

**The Effects of Physical Activity  
On Perceived Stress, Anxiety  
And Life Satisfaction**

Noeleen Richardson

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Business School, School of Arts, Dublin.

Supervisor: Dr Rosie Reid

Head of Department: Dr Sinead Eccles

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Department of Psychology

DBS School of Arts

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### **Abstract**

The aim of the study is to investigate if levels of stress, anxiety and life satisfaction correlate with engaging in regular physical activity, investigating associations with duration and exercise frequency. A quantitative cross sectional research design was adopted, using a self-completion questionnaire survey of 128 participants consisting of demographic information: age and gender and novel questions relating to engagement of exercise, activity type, frequency and duration, using Perceived Stress, State Trait Anxiety and Life Satisfaction scales. Results showed significant lower levels of stress and anxiety, increased levels of life satisfaction with physical activity across duration and frequency. The results support existing research engaging in regular physical activity has beneficial effects on individual's lives.

**Keywords:** Stress, Anxiety, Physical Activity, Life Satisfaction

## Introduction

An emerging body of evidence recognised that regular exercise has many beneficial effects on health and life satisfaction (Diener & Chan, 2011). The benefits affect psychological, physical health and life satisfaction. Physical activity (PA) helps to maintain a healthy body and there is a mounting body of research to suggest that engaging in regular PA lowers the risk of cardiovascular diseases, cancer, diabetes and indicates benefits for a better quality of life (Thune & Furberg, 2001; Nocon et al., 2008; Sofi, Capalbo, Cesari, Abbate & Gensini, 2008). High levels of perceived stress contribute to negative feelings such as anxiety and depression (Cohen, Janicki-Deverts & Miller 2007). Research suggests PA reduces perceived stress levels (Salmon, 2001) and in turn is associated with better physical health (Cohen, et al., 2007; Haskell et al., 2007). An elevated resting heart rate increases the risk of cardiovascular disease (CDV) mortality (Kristal-Boneh et al., 2000; Palatini 2006). Research has shown that regular PA is associated with a decreased heart rate (Houde & Melillo 2002). Furthermore, research provides evidence that performing aerobic exercise represents an antihypertensive therapy, and in turn is effective in minimizing cardiovascular risk factors (Maiorana et al., 2003; Goldsmith et al., 2000).

PA plays a role in the reduction of obesity, hypertension and cholesterol. Emotional stress and anxiety has been linked to be a major likely cause of hypertension (Littleton et al., 1981). Research suggests that a combination of resistance exercise and aerobic exercise programmes aid the prevention and control of hypertension (Fletcher et al, 2001; Keese et al., 2011). Furthermore, Sorace & associates, (2012) found this combined exercise programme should be undertaken five times per week starting with lighter activity and subsequently moderate activity. It is however, important to note that although exercise indicates to be beneficial for hypertension, it should be prevented if an individual has blood pressure above

160 mmHg systolic and 105 mmHg diastolic, respectively, as these high levels can cause cardiac ischemia or intracranial aneurysms (Brazilian Society of Hypertension, 2010)

### *Physical Activity Definition*

According to the World Health Organisation (2004) physical activity is defined as “any bodily movement produced by skeletal muscles that require energy expenditure”. Furthermore the World Health Organisation (2010) identifies physical inactivity as a leading risk factor for 6% of deaths globally. The psychological effects of engaging in physical exercise are associated with improved mood, reduced anxiety, reduced depression and acts as a buffer against stress. The body releases chemicals known as endorphins these are polypeptides, which bind to the neuron-receptors in the brain to reduce stress, relieve pain, enhance the immune system and postpone the aging process. Various types of activity and amounts of activity are associated with reducing stress and anxiety (Taylor, 2000; cited in Vancampfort et al., 2011).

### *Physical Activity and Gender*

Earlier studies have found that males partake in physical activity more so than females (Monteiro et al., 2003; Steptoe et al. 2002), although (Hallal et al., 2003) did not concur with this and observed no gender differences. Azevedo, Araujo, Reichert, Siqueira, da Silva, Hallal. (2007) do not concur with earlier studies. They examined the association between gender and physical activity of adults living in Brazil. They also proposed that socioeconomic status was significantly associated with physical activity in both males and females. Warburton and associates (2006), found that higher levels of physical activity were associated with a decreased risk of developing cardiovascular disease while, regular aerobic exercise was associated with reduced rates of cardiovascular disease in women (Manson et al.

2002) and reduced resting blood pressure (Cox 2006). Interestingly, swimming was linked with increased resting blood pressure in women (Cox 2006). Furthermore, walking or cycling reduced the risk of coronary heart disease in females however; no such reduction was evident in males (Hu et al., 2005). Bucksch and Schlicht (2006) suggested that 30 minutes of moderate intensity activities daily are essential to prevent harmful health effects.

### *Stress*

Stress is the non-specific response of the body to any demand made of it (Seyle, 1974). All individuals experience stress at some stage in their lives caused by stressors. Characteristics that influence individual's lives, depend on the stressors and the types of changes or events they are dealing with, stress can manifest it-self physically, emotionally and or mentally. Endocrinologist Hans Selye (1976) coined the term stress and provided important research into the physiological and psychobiological explanation for stress. There can be positive or negative stressors in life for example, a new-born baby or promotion (positive) or death of a loved one or career failure (negative).

### *Seyle's Stress Theory - General Adaptation Syndrome*

Seyle (1956) was responsible for proposing the General Adaptation Syndrome (GAS) which suggests there are three stages in the stress process. The alarm stage occurs immediately when an individual is exposed to a stressful situation or event. The nervous system (SNS) and the adrenal glands release the main stress hormones such as cortisol, adrenaline, and noradrenaline, which are responsible for providing instant energy. This is the fight or flight response. Resistance, the second stage is involved with coping mechanisms and it attempts to reverse the alarm stage. In the third stage, exhaustion is the repeated exposure to alarm which may cause individuals to become exhausted and therefore unable to

show further resistance (Seyle, 1956). Stress levels continue to rise which may damage nerve cells in tissues and organisms. The autonomic nervous system (ANS) can also be affected and result in high blood pressure, heart disease, rheumatoid arthritis, and other stress related illnesses. Research suggests that chronic psychological stress is linked to cardiovascular diseases including hypertension and cholesterol (Dimsdale, 2008).

Unfortunately, prolonged exposure to stress can affect an individual's emotional, physiological and behavioural responses and in turn may result in medical problems (Miller et al, 2009). Evidence suggests that there is a relationship between physical exercise and mental health and in particular the effects that regular exercise can have on stress management levels (Salmon, 2001).

Further research by Seyle, (1974) suggests that prolonged amounts of stress can cause physiological changes to the normal chemical balance of the brain, causing depletion of certain hormones and neurotransmitters. Benzodiazepines and serotonin reuptake inhibitors work on neurotransmitters within the brain, helping to regulate and enhance the effects of gamma-amino butyric acid (GABA) and serotonin, allowing the brain to function normally. Beta blockers affect the autonomic nervous system (ANS), which are administered to reduce blood pressure and the effect of adrenaline on the body, and aid in alleviating the physical symptoms of stress. Stress can have detrimental effects, in particular in relation to coronary heart disease. Individuals with coronary heart disease can experience reduced life satisfaction and research has provided support that physical activity can result in positive health benefits (McDonnell et al., 2011).

