Effects of Exercise Frequency on Perceived Stress, Psychological Wellbeing and General Self-Efficacy

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Submitted in partial fulfilment of the requirements of the BA Hons in at Dublin Business School, School of Arts, Dublin.

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March 2019

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Declaration

‘I declare that this thesis that I have submitted to Dublin Business School for the award of BA (Hons) Psychology is the result of my own investigations, except where otherwise stated, where it is clearly acknowledged by references. Furthermore, this work has not been submitted for any other degree.’

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Acknowledgements

Firstly I would like to thank my supervisor Dr. Rosie Reid for her support and feedback on my thesis project. Thank you to all the staff of DBS especially Dr. John Hyland and Ms. Joanne Conway whose interest and passion in their taught subjects made their classes really enjoyable. I am very grateful to all the participants who took the time to complete my online survey, also my friend Joseph whose advice on research was much appreciated.

Finally to my girlfriend Niamh for the endless support and of course the countless cups of tea!

Abstract

This quantitative and correlational between groups study examined if higher levels of weekly exercise would result in improved mental health, specifically if it would reduce participants perceived stress levels, increase psychological wellbeing and general self-efficacy. Participants were (n = 144) with roughly an even male/female ratio. Participants were sourced through Facebook where the studies questionnaire was posted. Respondents levels of exercise was measured and broken into low, moderate and high groups. No statistically significant results were found for the 3 groups of exercise across perceived stress, psychological wellbeing, or general self-efficacy. However psychological wellbeing and general self-efficacy both reported their highest mean score in the high exercise group, while the perceived stress highest mean was in the moderate exercise group. The main conclusions from this study were not in line with previous research which states increased exercise frequency has beneficial effects to perceived stress, psychological well-being and general self-efficacy.

Introduction and Literature Review

Introduction

Exercise is vital for human health, especially during periods of stress or boredom as failure to exercise can lead to debilitating conditions of both muscle and bone atrophy, often seen in injured patients (Jones et al., 2004, p. 1). Exercise is also an effective treatment for depression (Schuch et al., 2016). This same study conducted a Meta-Analysis and reported that exercise has been regularly shown to have significantly large antidepressant effects in people with depression (Schuch et al., 2016, p. 42). Regular exercise has also been shown to prevent numerous non-communicable diseases (W.H.O. 2018, p. 12) and reduce mortality by up to seventeen percent (Wen et al., 2011) thereby allowing for a healthier and fuller life. The benefits of regular exercise have been understood for thousands of years, with athletes in the Olympian games competing physically in wrestling and other competitions.

The freedom to undertake physical exercise in order to alleviate the stressors in life could perhaps be considered to be a natural 'home remedy' which allows the body to remove waste materials from the bloodstream and organs and also allows for greater periods of happiness due to the release of and activation of numerous neurochemicals in the brain (Basso & Suzuki, 2017, p. 144). In today's busy global environment, situations can arise that can cause no small amount of stress and anxiety. The previous freedoms people enjoyed, such as the stroll to work, or the local shop seems to have been replaced with the hurried and frantic commute to work.

Sports Psychology

The growing interest in the health and fitness sector has seen massive improvements in numerous aspects of the industry including scientific research. Predictably, improvements have followed in many areas of exercise, fitness, sports nutrition, knowledge of physiology, gym equipment and the psychology of sport. Olympic records continue to be broken, likely due to the new and improved techniques, knowledge and routines for both trainers and athletes. According to Learish (2016, para. 2), these improvements have come about due to three factors; inability to control randomness, improvements in technology, and limited sample size.

The relatively contemporary discipline of sports psychology has evolved from this growing interest and is one of the fastest growing branches of modern psychology. As Weir (2018, para. 1) outlines "*the current trend of athletes discussing mental health issues is a possible reason for its recent surge in popularity*". The field of sports psychology is generally credited due to the work carried out by Norman Triplett, who published (1898) '*The Dynamogenic Factors in Pacemaking and Competition*', which measured cyclists' pace and reported that they went faster when riding in company than when solo. From this novel and original study, the field of sports psychology was born and evolved into its current status.

Mental Health

Mental health does not receive the same attention physical health does. Therefore many problems of the mind, such as depression can go untreated. Irish males show very high suicide rates in Europe. Figures on Irish suicides have been reported as eight in every ten to be males (Ryan, 2018, para. 1). Sadly Gallagher reported that Ireland has the "highest suicide rate for female children in the EU" (2018, para. 1).

