.52), post-mean 72.60, (SD = 10.69); fifteen minutes of yoga: pre-mean 78.56, (SD = 12.75), post-mean 75.40, (SD = 19.83). Descriptive and inferential statistics revealed an increase in systolic blood pressure in opposition to the indication of an elicited relaxation response in knitting and yoga. The decrease in heart rate in knitting was statistically significant (Z = -2.49, p = 0.01), however in the yoga condition no significant difference was found. Similarities were indicated in the direction and strength of means in knitting and yoga, providing some support for the proposition “Knitting is the new Yoga”. However the null is accepted for hypothesis 1 as neither group demonstrated the elicitation of the relaxation response based on decreases in heart rate and systolic blood pressure.
Hypothesis 2

It was hypothesised that the elicitation of the relaxation response would be demonstrated by a significant increase in semantic relaxation and relaxation state. Descriptive statistics found increases in measures of semantic relaxation in both knitting pre-mean 69.24, (SD = 18.64), post-mean 84.28, (SD = 11.98); and yoga pre-mean 57.16, (SD = 20.29), post-mean 74.16, (SD = 20.31). Increases were also found in relaxation state in both knitting: pre-mean 3.66, (SD = 0.74), post-mean 4.03, (SD = 0.670, and yoga: pre-mean 3.07, (SD = 0.59), post-mean 3.74, (SD = 0.78). Inferential statistics revealed significant differences in semantic relaxation in both knitting: (Z = -3.75, p = 0.00), and yoga: (Z = -3.55, p = 0.00). A statistically significant difference in relaxation state in knitting: (Z = -2.96, p = 0.00) and yoga: (Z = -4.01, p = 0.00) was also revealed. Therefore the null can be rejected and it can be assumed that there is support for the proposition that “Knitting is the new Yoga”.

Hypothesis 3

It was hypothesised that the regularity of the participation in knitting or yoga will affect the elicitation of the relaxation response. Descriptive statistics revealed decreases in heart rate and increases in semantic relaxation and relaxation state in both knitting and yoga in the conditions of: once a week and more than once a week. Interestingly systolic blood pressure increased in the more than once a week knitting condition pre-mean 129.91, (SD = 19.99), post-mean 132.95, (SD = 22.95), but decreased in the knitting once a week condition: pre-mean 143.00, (SD = 5.66), post-mean 132.00, (SD = 1.41). The reverse was found in the
more than once a week condition in yoga, where systolic blood pressure decreased: pre-mean 116.00, (SD = 15.25), post-mean 113.14, (SD = 11.17) compared with the once a week condition where systolic blood pressure increased: pre-mean 118.65, (SD = 15.05), post-mean 125.06, (SD = 18.65). However significant results that indicate the relaxation response in knitting and yoga, once a week condition are: semantic relaxation; knitting (Z = -3.43, p = 0.00), yoga (Z = -2.63, p = 0.00) and relaxation state knitting (Z = -2.63, p = 0.01), yoga (Z = -3.10, p = 0.00); and in the knitting and yoga, more than once a week condition semantic relaxation, knitting (Z = -3.43, p = 0.00), and yoga (Z = -2.20, p = 0.03).

Results indicate that both activities elicit some form of relaxation response however, a greater relaxation response is found in the once a week condition, with significant results in knitting condition: heart rate (Z = -2.74, p = 0.01), semantic relaxation and relaxation state and in the yoga condition systolic blood pressure (Z = -2.11, p = 0.04). Therefore the null hypothesis can be rejected as results indicate the regularity of participation affects the elicitation of the relaxation response.