#### *Lazarus's Stress Theory - Cognitive Transaction Model of Stress*

Following on from Seyle's theory Richard Lazarus (1984) proposed a two way process stress model known as the Cognitive Transaction Model of Stress which has provided

to be important and is the most influential theory of stress to date. There are two types of appraisals: primary appraisal and secondary appraisal. Primary appraisal determines whether an event is stressful or not and if it requires psychological appraisal for example, positive, neutral and negative (Lazarus & Folkman, 1984). An individual will subsequently assess what damage has been done so far, if there is any further possible damage and challenge the potential to overcome or profit from the stressful event. Secondary appraisal often occurs at the same time as primary appraisal. For example, some students face the positive secondary appraisal to stress, they may believe that they can and will pass an exam while others have to deal with a negative secondary appraisal whereby they believe they cannot pass an exam and believe that others do not expect them to pass the exam either.

Perceived stress has been linked with adverse physical health illness, with research suggesting that high levels of perceived stress contribute to feelings of anxiety, depression, biological and behavioural processes that play a role in the development of several physical health problems (Miller, Chen & Cole, 2009). Research suggests that high levels of perceived stress are related to low levels of exercise (Ng & Jeffery, 2003). Furthermore, stress is known to have a negative effect on cognitive and brain aging (Sapolsky, 1999). Stress affects the hippocampus and recent research suggests that stress and stress hormones are related with memory deterioration (Sauro, Jorgensen, & Pedlow, 2003).

Prolonged stress affects emotional, physiological and behavioural responses which influences the susceptibility of disease (Miller et al, 2009). Further support of this evidence has provided that physical activity is associated with better physical health, in particular with individuals experiencing multiple stressful events who display physiological distresses (Brown, 1991; Brown & Siegel, 1988; Carmack et al., 1999; cited in Rueggeberg, Wrosch & Miller, 2012).

### *Coping Mechanisms*

Coping is defined as “constantly changing cognitive and behavioural efforts to manage specific external and internal demands that are appraised as taxing or exceeding the resources of the person” (Lazarus & Folkman, 1984, p.141). There are two categories individuals can use to cope with and manage the stress they are under. They are known as problem-focussed and emotion-focussed (Lazarus 1991). Problem-focused coping is involved with tackling a stressful situation and focuses on the causes of the stress, therefore attempting to directly reduce the stress through problem solving, planning and action (Folkman & Lazarus, 1985; Sasaki & Yamasaki, 2007). For example, a student may require a change in accommodation if they have a difficult roommate. The college student must take control and remove the stress, and put into place cognitive strategies to avoid this particular stress in the future. Emotion-focussed coping attempts to remove negative emotions associated with stress for example, fear, anxiety, frustration and depression (Folkman, & Lazarus, 1985). Evidence suggests that females are thought to adopt emotion-focused coping more so than males (Ptacek et al. 1994; cited in Lawrence et al. 2006). Roesch, Wee and Vaughn (2006) suggested that an individual’s unique set of personality traits similar to the big five personalities also help to cope with stressors.

### *Anxiety*

According to Passer and Smith (2009) anxiety is defined as “the state of tension and apprehension that is a natural response to a perceived threat” (p. 787). Anxiety responses vary from feelings of tension, sense of being unable to cope, increased heart rate and blood pressure, muscle tension and impaired task performances (Barlow, 2002). Anxiety affects millions of people world-wide and is associated with increased mortality and has been associated with high economic costs and reduced work place performance (Albert et al, 2005;

Smoller et al, 2007). Anxiety disorders affect approximately 40 million US adults per year with prevalence rates higher in females than males (Kessler, Chiu, Demler & Walters, 2005). Anxiety disorders include phobic disorder, generalised anxiety disorder (GAD), panic disorder, obsessive compulsive disorder (OCD), and post-traumatic stress disorder (PTSD).

Recent research in neuroimaging has provided important findings in determining brain areas that underlie anxiety disorders. Excessive fear is an important component in anxiety disorders. In PTSD the amygdala is hyper-responsive (Morey et al, 2009; Bryant et al, 2008b), while ventral portions of the medial prefrontal cortex (mPFC) are hypo-responsive (Hou, et al, 2007); Kim et al, 2007). In addition PTSD has been associated with diminished hippocampal volumes and abnormal functioning (Etkin & Wager, 2007). In panic disorder the amygdala and brain stem are hyper-responsive (Pillay et al, 2007) and abnormalities in hippocampal metabolic rates were reported (Sakai et al, 2005). In GAD it appears the activation of the Amygdala is exaggerated (Monk et al, 2008), while (mPFC) activation is elevated (McClure et al, 2007b). Anxiety can occur during intense hormonal changes such as puberty, pregnancy or menopause and research suggests that changes in the two sex hormones oestrogen and testosterone may contribute to anxiety levels (Bangasser, 2013).

A study conducted by De Moor and associates (2006) have shown that individuals who exercise are less anxious than those who do not. According to Spielberger, (1983) state anxiety refers to the temporary dimension of anxiety which relates to stress responses while, trait anxiety refers to character dimension of anxiety which refers to long-term stability of personality. Ma et al., (2009) conducted a study examining the role of state and trait anxiety in physical activity participation of Taiwanese adults and found there was a significant negative correlation between trait anxiety and physical activity in individuals with anxiety disorders. However, no significant association between trait anxiety and physical activity was reported. Anxiety reduction in relation to Dienstbier's model 1989 suggests chronic

exercise is correlated with trait anxiety reduction and in particular when PA duration exceeds nine weeks. Previous research suggests that physical activity can reduce symptoms of anxiety (Ross & Hayes, 1988; Asztalos et al., 2012) and more recent findings show a link between physical exercise and anxiety (Bicer, Asghari, Kharazi & Asl, 2012). The potential relationship between anxiety and hypertension has been examined and according to (Johannessen, Strudsholm, Foldager & Munk-Jorgensen, 2006) individuals with anxiety disorders have increased risks of developing hypertension. Meanwhile, anxiety has been shown to increase the risk of diabetes (Engum, 2007). PA has been associated with reduction of anxiety levels (Petruzzello et al., 1991; Stewart et al., 1994) by impacting on the biological system (Hoffmann, 1997) and emotional status (Stutts, 2002). Therefore, participating in regular PA has demonstrated an importance for individuals with anxiety disorders (Paluska & Schwenk 2000).