Depression and poor mental health can have varied causes such as the poor state of the economy after the economic crash which was very likely a factor. This was reported on by Van Hal (2015, p. 19) who outlined in a study that large portions of the population displayed increased levels of reported stress, reductions in psychological wellbeing and reported reduced levels of self-efficacy. He stated that this was due to the often 'severe' austerity measures enacted by government stating that "a detrimental effect on the mental health of the population, which is often deteriorated because of job loss resulting from the economic crisis was a major factor in these reported measures". Van Hal goes on to describe how countries hit worst by the economic crisis such as Greece and Ireland reported increased suicide rates. (Van Hal, 2015, p. 19). Thus, as mentioned above, external factors such as loss of income are very likely to result in stress and deteriorating mental health. Basso & Suzuki (2017, p. 127-8) highlights the beneficial effects exercise has shown by preventing or delaying cognitive decline due to natural ageing or dementia such as Alzheimer's or Parkinson's disease. With so much evidence showing exercises effects on mood Yeung (1996), depression, anger, mood and anxiety (Hassmén et al., 2000, p. 17), neurodegeneration (Basso & Suzuki (2017, p. 127-8) it is surprising how little emphasis is given to this free alternative to therapy and or medication (Ratey, 2017, *para*. 1).

The Fitness Industry

The fitness industry is a sector that appears to be growing at a positive incline since Ireland's recovery from the previously mentioned financial crises, gym membership has skyrocketed and according to Last (2018, para. 2), "*the last decade has seen a complete transformation of the fitness industry in Ireland, with this country now full of commercial gyms, boxing clubs, training academies and smaller private fitness ventures*". Last however questions

why obesity rates are also rising, stating that "*we are sicker and fatter than ever before"* (2018, para. 4), when technology such as the internet has expert advice at the click of a mouse. This is alarming indeed, as this seems to suggest a measure of extremes where Irish adults are either fit and healthy or display such low levels of physical inactivity that the 'World Health Organisation' (W.H.O) predicts is detrimental to a healthy lifestyle.

W.H.O's 'Physical Activity Fact Sheet' (2018, p. 2), states Irish adults are reported to undertake only a third of their recommended amount of daily exercise. W.H.O has proceeded to develop an initiative to combat this undesirable outcome not only in Ireland but on a global platform, and many countries have signed up to their new 'Global Action Plan on Physical Activity' (2018). The target for this plan "*is to achieve a 15% relative reduction in the global prevalence of physical inactivity in adults and in adolescents by 2030*" (W.H.O, 2018, p. 8).

The Mental Benefits of Exercise

The promotion of a healthy, fit body and mind is of paramount importance considering the rising worldwide levels of obesity. The W.H.O report (2018, p. 12) outlines the multiple benefits that regular physical activity can have;

1. Prevention and treatment of the leading non-communicable diseases (NCDs), namely heart disease, stroke, diabetes, breast and colon cancer.
2. Contribution to the prevention of other important NCD risk factors such as hypertension, overweight and obesity, and is associated with improved mental health.
3. Delay in the onset of dementia.
4. Improved quality of life and well-being.

The recommended levels of exercise for adults, as stated by the W.H.O (2018, p. 15) are '*one hundred and fifty minutes of moderate intensity a week. This can include physical activity through travelling to work or physical activity undertaken as part of a job or hobby*'.
According to Dinas, Koutedakis, & Flouris (2010, p. 319) "*Evidence suggests that exercise and physical activity have beneficial effects on depression symptoms that are comparable to those of antidepressant treatments".*

Callaghan (2004, p. 476) seemingly agrees with this and states that "*Recent trends and beliefs of the mental benefits of exercise are becoming increasingly supported by scientific literature*". Callaghan further describes how throughout history ancient and modern societies used exercise as a preventative measure to many diseases, also as a promoter of health and well-being (2004, p. 476).

Ratey (2013; 2014), outlines the many positive effects exercise has on the brain and reported feelings and moods. Referring to some of his patients who run and jog regularly, referring to injured patients he treated states that "*I could see first-hand how their running was functioning, almost as a prescription that could parallel some of our psychiatric medications*." (Ratey, 2017, *para*. 1).

Salmon (1999, p. 31) states that "*treatments in clinical psychology routinely aim to alleviate the emotional effects of stressors that have already occurred, exercise training provides a way to ameliorate effects of stressors yet to occur*" however this perhaps could be viewed as a 'preventative' measure, which could likely be a favoured method used before or even over treating an actual problem as it arises.