Hypothesis 4

It was hypothesised that the skill level of knitters and yoga participants will significantly affect the elicitation of the relaxation response. Descriptive statistics found decreases in heart rate and increases in semantic relaxation and relaxation state, in the beginner and intermediate skill levels in knitting and yoga. Interestingly systolic blood pressure increased in the beginner yoga condition pre-mean 115.50, (SD = 12.07), post-mean 124.07, (SD = 20.08), and decreased in the intermediate yoga condition: pre-mean 120.25,
(SD = 16.98), post-mean 119.92, (SD = 14.21). Inferential Statistics indicate the relaxation response in the beginner knitting condition is not significant in any of the measures. However, in the beginner yoga condition statistically significant differences were found in systolic blood pressure (Z = -2.06) p =0.04), semantic relaxation (Z = -1.96, p = 0.05) and relaxation state (Z = -2.69, p = 0.01). In the intermediate knitting and yoga conditions statistically significant indicators of relaxation response are present in semantic relaxation knitting: (Z = -2.48, p = 0.01), yoga (Z = -2.98, p = 0.00) and relaxation state knitting (Z = -2.61, p = 0.01), yoga (Z = -2.98, p = 0.00).

While differences in relaxation responses are present between knitting and yoga in both beginners and intermediate skill levels, skill appears to significantly affect the elicitation of the relaxation response in the intermediate level. Significant knitting results were found in decreases in heart rate: (Z = -2.02, p = 0.04), semantic relaxation and relaxation state; whereas significant yoga results were found in systolic blood pressure and semantic relaxation, therefore the null hypothesis can be rejected.

Hypothesis 5

It was hypothesised that knitting and yoga participants will show an increase in relaxation states, positive energy and mindfulness following fifteen minutes of knitting or yoga. Descriptive statistics demonstrate knitting and yoga differences in the relaxation states of: basic relaxation knitting; pre-mean 3.08, (SD = 0.91), post-mean 3.48, (SD = 0.74), yoga: pre-mean 2.43, (SD = 4.70), post-mean 3.27, (SD = 0.85), positive energy knitting: pre-mean 3.85, (SD = 0.96), post-mean 4.24, (SD = 0.89), yoga: pre-mean 3.28, (SD = 1.01), post-mean
3.85, (SD = 1.03) and transcendence knitting: pre-mean 2.56, (SD = 0.93), post-mean 2.85, (SD = 0.96), yoga: pre-mean 2.28, (SD = 1.00), post-mean 2.43, (SD = 0.96), however mindfulness mean scores remained unchanged in both knitting and yoga. Inferential statistics revealed significant knitting and yoga differences in basic relaxation knitting: (Z = -2.93, p = 0.02), yoga: (Z = -3.57, p = 0.00) and positive energy knitting: (Z = -2.90, p = 0.00), yoga: (Z = -3.63, p = 0.00). A significant result was found for transcendence in knitting (Z = -2.49, p = 0.01) but not in yoga. Mindfulness produced no significant results in either knitting or yoga.

Similarities between knitting and yoga are expressed in descriptive and inferential statistics providing support for the proposition that “Knitting is the new Yoga”, the null can be rejected for the relaxation state positive energy, but must be accepted for the relaxation state mindfulness.

Hypothesis 6

It is hypothesised that knitting and yoga based on measurements of heart rate, systolic blood pressure, semantic relaxation, relaxation state, basic relaxation, mindfulness, positive energy and transcendence will be significantly associated. Descriptive statistics revealed differences in base line measures of all variables in knitting and yoga, with the exception of basic relaxation in the yoga condition, which remained unchanged. A Spearman rho correlation revealed significant associations between two knitting and yoga baseline measures of systolic blood pressure, knitting: (rho = 0.54, p = 0.01), yoga: (rho = 0.76, p = 0.00), relaxation state knitting: (rho = 0.59, p = 0.00), yoga: (rho = 0.95, p = 0.00), basic relaxation knitting: (rho = 0.51, p = 0.01), yoga: (rho = 0.93, p = 0.00), mindfulness knitting: (rho =
0.60, p = 0.00), yoga: (rho = 0.88, p = 0.00), positive energy knitting: (rho = 0.61, p = 0.00),
yoga: (rho = 0.90, p = 0.00) and transcendence knitting: (rho = 0.61, p = 0.00), yoga (rho =
0.91, p = 0.00).