### *Life satisfaction*

Life satisfaction is defined as a global assessment of a person's quality of life (Shin & Johnson, 1978). Furthermore, Brand et al, (2010) define life satisfaction as a measure of how happy individuals are and how satisfied they are with life. Satisfaction with life relates to a person's physical and mental health and can determine a person's level of happiness throughout life (Diener & Chan, 2011). Obesity is directly caused by an imbalance in dietary intake and PA along with underlying mechanisms including sociocultural, environmental and genetic factors (Swinburn et al., 2011). Obesity has serious medical consequences such as Type II diabetes, CVD and contributes to morbidity and mortality and is associated with reduced life satisfaction (Coldquitt, Picot, Loveman & Clegg, 2009). Physical activity has been linked with enhancing life satisfaction and research by McAuley and associates, (2008) provided research that there is an association in participating in regular physical activity and

improved satisfaction with life. Satisfaction with life can affect physical self-worth, self-efficacy and mental health (McAuley et al., 2008). Further support of this reported that satisfaction with life was impacted by individual's daily physical activity which has important consequences in developing strategies to enhance life satisfaction (Maher et al., 2013).

### *Aim of Study*

The aim of this study is to investigate whether there is a correlation in levels of stress, anxiety and satisfaction with life of those who engage in regular physical activity compared with those who do not. This study also investigated the effects of activity type, duration and frequency on stress, anxiety and life satisfaction. Overall the results from this study could provide support of previous research in the field demonstrating that physical activity can contribute to improving health problems related to stress and anxiety and increase satisfaction with life. Furthermore this research should highlight awareness of the importance of regular PA and provide future directions in developing programmes to reduce anxiety and stress related illnesses. Stress and anxiety have been found to exacerbate many illnesses such as diabetes, coronary heart disease, hypertension, asthma, depression, and gastrointestinal diseases. Individuals suffering from stress and anxiety are likely to result in bad behaviours such as unhealthy eating and excessive drinking leading to rising glucose levels especially in individuals with type II diabetes. Diseases and disabilities increase as individual's age and it has been found to be hugely important for PA to increase life expectancy (Lee, Shiroma, Lobelo, Puska, Blair & Katzmarzyk, 2012). Depending on major life events or transitions individuals happen upon for example, occupation, socioeconomic status (SES) these can affect social and physical activities (McMunn, Nazroo, Wahrendorf, Breeze & Zaninotto, 2009) with retired individual's levels of PA differing from when in employment.

Furthermore, Barnes, Yaffe, Satariano and Tager, (2003) postulate the importance of exercise for increasing attention and performance on cognitive tasks and more importantly to protect aging individuals against cognitive decline (Etgen, et al., 2010). The World Health Organisation states that 50% of adults in Europe and United States of America do not follow the health recommendations relating to physical activity (WHO, 2010).

### *Hypotheses*

Hypothesis 1: There will be a significant difference in perceived stress, anxiety and life satisfaction between participants who do or do not regularly exercise.

Hypothesis 2: There will be significant differences in perceived stress, anxiety and life satisfaction across a variety of exercise activities.

Hypothesis 3: There will be a significant correlation between amount of exercise and life satisfaction.

Hypothesis 4: There will be significant differences in perceived stress, anxiety and life satisfaction between exercise frequency groups.

Hypothesis 5: There will be a significant difference in the effect of duration of exercise on perceived stress, anxiety and life satisfaction.

## Method section

### *Participants*

The total number of participants involved in the research was one hundred and twenty eight (n =128), female (n = 75) and male (n = 53). The sample was a mix of physically active individuals who accounted for 58.6% and non-physically active individuals who accounted for 41.4% subjects. The population of participants were from the Killashee Leisure Centre in Naas, Co Kildare, family, friends, their friends and Dublin Business School students who took part as part of a class. All participants had the option to withdraw their data if they wanted before the questionnaires were collected. This was explained to participants in the cover letter with the questionnaire and that the information is anonymous, confidential and completely voluntary. Thus responses could not be attributed to any one participant. For this reason, it would not be possible to withdraw from participation after the questionnaire has been collected. The mean age of the sample was (m = 35.03), the age range was (18 - 68), standard deviation of age (SD = 12.06). The Inclusion Criteria for this research was all participants must have a reading/writing ability and the exclusion criteria was all must all be over 18 years of age. The rate of questionnaires returned was approximately 98% (128/130) which were distributed between the 3<sup>rd</sup> December 2013 and the 29<sup>th</sup> February 2014.

### *Design*

The design used in this research was cross-sectional, quantitative, correlation and used mixed methods. It was two-tailed and used nominal, ordinal and scale data levels of measurement. Hypotheses 1 used between groups design the IV variable is participants who do or do not exercise and the DV variables are perceived stress, anxiety and life satisfaction between-groups. Hypothesis 2 used a series of independent t-tests, between groups the IV variable is type of activities and DV variables are perceived stress, anxiety and life

satisfaction. Hypothesis 3 used a correlational design the PV variables are the amount of regular physical activity, age and gender and the CV variables are perceived levels of stress, anxiety and life satisfaction within-groups. For hypothesis 4 a between groups design was used the DV was exercise frequency and the IV was perceived stress and anxiety levels and satisfaction with life. Finally, hypothesis 5 was between groups the DV was exercise duration and the IV's were levels of perceived stress, anxiety and life satisfaction.

### *Materials*

A self-administered, paper and pen questionnaire was used to gather some demographics of the sample, such as age and gender and four novel questions relating to engagement of exercise, type of activity, frequency (< 1 Month, 2-6 months, 6-12 months & >12 months) and duration (once per week or more than three times per week). It also comprised of three frequently used and reliable questionnaires. The first questionnaire used was the Perceived Stress Scale (PSS, Cohen, 1983) which consisted of 14 questions. Participants were asked to indicate their feelings and thoughts during the last month on a five point Likert scale (0 – never, 1 – almost never, 2 – sometimes, 3 – fairly often, 4 – most often). Scores were reversed for the positively worded items (4,5,7 & 8) eg 0=4, 1=3, 2=2, 3=1, 4=0 and added together with original scores. The higher the overall total scores the greater the amount of perceived stress the person is experiencing.

The second of the three questionnaires was State Trait Anxiety Scale (STAI, Spielberger, 1983) which consisted of 40 questions and was used to determine the anxiety level of participants. For the first 20 questions participants were asked to evaluate how they feel right now - at this moment on a four point Likert scale (1 - not at all, 2 - sometimes, 3 - moderately so and 4 - very much so). The last 20 questions participants evaluate how they feel generally on the same four point scale. Scores range from 20-80 separately for the S-

anxiety and T-anxiety scale. High scores indicate a severe form of anxiety whereas median scores indicate a moderate form of anxiety and low scores indicate a mild form of anxiety.

The final part of the questionnaire was Satisfaction with Life Scale (SWLS, Diener, Emmons, Larsen, & Griffin, 1985) participants are asked to indicate their agreement on five statements using 1 - 7 scale, (7 - strongly agree, 6 – agree, 5 - slightly agree, 4 - neither agree nor disagree, 3 - slightly disagree, 2 – disagree, 1 - strongly disagree). Scores range from 5 to 35 with higher scores indicating greater life satisfaction. A copy of the questionnaire can be found in (Appendix A).

A typed cover sheet preceded each questionnaire which clearly explained that the research study was related to the effects of physical activity on stress, anxiety and life satisfaction and what was expected of each participant. It also addressed ethical concerns such as confidentiality and the right to withdraw at any time. Upon completing the questionnaire the participant gave their consent. The cover sheet can be found in (Appendix B). A sealed cardboard box was used for participants to place their questionnaire upon completion.