Yeung's (1996) study states that "*there is strong support for the existence of acute mood benefits derived from a single bout of exercise. This suggests that exercise may be a valuable short-term strategy for the self-regulation of mood in both distressed and normal subjects*." (1996, p.138). This finding could be utilised by doctors or psychologists treating patients for depression or various mental health issues. As this finding came from both distressed and normal subjects it should give weight to not only Yeung's findings but also to the general theories of exercise as a treatment and preventative method to various mental health problems.

An interesting study on 'Physical Exercise and Psychological Well-Being', by Hassmén, Koivula & Uutela (2000, p. 17) found a consistent relationship between enhanced psychological well-being and regular exercise. This same study, with over three thousand participants, according to Hassmén et al. (2000) *"suggests that individuals who exercised at least two to three times a week experienced significantly less depression, anger, cynical distrust, and stress than those exercising less frequently or not at all"*. This finding would, however be contested by Yeung's (1996) study mentioned in the previous paragraph which found significant short term beneficial effects on peoples mood and distressed states from a single bout of exercise.

It appears the belief that exercise is beneficial for one's mental health is becoming increasingly supported by scientific literature. Research carried out by Salmon (2001) outlines how "*the pattern of evidence suggests the theory that exercise training creates a process which confers enduring resilience to stress*" (2001, p.33) and this is a welcome addition to this growing field of knowledge.

Again the (2018) W.H.O report addressed the concerns felt about the current worldwide obesity crises, yet the correlation between increased gym membership in Ireland along with increased obesity levels is a confusing and worrying issue.

Self-Efficacy

General self-efficacy can be defined as "the optimistic self-belief in our competence or chances of successfully accomplishing a task and producing a favourable outcome." (Akhtar, 2008). To be productive in any sense, a small level of self-belief is needed. If exercise can help boost self-efficacy then why not utilise this gift?

Bandura and Adams (1977) proposed that people who suffer from negative moods experience and report lower levels of general self-efficacy. They showed lower levels of general self-efficacy also altered performance and effort on tasks. As the measure of 'General Self-Efficacy' is a 'general' measure it is possible individuals could display certain increased aspects of self-belief and confidence in a specific area, such as a strong academic self-efficacy that could strongly affect the outcome on the 'General Self-Efficacy' questionnaire. Here an individual with a low level of general self-efficacy could achieve high scores from the 'General Self-Efficacy' questionnaire.

Inactivity

The vast amount of literature on exercise and its potential beneficial effects for humans seems to be based on what exercise can do for people. Inactivity, however, seems to remain in the background receiving less emphasis (Wen & Wu, 2012, p. 192). As exercise has been shown to be beneficial in numerous aspects of one's physical and mental health, inactivity has

been conversely shown to be detrimental to one's physical and mental health (Booth, Roberts & Laye, 2012).

Kohl et al. (2012, p. 294) describes physical inactivity as being a pandemic and reports it as being the fourth leading cause of death worldwide. Discussing the magnitude of this 'pandemic', Kohl et al. (2012, p. 294) advise that inactivity should be a public health priority, implemented through increased education, increased investment in physical activity/inactivity research, policy, and training. This study reports that "31 % of the world's population is not meeting the minimum recommendations for physical activity" (Kohl et al. 2012, p. 294). This worrying statistic is likely their justification needed for the use of the term pandemic.

Research on physical inactivity has shown that those who do not exercise or engage in physical activity ranging from fifteen to thirty minutes a day are at increased risks of cancer, heart disease, stroke, and diabetes by 20 – 30%, and a reduction in lifespan by three to five years (Wen & Wu, 2012, p. 193). It would, therefore, be much cheaper for patients to use this 'free medication' as a treatment and hopefully in the near future a used commonly as a preventative measure. Janssen (2012) carried out a study to measure the estimated health care costs resulting from inactivity in adults in Canada. The total figure for 2009 was reported as 13.5 billion dollars. Broken down to represent direct care cost $2.4 billion, indirect care cost 4.3 billion, and total health care cost 6.8 billion, from physical inactivity in Canada (Janssen, 2012, p. 803) Here we see that inactivity can produce unexpected and costly outcomes creating a strain on a countries economy. As inactivity has been shown to result in muscle and bone atrophy (Jones et al., 2004, p. 1), among its many other debilitating effects, education on inactivity should be given the same emphasis given to the promotion of a fit and healthy lifestyle often used by health professionals and the media instead of primarily remaining in the background receiving little emphasis (Wen & Wu, 2012, p. 192).