An association between knitting and yoga can be observed in the baseline
measurements of 6 out of 8 of the variables, suggesting support for the proposition “knitting
is the new Yoga”, the null hypothesis can be rejected for systolic blood pressure, relaxation
state, basic relaxation, mindfulness, positive energy and transcendence, but can be accepted
for heart rate and semantic relaxation.

4.3 Supporting Research

The assumption that knitting is the new yoga is based on a perceived shared
meditative quality with yoga produced by repetitive movement and sound. Benson (1975,
2000) proposed that knitting and yoga can both elicit the relaxation response. This research
found some evidence of the relaxation response in both knitting and yoga although the
measures of relaxation varied between groups. Smith (1999, 2001) proposed that different
activities may produce differences in levels and elements of the relaxation response, which
may explain the findings in this research.

Decreases in systolic blood pressure is reported by Benson (1975, 2000) to indicate
elicitation of the relaxation response, however results of this study are inconsistent with this.
Ghoncheh et al (2004) waited for 3 minutes after the experimental condition to measure
blood pressure and heart rate. Future research may consider waiting for a few minutes post knitting or yoga before taking measurements and compare results with this study.

This study revealed feelings of relaxation are frequently reported compared to physiological indicators of relaxation. Benson (2000) said subjective feelings of relaxation often accompany the relaxation response. Aivazyan et al (1988) proposed that as one becomes more practised in the art of relaxation the effects become more profound. This study found participants at an intermediate level of skill reported a greater number of indicators of the relaxation response. Benson (1975, 2000) found that regular transcendental meditation led to reduced differences in blood pressure and heart rate as the relaxation response lasts longer and a permanent optimum level can be maintained. However this study found a greater relaxation response in participants of yoga and knitting in the less frequent practitioners.

Manning (2004, p.4) said “knitting is a mindful activity” however this study found no changes in mindfulness as a result of knitting or yoga. Williams et al (2003) proposed the relaxation response can increase energy and relax the body. This study found a significant increase in positive energy and basic relaxation following yoga and knitting.

4.4 Strengths and Limitations

The sample size was too small to make any real assumptions about the abilities of any correlation between knitting and yoga in this study. While results indicate increases in relaxation a larger sample, tested on more than one occasion for either a longer period of time
or in multiple variations of time may provide more reliable results. Furthermore this research lacked the control of a true experiment. With differences in how yoga participants were sourced and tested within groups and between groups reduced the consistency of controls for extraneous variables. However conducting field research offers strength to the findings as they reflect conditions encountered in everyday living as would be the case when exposed to stress and attempting to counteract it by purposefully eliciting the relaxation response. Future research may consider replicating this study under more controlled conditions, in a laboratory or in purposely formed groups.

Based on assumptions that knitting, yoga and eliciting the relaxation response has health benefits (Benson 1975, Esch et al 2002, Williams et al 2003, Ferber 2012) future research may build on this research by adding health related variables. A strength of this study is its scientific approach to examining the hypothesis. The experiment was carefully designed to prevent as much disruption to existing groups as possible and in every instance was successfully completed with no difficulties.

4.5 Conclusion

In conclusion this research examined variables that indicate the elicitation of the relaxation response in an attempt to compare knitting and yoga in support of the proposition “knitting is the new yoga”. The null was accepted for hypothesis 1 based on lack of evidence of the relaxation response; also in part for hypothesis 5 based on the static measures of mindfulness and finally in part for hypothesis 6 based on insignificant results in baseline measures of heart rate and semantic relaxation. The null was rejected in all other hypotheses.
This research finds evidence to support the proposition “knitting is the new yoga” but recommends further research be carried out for greater reliability and confidence in the research findings.
5. REFERENCES


(Published 25/01/05).


http://www.stitchlinks.com


6. APPENDIX

6.1: Appendix Information letter presented with each questionnaire pack.
(materials and Procedure)

My name is Christiana Croghan and I am conducting research in the Department of Psychology at Dublin Business School, which explores the proposition ‘Knitting is the new yoga’. This research is being conducted as part of my studies and will be submitted for examination.