### *Procedure*

Following ethical approval from the Department of Psychology in Dublin Business School, permission was sought and granted within that week from Killashee Leisure Centre. Times and dates were set up for the month of December 2013 to gain access to some of my sample. Participants were asked to complete a questionnaire for research on the effects of physical activity has on stress, anxiety and life satisfaction. It was explained in their cover letter that it may take approximately 10 minutes to complete. It also discussed confidentiality, anonymity and their right to withdraw until they placed their questionnaire in the sealed cardboard box. Participants were debriefed the last page of the questionnaire

consisted of helpline numbers for participants in case they were affected by any of the questions asked. This can be found in (Appendix 3). When all the questionnaires were collected the data was entered on IBM SPSS 21 the statistical software package for analysis. Statistical tests were conducted to obtain descriptive statistics and test the hypotheses and discuss the findings of this research.

## Results

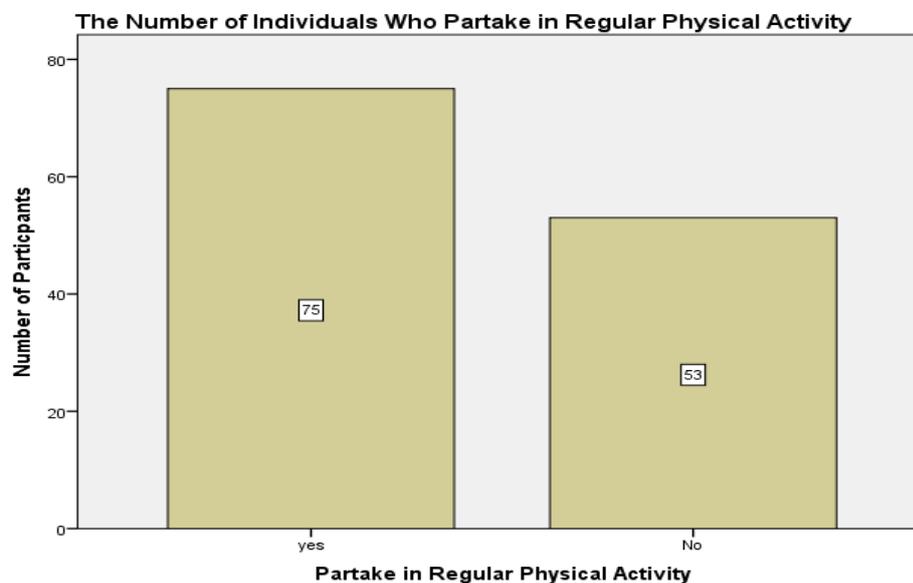
### *Descriptive Statistics*

Descriptive statistics were run to achieve the measures of central tendency, measures of variability, frequencies and information about the spread of the distribution. The variables included were perceived stress, anxiety and life satisfaction. The results were examined using three types of procedures, an Independent Sample T-test was run for hypothesis 1 to explore if there were significant differences in perceived stress, anxiety and life satisfaction between participants who do or do not regularly exercise. For hypothesis 2 a series of Independent Samples T-tests were run to explore if there were significant differences in perceived stress, anxiety and life satisfaction across a variety of exercise activities such as walking, jogging/running, cycling, aerobics/fitness class, martial arts, team sports, gym workout, swimming, aqua aerobics, horse riding and yoga. A total of 128 participants (Male= 53, Female= 75) took part in this study. The age of participants ranged from 18- 68 (Mean age = 35.03, SD= 12.06). The average scores for each of the variables measured are shown in Table 1.

*Table 1: Descriptive Statistics of Psychological Measures*

	Mean	Std. Deviation	Minimum	Maximum
Perceived Stress	17.68	7.72	2	36
State Anxiety	39.76	15.02	20	79
Trait Anxiety	42.30	14.08	20	80
Life Satisfaction	21.56	7.66	5	34

Graph 1 – The Number Of Participants Who Did or Did Not Partake in PA.



### Inferential Statistics

*Hypothesis 1* tested the difference in perceived stress, anxiety levels and life satisfaction that were found to have significant differences with regular PA

Table 2: An Independent Samples T-test table displaying the differences between individuals who do or do not partake in PA (physical activity) for the various variables.

Variables	Groups	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i>
Perceived Stress	PA	15.91	7.35	-3.20	125	.002
	No PA	20.23	7.58			
State Anxiety	PA	34.88	13.08	-4.68	125	.000
	No PA	46.58	15.00			
Trait Anxiety	PA	38.20	12.77	-4.11	125	.000
	No PA	48.02	13.92			
Life satisfaction	PA	22.97	7.69	-2.47	124	.015
	No PA	19.62	7.25			

Note: *p* significant at .05 level

Individuals who regularly exercise (mean 15.91, SD = 7.35) were found to have lower levels of stress than those who do not exercise (mean = 20.23, SD = 7.58). The 95 %

confidence limits show the population mean differences of the variables lies somewhere between -7.00 and -1.65. An Independent Samples T-test was conducted and found that there was a statistically significant difference between stress levels of participants who do or do not regularly exercise ( $t(125) = -3.20, p = .002$ ).

Individuals who exercise (mean = 34.88, SD = 13.08) were found to have lower levels of state anxiety than those who do not exercise (mean = 46.58, SD = 15.00). The 95 % confidence limits show the population mean differences of the variables lies somewhere between -16.79 and -6.63. An Independent Samples T-test was conducted and found that there was a statistically significant difference between state anxiety levels of participants who do or do not regularly exercise ( $t(125) = -4.68, p = .000$ ).

Individuals who exercise (mean = 38.20, SD = 12.77) were found to have lower levels of trait anxiety than those who do not exercise (mean = 48.02, SD = 13.92). The 95 % confidence limits show the population mean differences of the variables lies somewhere between -14.62 and -5.02. An Independent Samples T-test was conducted and found that there was a statistically significant difference between trait anxiety levels of participants who do or do not regularly exercise ( $t(125) = -4.11, p = .000$ ).

Individuals who exercise (mean = 22.97, SD = 7.69) were found to have higher levels of life satisfaction than those who do not exercise (mean = 19.62, SD = 7.25). The 95 % confidence limits show the population mean differences of the variables lies somewhere between .69 and 6.01. An Independent Samples T-test was conducted and found that there was a statistically significant difference between levels of life satisfaction of participants who do or do not regularly exercise ( $t(124) = -2.47, p = .015$ ).

*Hypothesis 2* – A series of Independent Samples T-tests were conducted and found that there was statistically significant differences in perceived stress, anxiety levels and life

satisfaction with activity type walking, significant difference in trait anxiety with aerobics and a significant difference in trait anxiety and life satisfaction for team sports.

Participants who chose walking (mean = 13.05, SD = 5.56) were found to have lower levels of perceived stress than individuals who do not walk (mean = 18.84, SD = 7.86). The 95% confidence limits show that the population mean difference of the variables lies somewhere between 2.66 and 8.91. An Independent Samples T-test found that there was a statistically significant difference between stress levels for those who walk and do not walk. ( $t(73) = 3.69, p = 0.00$ ).

Participants who chose walking (mean = 31.74, SD = 9.57) were found to have lower levels of state anxiety than individuals who do not walk (mean = 38.22, SD = 15.21). The 95% confidence limits show that the population mean difference of the variables lies somewhere between .65 and 12.31. An Independent Samples T-test found that there was a statistically significant difference between state anxiety levels for those who walk and do not walk. ( $t(73) = 2.21, p = 0.30$ ).

Participants who chose walking (mean = 33.68, SD = 8.45) were also found to have lower levels of trait anxiety than individuals who do not walk (mean = 43.16, SD = 14.64). The 95% confidence limits show that the population mean difference of the variables lies somewhere between 3.93 and 15.02. An Independent Samples T-test found that there was a statistically significant difference between trait anxiety levels for those who walk and do not walk. ( $t(73) = 11.83, p = .001$ ).

Participants who chose walking (mean = 25.18, SD = 6.39) were found to have higher levels of life satisfaction than individuals that do not walk (mean = 20.56, SD = 8.21). The 95% confidence limits show that the population mean difference of the variables lies somewhere between -8.03 and -1.23. An Independent Samples T-test found that there was a

statistically significant difference between life satisfaction scores for those who walk and do not walk. ( $t(72) = 2.21, p = .008$ ).

Participants who chose aerobics (mean = 33.61, SD = 8.00) were found to have lower levels of trait anxiety than individuals that do not take part in aerobics (mean = 39.86, SD = 13.64). The 95% confidence limits show that the population mean difference of the variables lies somewhere between -13.01 and .52. An Independent Samples T-test found that there was a statistically significant difference between trait anxiety levels for those who partake in aerobics than those who do not. ( $t(73) = -1.84, p = .070$ ).

Participants who partake in team sports (mean = 32.75, SD = 6.32) were found to have lower levels of trait anxiety than individuals that do not take part in team sports (mean = 39.03, SD = 13.19). The 95% confidence limits show that the population mean difference of the variables lies somewhere between -12.13 and -.43. An Independent Samples T-test found that there was a statistically significant difference between trait anxiety levels for those who partake in team sports than those who do not. ( $t(73) = -2.28, p = .037$ ).

Participants who partake in team sports (mean = 26.75, SD = 2.82) were found to have higher levels of life satisfaction than individuals that do not take part in team sports (mean = 22.47, SD = 7.92). The 95% confidence limits show that the population mean difference of the variables lies somewhere between 1.41 and 7.15. An Independent Samples T-test found that there was a statistically significant difference between trait anxiety levels for those who partake in team sports than those who do not. ( $t(72) = 3.07, p = .005$ ).

Interestingly, it was found that jogging/running, cycling, martial arts, gym, swimming, yoga, horse riding and aqua aerobics showed no significant difference in levels of perceived stress, anxiety and life satisfaction.

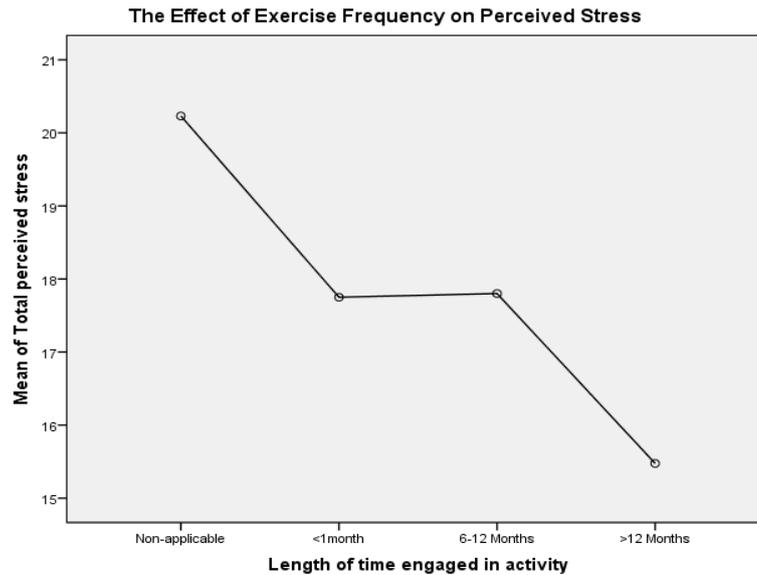
*Hypothesis 3* - A Spearman's Rho correlation was computed (Table 3) to assess the relationship between amount of exercise and life satisfaction score and found there were significant associations between amount of exercise and life satisfaction ( $r_s(126) = 0.26, p = .003$ ).

*Table 3: Correlation Table Displaying the Relationship between Amount of Exercise and Life Satisfaction*

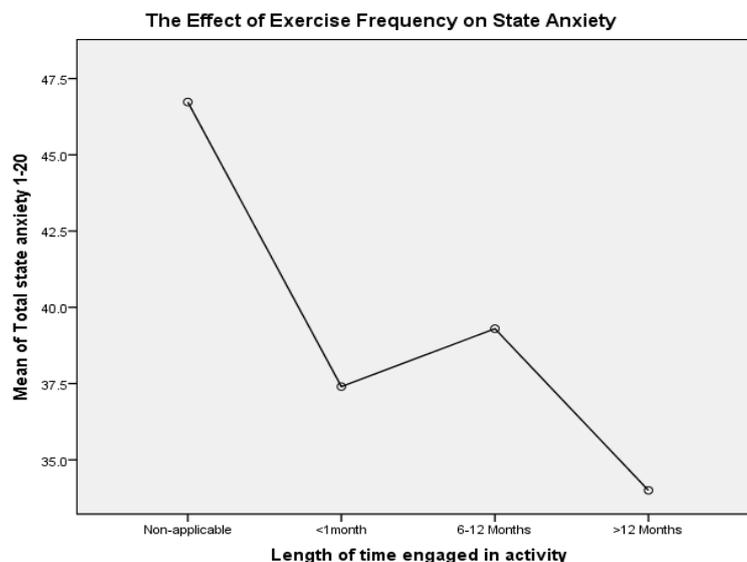
		Total Life Satisfaction	How often does respondent engage in Physical Activity
Total Life Satisfaction	(Pearson Correlation)	1	.259**
	Sig. (2-tailed)		.003
	N	126	126
How often does participant engage in RPA	(Pearson Correlation)	.259**	1
	Sig. (2-tailed)	.003	
	N	126	128

\*\*Correlation is significant at the 0.01 level (2-tailed)