You are invited to take part in this study and participation involves completing and returning the attached anonymous survey. Measurements of Blood pressure and Heart rate will also be collected using a wrist monitor. All measurements will be recorded a total of 3 times. One set of baseline measurements and two sets of experimental measurements pre and post yoga participation.

Participation is completely voluntary and so you are not obliged to take part. Participation is anonymous and confidential. Thus responses cannot be attributed to any one participant. For this reason, it will not be possible to withdraw from participation after the final questionnaire has been collected.

The questionnaires will be securely stored and data from the questionnaires will be transferred from the paper record to electronic format and stored on a password protected computer. Data will be stored for one year following examination, at which time original questionnaires will be shredded and electronic files will be deleted.

Data collected on the wrist monitor will be transferred to paper and then to an electronic format and stored on a password protected computer. Information recorded on the wrist monitor will be deleted immediately following transferences of data.

It is important that you understand that by completing and submitting the questionnaire and allowing measurements of blood pressure and heart rate that you are consenting to participate in the study.

Should you require any further information about the research, please contact Christiana Croghan at ************ or telephone **********. My supervisor Dr Garry Prentice can be contacted at ************, or **********

Thank you for taking the time to complete this survey and providing heart rate and blood pressure measurements.

Christiana Croghan
6.2 Appendix: questionnaire pack (a) (materials)

Select the response that best represents you.

1. How regularly do you practice yoga?
   
   More than once a week
   
   Once a week
   
   Less than once a week

2. What is your level of skill in the practise of yoga?
   
   Beginner
   
   Intermediate
   
   Advanced
6.2 Appendix: questionnaire pack (a) (materials)

Select the response that best represents you.

1. How regularly do you hand knit?
   - More than once a week
   - Once a week
   - Less than once a week

2. What is your level of skill in the practice of hand knitting?
   - Beginner
   - Intermediate
   - Advanced
6.2 Appendix: questionnaire pack (b) (materials)

How relaxed do you feel right now?

Mark your response on the line below.

0 represents not relaxed at all and 100 represents totally relaxed.

0

100

Not relaxed
totally relaxed

At all
6.2: Appendix: Questionnaire pack (c) (materials)

SRSI3

HOW DO YOU FEEL RIGHT NOW? PLEASE CHECK ALL THE ITEMS USING THIS KEY.

RIGHT NOW, I FEEL THIS

Not at All A Little . . Moderately . . A Lot Maximum

1 2 3 4 5 6 1. My mind is SILENT and calm (I am not thinking about anything).
1 2 3 4 5 6 2. My muscles feel TIGHT and TENSE (clenched fist or jaws; furrowed brow).
1 2 3 4 5 6 3. I feel AT PEACE.
1 2 3 4 5 6 4. I feel DROWSY and SLEEPY.
1 2 3 4 5 6 5. Things seem AMAZING, AWESOME, and EXTRAORDINARY.
1 2 3 4 5 6 6. Right now I recognize the wisdom of sometimes ACCEPTING things as they are.
1 2 3 4 5 6 7. My muscles are SO RELAXED that they feel LIMP.
1 2 3 4 5 6 8. I am HAPPY.
1 2 3 4 5 6 9. I am WORRYING
1 2 3 4 5 6 10. I feel AT EASE.
1 2 3 4 5 6 11. I feel DISTANT and FAR AWAY from my cares and concerns.
1 2 3 4 5 6 12. I feel ENERGIZED, CONFIDENT, and STRENGTHENED
1 2 3 4 5 6 13. I am DOZING OFF or NAPPING.
1 2 3 4 5 6 14. I feel THANKFUL.
1 2 3 4 5 6 15. I feel like I am living fully and SIMPLY in the PRESENT, not distracted by past or future concerns.
1 2 3 4 5 6 16. Things seem TIMELESS, BOUNDLESS, or INFINITE
1 2 3 4 5 6 17. I feel IRRITATED or ANGRY.
18. I feel JOYFUL.
19. I feel SAD, DEPRESSED, or BLUE.
20. I feel AWARE, FOCUSED, and CLEAR.
21. My hands, arms, or legs are SO RELAXED that they feel WARM and HEAVY.
22. I feel INNOCENT and CHILDLIKE.
23. My BREATHING is NERVOUS and UNEVEN (Or shallow and hurried).
24. I feel LOVING.
25. Things seem FRESH and NEW, as if I am seeing them for the first time.
26. I feel INDIFFERENT and DETACHED from my cares and concerns.
27. I feel PRAYERFUL or REVERENT.
28. I feel PHYSICAL DISCOMFORT or PAIN (backaches, headaches, fatigue)
29. My mind is QUIET and STILL.
30. I feel ANXIOUS.
31. I sense the DEEP MYSTERY of things beyond my understanding.
32. I feel RESTED and REFRESHED
33. I feel CAREFREE.
34. TROUBLESOME THOUGHTS are going through my mind.
35. My body is PHYSICALLY RELAXED.
36. Presently I feel there=s no need to try to change things that simply cant be changed.
37. I feel fully focused and ABSORBED in what I am doing
38. I feel OPTIMISTIC, HOPEFUL, or TRUSTING that I can rely on someone or something.