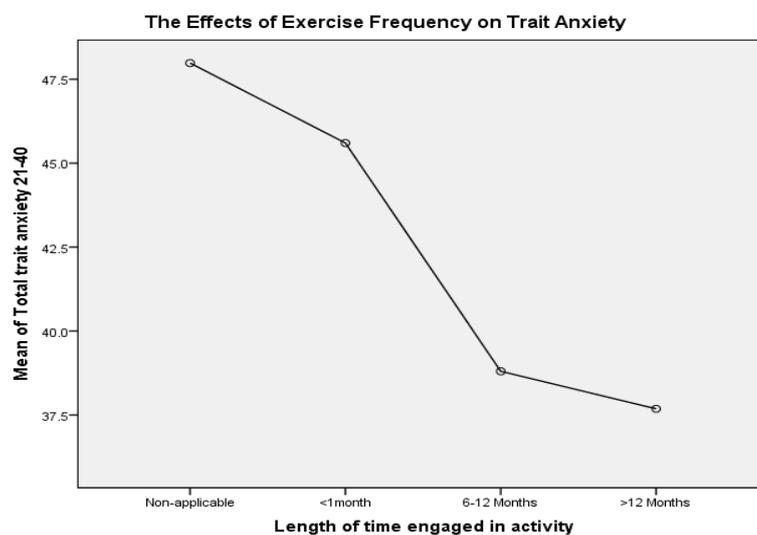
*Hypothesis 4* - A one-way ANOVA was conducted. The results of this test show the relationship between perceived stress, anxiety and life satisfaction across exercise frequency groups. Upon examination the mean number of perceived stress levels for each frequency, showed that the high frequency of >12 months had the lowest perceived stress levels. A one-way analysis of variance showed that there was a significant difference between the frequency groups in terms of the levels of perceived stress ( $F(3,123) = 3.79, p = .012$ ). Post hoc analysis confirmed that the differences were significant in nature between the >12 months frequency group ( $M = 15.48, SD = 7.44$ ) with the 6-12 month frequency group ( $M = 18.80, SD = 7.70$ ) and with the <1 month frequency group ( $M = 17.75, SD = 5.06$ ). See graph 2 below.



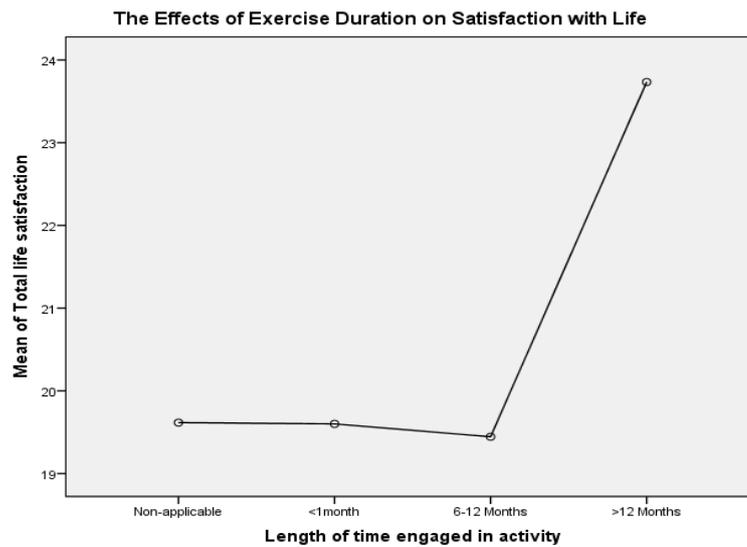
Examining the mean number of state anxiety levels for each frequency, showed that the high frequency of >12 months had the lowest state anxiety levels. A one-way analysis of variance showed that there was a significant difference between the frequency groups in terms of the levels of state anxiety ( $F(3,123) = 7.81, p < 0.01$ ). Post hoc analysis confirmed that the differences were significant in nature between the >12 months frequency group ( $M = 34.00, SD = 12.62$ ) with the 6-12 month frequency group ( $M = 39.30, SD = 16.37$ ) and with the <1 month frequency group ( $M = 37.40, SD = 10.29$ ). See graph 3 below.



The mean number of trait anxiety levels for each frequency was examined, it showed that the high frequency of >12 months had the lowest trait anxiety levels. A one-way analysis of variance showed that there was a significant difference between the frequency groups in terms of the levels of trait anxiety ( $F(3,123) = 5.87, p = 0.01$ ). Post hoc analysis confirmed that the differences were significant in nature between the >12 months frequency group ( $M = 37.68, SD = 12.52$ ) with the 6-12 month frequency group ( $M = 38.80, SD = 14.67$ ) and with the <1 month frequency group ( $M = 45.60, SD = 11.87$ ). See graph 4 below.



Upon examination the mean number of life satisfaction scores for each frequency, it showed that the high frequency of >12 months had the lowest life satisfaction scores. A one-way analysis of variance showed that there was a significant difference between the frequency groups in terms of the life satisfaction scores ( $F(3,122) = 3.23, p = .025$ ). Post hoc analysis confirmed that the differences were significant in nature between the >12 months frequency group ( $M = 23.73, SD = 7.56$ ) with the 6-12 month frequency group ( $M = 19.44, SD = 8.43$ ) and with the <1 month frequency group ( $M = 19.60, SD = 5.60$ ). See graph 5 below.



*Hypothesis 5* - A one-way ANOVA was conducted and the results of this test show the relationship between perceived stress levels across exercise duration groups. The results of this test for perceived stress were the mean number of perceived stress levels for each frequency, it can be seen that the high duration of 5-7 times per week had the lowest perceived stress levels. A one-way analysis of variance showed that there was a significant difference between the duration groups in terms of the levels of perceived stress ( $F(3,123) = 9.07, p < 0.01$ ). Post hoc analysis confirmed that the differences were significant in nature between the 5-7 times per week duration group ( $M = 13.14, SD = 6.12$ ) with the 2-4 times per week duration group ( $M = 17.21, SD = 7.10$ ) and with the once per week duration group ( $M = 24.67, SD = 7.37$ ).

The results of this test show the relationship between state anxiety levels across exercise duration groups. Upon examination of state anxiety levels for each frequency group results showed that the high duration group of exercise 5-7 times per week had the lowest state anxiety levels. A one-way analysis of variance showed that there was a significant difference between the duration groups in terms of the levels of state anxiety ( $F(3,123) = 10.45, p < 0.01$ ). Post hoc analysis confirmed that the differences were significant in nature

between the 5-7 times per week duration group ( $M = 31.03$ ,  $SD = 10.81$ ) with the 2-4 times per week duration group ( $M = 36.73$ ,  $SD = 13.50$ ) and with the once per week duration group ( $M = 46.00$ ,  $SD = 14.18$ ).

The results of this test examined the relationship between trait anxiety levels across exercise duration groups and showed that the high duration group of 5-7 times per week had the lowest trait anxiety levels. A one-way analysis of variance showed that there was a significant difference between the duration groups in terms of the levels of trait anxiety ( $F(3,123) = 9.51$ ,  $p < 0.01$ ). Post hoc analysis confirmed that the differences were significant in nature between the 5-7 times per week duration group ( $M = 34.77$ ,  $SD = 11.15$ ) with the 2-4 times per week duration group ( $M = 39.18$ ,  $SD = 12.54$ ) and with the once per week duration group ( $M = 52.43$ ,  $SD = 12.41$ ).

The results of this test for life satisfaction examined the mean number of life satisfaction scores for each frequency; it showed that the high duration exercise group of 5-7 times per week had the highest life satisfaction score. A one-way analysis of variance showed that there was a significant difference between the duration groups in terms of the life satisfaction scores ( $F(3,122) = 3.23$ ,  $p = .025$ ). Post hoc analysis confirmed that the differences were significant in nature between the 5-7 times per week duration group ( $M = 24.20$ ,  $SD = 7.60$ ) with the 2-4 times per week duration group ( $M = 22.53$ ,  $SD = 7.85$ ) and with the once per week duration group ( $M = 18.43$ ,  $SD = 5.62$ ).

## Discussion

The aim of this research was to investigate and understand whether there were associations in levels of perceived stress, anxiety and life satisfaction in individuals who engage in regular physical activity compared with those who do not. The study also aimed to investigate the benefits of activity type, duration and frequency on stress, anxiety and satisfaction with life. Moreover, this study aimed to build on previous research in the area of regular physical activity and the health benefits in particular in relation to stress, anxiety and life satisfaction. This section will identify areas for discussion based on the analysis in the current study. Moreover, an overview of the strengths and limitations will also be discussed and based on this research other areas for further investigation will be highlighted.

The findings of this study are consistent with previous research pertaining to the health benefits of engaging in regular physical activity in relation to psychological affects, physical health and life satisfaction (Diener & Chan, 2011). Existing research provides support for the first hypothesis in this study which found there were significant differences in perceived stress, anxiety and life satisfaction for individuals who do or do not regularly exercise. In support of previous research PA has been shown to reduce perceived stress levels (Salmon, 2001), reduce anxiety levels (De Moor, 2006) and enhance life satisfaction (McAuley et al., 2008).

In the second hypothesis there were significant differences in perceived stress, anxiety and life satisfaction. The activity types walking and aerobics were shown to be significant for trait anxiety and team sports were significant with trait anxiety and life satisfaction. While research has shown that aerobic exercise is beneficial for reducing hypertension and is effective in minimizing cardiovascular risk factors (Maiorana et al., 2003; Goldsmith et al., 2000), this previous research largely relates to health outcomes associated with PA. Very

little attention has been paid to the effects of particular types or modes of activity in relation to psychological factors such as stress and anxiety.

In the third hypothesis it was examined whether a significant correlation between amount of exercise and life satisfaction would occur. A significant positive correlation was found between amount of exercise and life satisfaction. This supports previous research by Maher et al., (2013) regarding the impact of individual's daily physical activity on life satisfaction.

In the fourth hypothesis significant differences in life satisfaction, perceived stress and anxiety between exercise frequency groups were examined. While frequency of PA was reported to lower the levels of state and trait anxieties, more specifically exercise frequency reported more of an effect in lowering trait anxiety. Previous research provides support for this suggesting that PA must take place for more than 21 minutes daily in order to achieve a reduction in both state and trait anxiety (Petruzzello et al., 1991). Furthermore, Morgan (1997) postulate that engaging in PA for 15 minutes three times per week reduces levels of anxiety.

A positive correlation between frequency of PA and life satisfaction were reported showing more significant positive correlation in individuals who exercise 5-7 times per week. These findings provide support of previous research by Maher et al, (2013) that daily PA can enhance life satisfaction. Engaging in PA 5-7 times per week has shown greater reductions in perceived stress levels. Previous research highlights that high levels of perceived stress are related to low levels of exercise (Ng & Jeffery, 2003). A major likely cause of hypertension has been linked to emotional stress and anxiety (Littleton et al., 1981). There is evidence to show that a combination of resistance exercise and aerobic exercise programmes undertaken five times weekly aid in the prevention and control of hypertension (Fletcher et al., 2001; Keese et al., 2011 & Sorace et al., 2012), and in turn suggests that these exercise programmes

may have an association with stress and anxiety reduction however research has not examined the effects of frequency of PA and its associations with stress reduction.

Finally, the fifth hypothesis examined if there was a significant difference in the effect of duration of exercise on perceived stress, anxiety and life satisfaction. This study reported a largely significant reduction in perceived stress, state and trait anxiety levels in individuals who engaged in PA for 12 months and over, with state anxiety showing a greater reduction. With respect to anxiety reduction, Dienstbier's model (1989) suggests that chronic exercise is associated with reduction in trait anxiety and more specifically when exercise duration exceeds nine weeks. Furthermore, individuals training for 16 weeks or longer had a significantly larger effect size in trait anxiety (Petruzello et al., 1991).

### *Implications*

Findings from this study support existing research that there is an association between PA and perceived stress, anxiety and life satisfaction levels in human beings. PA has been identified as an important indicator in health benefits and therefore, is crucial for health professionals to develop programmes and interventions that promote and maintain healthy behaviours.

### *Weaknesses*

Like other empirical research this study had some limitations. Firstly, as self-reporting is subject to biases the utilisation of self-reported questionnaires does not always allow for accurate reporting of views of oneself (Dodd-McCue & Taraglia, 2010).

Secondly this study had a significantly higher number of female participants compared to males and therefore did not provide support for previous research that males are more likely to take part in physical activity (Monteiro et al., 2003; Steptoe et al. 2002). Previous research also suggests that females adopt emotion-focused coping more so than males (Ptacek et al. 1994; cited in Lawrence et al. 2006) and due to the gender imbalance of participants in the study this may have led to biases which may have impacted on the results in relation to the effects of PA on stress and anxiety levels.

Thirdly since some participants from the gym had just completed a workout before completing the questionnaire this may have resulted in lower levels of anxiety as previous research suggests that anxiety can be reduced for several minutes after cessation of PA (Raglin, 1993; Garvin, Koltyn & Morgan, 1997).

### *Strengths*

There are a number of strengths in this research study. Firstly the questionnaire was piloted on a third year student in an attempt to identify and guarantee an estimated target time for completion. The approximate time for completing the questionnaire was set at 10 minutes which was an honest and accurate indication for the participants.

Secondly the length of the questionnaire and the time allocated for completion was not too long. This attempted to ensure participants did not lose interest and therefore allowing individuals to give full attention throughout the whole questionnaire.

Thirdly the sample of participants contained a wide variety of age groups ranging from 18 to 68 years of age this meant the results were not age bias.

### *Future Research*

Physical inactivity has been associated with CVD, cerebrovascular diseases, Type II diabetes and some cancers (Murray & Lopez 1996). Reducing the health risks associated with these diseases is paramount. Future research could create awareness and design programs and interventions that encourage individuals to adhere to the engagement of PA over the long-term. Without interventions approximately on average, 50 per cent of individuals who begin a PA program will drop out within the first six months (Dishman & Buckworth, 1996).

Asztalos, DeBourdeoudhuij and Cardon (2010) suggest that PA benefits individuals mental health regardless of intensity, future research could examine how daily changes in mood and affect interact with the effects of PA. Frequent assessments of mood in response to daily stressors and anxieties may provide more consistent findings regarding frequency, duration and intensity and how they interact with PA in relation to stress, anxiety and life satisfaction. In order to understand the complex relationships between PA frequency and duration with stress, anxiety and life satisfaction future research could use of multi-analysis of covariance to provide better insight into the correlations.