Your age: __________ Gender: M F 2005, Jonathan C. Smith, PhD
6.3 appendix: Consent e-mail from Dr J. Smith to use the SRSI3 questionnaire. (Materials)

Jonathan C. Smith

To

christiana croghan

Dear Christina,

You have my permission to use the SRSI3 (www.lulu.com/stress), and make as many copies as you need.

Best of luck in your very interesting and important project! Keep me posted.

Dr. Smith
### 6.4 Appendix: Recording sheet for blood pressure and heart rate (Materials and procedure)

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6.5: Appendix E-mail requesting participants. (Procedure)

Dear ________________________________

I am conducting an experiment for my psychology degree thesis and would like to invite your yoga group to take part. Basically based on Herbert Benson 1975 theory that both yoga and knitting elicit the same relaxation response I wish to measure changes in blood pressure and heart rate of participants that take part in regular groups of either knitting or yoga both before and after a normal class.

What I propose is that you discuss with your usual group and if they are happy to take part I would need to meet one week prior to the experiment and ask each member to complete a questionnaire. The following week both before and after the class I would need to take a recording of each member’s Blood pressure and heart rate using a wrist monitor. Each reading takes 1 minute. I would also ask members to complete a questionnaire before and after the class perhaps 5 minutes to complete each.

I will not be taking any names of participants; for the first reading initials will be used to identify members for the matching of data for the second meeting. On completion of readings on the day of experiment all dates of birth will be replaced by an unidentifiable code so anonymity and confidentiality will be maintained.

What is important for participants to note is that I am unable to give advice regarding blood pressure and heart rate readings as my purpose is not one of diagnosis, but simply to record any changes that occur as a result of yoga. However if anyone wishes a copy of their results I will happily give them to individuals.

Members that wish to withdraw from the experiment may do so up until the time I leave the experiment on the final day as initials are transferred to code I will have no way of knowing who's information is who's.

When my research is complete it will be seen by assessors in Dublin Business School and kept on record at the college. If the group are interested in the results of the experiment I can provide you with a copy of results to share with the group next September when marking is complete.

I really hope you and your group members will be happy to take part in this experiment. Please feel free to contact me on [redacted] or by email. I have attached a copy of the questionnaires that will be used for the experiment the first page of the questionnaire will only be administered at the first meeting. The other two questionnaires will be administered before the yoga class on meeting one; and before and after the class on the experiment day.

I hope to conduct the experiment during February if this is suitable for you.

Kind regards

Christiana Croghan
6.6: Appendix Histograms of normality tests. (Data Analysis)
6.7: Appendix Bar charts of mean score differences before and after knitting or yoga. (Descriptive statistics)