Future research might also take into account the possibility that physically active people have more resources, appear to have higher levels of life satisfaction and represent a positive selection irrespective of their PA habits. Comparing and contrasting the benefits of various types of activity is an important issue for future research. Other research has reported no significant differences between jogging and walking in individuals with anxiety (Sexton, Mære & Dahl, 1989) however this study found walking to be significant for trait anxiety.

### *Conclusion*

In conclusion, this study aimed to determine the effects of Regular PA on individual's perceived stress, anxiety levels and how satisfied they were with life. The findings concur with research in the area providing evidence there is a strong association with PA on stress, anxiety reduction and increased life satisfaction. While this study failed to find significant differences between all the activity types, on stress, anxiety and life satisfaction it did provide support of the importance of PA for individual's health benefits in relation to psychological affects, physical health and life satisfaction. Interestingly, taking part in regular physical activity for as little as 15 minutes per day can provide for the health benefits as mentioned previously.

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## Appendix

### Appendix A: Copy of Questionnaire

#### SECTION 1

Please tick the appropriate Boxes ✓

Gender       Male       Female

Age: \_\_\_\_\_

Do you partake in regular physical activity (*Ihr once per week or more*)

Yes       No

*(If you answered NO to the above skip to Section 2 of the Questionnaire)*

How often do you engage in physical activity?

Once p/week       2-4 times p/week       5-7 times p/week

Please Tick the type of activity you mostly engage in:

Walking       Jogging/Running       Cycling  
 Aerobics/Fitness Class       Martial Arts       Team Sports  
 Gym Workout       Swimming

Other: Please Specify \_\_\_\_\_

How long have you engaged in the activity ticked above?

<1 month       2-6 months       6-12 months       >12 months

**SECTION: 2****Instructions**

Please Circle that which most describes how you have felt in the past month:

**0 = never    1 = almost never    2 = sometimes    3 = fairly often    4 = very often**

<b>1</b>	1. In the last month, how often have you been upset because of something that happened unexpectedly?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>2</b>	2. In the last month, how often have you felt that you were unable to control the important things in your life?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>3</b>	3. In the last month, how often have you felt nervous and stressed?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>4</b>	4. In the last month, how often have you felt confident about your ability to handle your personal problems?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>5</b>	5. In the last month, how often have you felt that things were going your way?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>6</b>	6. In the last month, how often have you found that you could not cope with all the things you had to do?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>7</b>	7. In the last month, how often have you been able to control irritations in your life?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>8</b>	8. In the last month, how often have you felt that you were on top of things?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>9</b>	9. In the last month, how often have you been angered because of things that happened that were outside of your control?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>10</b>	10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

Please write the answer you think mostly applies to how you (feel right now) at this moment:

**1 = not at all      2 = somewhat      3 = moderately so      4 = very much so**

1. I feel calm \_\_\_\_\_
2. I feel secure \_\_\_\_\_
3. I am tense \_\_\_\_\_
4. I feel strained \_\_\_\_\_
5. I feel at ease \_\_\_\_\_
6. I feel upset \_\_\_\_\_
7. I am presently worrying over possible misfortunes \_\_\_\_\_
8. I feel satisfied \_\_\_\_\_
9. I feel frightened \_\_\_\_\_
10. I feel comfortable \_\_\_\_\_
11. I feel self-confident \_\_\_\_\_
12. I feel nervous \_\_\_\_\_
13. I am jittery \_\_\_\_\_
14. I feel indecisive \_\_\_\_\_
15. I am relaxed \_\_\_\_\_
16. I feel content \_\_\_\_\_
17. I am worried \_\_\_\_\_
18. I feel confused \_\_\_\_\_
19. I feel steady \_\_\_\_\_
20. I feel pleasant \_\_\_\_\_

**1 = not at all    2 = somewhat    3 = moderately so    4 = very much so**

Please write the answer you think mostly applies to how you generally feel

21. I feel pleasant \_\_\_\_\_
22. I feel nervous and restless \_\_\_\_\_
23. I feel satisfied with myself \_\_\_\_\_
24. I wish I could be as happy as others seem to be \_\_\_\_\_
25. I feel like a failure \_\_\_\_\_
26. I feel rested \_\_\_\_\_
27. I am "calm, cool, and collected" \_\_\_\_\_
28. I feel that difficulties are piling up so that I cannot overcome them \_\_\_\_\_
29. I worry too much over something that really doesn't matter \_\_\_\_\_
30. I am happy \_\_\_\_\_
31. I have disturbing thoughts \_\_\_\_\_
32. I lack self-confidence \_\_\_\_\_
33. I feel secure \_\_\_\_\_
34. I make decisions easily \_\_\_\_\_
35. I feel inadequate \_\_\_\_\_
36. I am content \_\_\_\_\_
37. Some unimportant thought runs through my mind and bothers me \_\_\_\_\_
38. I take disappointments so keenly that I can't put them out of my mind \_\_\_\_\_
39. I am a steady person \_\_\_\_\_
40. I get in a state of tension or turmoil as I think over my recent concerns and interests \_\_\_\_\_

Indicate your agreement with each item by placing the appropriate number on the line

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

\_\_\_\_ In most ways my life is close to my ideal.

\_\_\_\_ The conditions of my life are excellent.

\_\_\_\_ I am satisfied with my life.

\_\_\_\_ So far I have gotten the important things I want in life.

\_\_\_\_ If I could live my life over, I would change almost nothing.

*The End*

*Thank you for your participation*

*Please take the contact information for support services.*

*Appendix B: Cover Letter*

21 January 2015

Dear Participant

As part of my final year thesis in the BA Honors Psychology program in Dublin Business School I am undertaking a study on Physical Activity and its association to perceived stress, anxiety and satisfaction with life.

I would like to invite you to partake in my study; your participation is greatly appreciated.

While the survey asks some questions that might cause some minor negative feelings, it has been widely used in research. If any of the questions do raise difficult feelings for you, contact information for support services are included on the final page.

Participation is anonymous and confidential and completely voluntary. Thus responses cannot be attributed to any one participant. For this reason, it will not be possible to withdraw from participation after the 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. It is important that you understand that by completing and submitting the questionnaire that you are consenting to participate in the study.

Please be honest in filling out the questionnaire which should take approx. 10 minutes to complete.

Thank you in advance. Should you have any questions please contact me on or my supervisor Rosie Reid on

Noeleen Richardson

*Appendix C: List of helpful contacts for participants*

**Contacts of Helpful Organisations Working in the Area of Stress, Anxiety  
and Depression**

**Aware Helpline:** 1890 303 302

www.aware.ie

National Office: 72 Lower Leeson Street, Dublin 2.

Tel: (01) 661 7211.

**Clane Counselling & Hypnotherapy**

Email: [clanecounselling@gmail.com](mailto:clanecounselling@gmail.com)

Tel: 045 868751 or 087 9376603

**Samaritans Ireland**

4-5 Usher's Court

Usher's Quay

Dublin 8

Tel: (01) 6710071

Helpline: 1850 60 90 90

**Life and Balance Centre**

Unit F8 (rear entrance) Nutgrove Office Park

Rathfarnham

Dublin 14

Tel: (01) 207 9881

Email: [info@lifeandbalance.ie](mailto:info@lifeandbalance.ie)