Janssen describes the problem of inactivity in Canada as surpassing ‘epidemic proportions’ and being a major strain on the health care system (2012, p. 806). Janssen lists the seven main physical inactivity-related chronic diseases as: Coronary artery disease, Stroke, Hypertension, Colon cancer, Breast cancer, and Type 2 diabetes, and Osteoporosis all showing increased likelihood shown to be directly attributable to prolonged levels of inactivity (2012, p. 804-5). Murtagh et al., (2015) examined the prevalence and correlations of physical inactivity in the Irish elderly, with the aim of producing better-informed intervention methods for the community-dwelling older adults. They examined levels of inactivity adults aged 60 + and found that twice as many females were inactive compared to males of the same age. (2015, p. 1). Their conclusion highlights a common worry for most developed countries. That being an ageing population. (2015, p. 8)

Historically bed rest was the doctor’s prescription for many ailments. Since Yuri Gagarin’s 1961 space flight however, much research has been conducted on physical inactivity likely due to the zero gravity conditions astronauts are subjected to in space. NASA regularly advertises or requests participants for sleep studies. Results have shown that the degeneration of many organs including skeletal mass and muscles are at increased rates while in space (Booth et al, 2012, p. 8). The bones of astronauts displayed atrophy ten times faster than natural ageing along with artery homeostasis and reduced cardiac output among other bodily reductions (Booth et al, 2012, p. 8).

As mentioned W.H.O recommends one hundred and fifty minutes of moderate physical activity or exercise per week, but what happens if individuals do no exercise at all or only get a reduced amount of their usual exercise. Booth et al, report findings that even a short term reduction in daily physical output will enable decreased cardiorespiratory fitness, altered insulin sensitivity, reduction in muscle mass and increases in fat tissue. This same study states

that this explains the link between reductions in physical activity and the progression of various chronic disorders on the human body (2012, p. 10). The Booth et al. (2012) paper reports on inactivity studies which were carried out in the past. For example the 1968 paper "Response to Exercise after Bed Rest and After Training" which reported as cited in Booth et al, "reductions of 28%, 11%, 26%, and 29% in VO2max, ventricular volume (ml), maximal cardiac output, and maximal stroke volume" (2012, p. 9).

Inactivity's effects can be very costly to the body and even to health care systems as a sedentary lifestyle is strongly associated with type 2 diabetes, cardiovascular disease and reduced life expectancy (Slentz, Houmard & Kraus, 2009). Apart from injured and serious disease suffering patients, exercise seems to be an underutilised method of prescription. Wen et al., Reported that when comparing a low activity group to an inactive group the low activity group had a 14% reduced risk of mortality and an increase of 3 years life expectancy (2011, p. 1). For those who are injured, muscle and bone atrophy is a factor that reduces recovery time and thus prolongs the recovery and regeneration of the bodies bones and muscles Jones et al., (2004, p. 1). The Jones et al., (2004) study measured nine participants muscle and bone mass and then muscle and bone atrophy levels after two weeks of forced inactivity. Significant reductions in both were reported including changes to various gene expressions. This research specifically patients recovery periods and data on gene expression post injury/inactivity could be absolutely vital for programmes of recovery, treatment techniques, and enable space exploration companies such as TESLA and NASA to accurately predict the limits of human space travel.

Exercise on Electrophysiology and Neurochemical pathways

Basso & Suzuki outline the many effects acute bouts of exercise can have on neurochemical pathways, reporting that the prefrontal cortex is the most commonly reported on brain structure for exercise influenced enhancements such as attention. (2017, p. 127). This study goes on to say that chronic exercise is even helpful to those already diagnosed with dementia (2017, p. 128). It seems here that an increase in exercise or physical activity would be an efficacious technique for those with cognitive impairments or dementia.

As technology advances equipment such as the functional magnetic resonance imaging (fMRI), Transcranial magnetic stimulation (TMS), and the electroencephalography (EEG) give more insight into the factors at play in the brains of humans and animals. These imaging and electrophysiological machines are non-evasive and thus patient or participant friendly.

Using fMRI Van Dongen et al. found increased hippocampal functioning in a memory task post workout which resulted in higher levels of recall, suggesting acute bouts of exercise could be used to increase memory and hippocampal function. The timing of the exercise was a factor in this study. They showed exercise conducted four hours after a learning task was much more effective than straight after a learning task and increased activity in the hippocampal area of the brain (2016, p. 134).

An EEG study by (Gutmann et al. 2015) on acute exercise has found that individual alpha peak frequency (iAPF) involved in arousal, attention and processing of information, after a bout of exhaustive exercise showed a significantly greater increase in (iAPF) while the same (iAPF) was measured for a bout of steady-state exercise and remained unchanged (2015, p. 1). Gutmann et al. went on to examine if four weeks of persistent exercise training at a steady-state would result in greater changes in (iAPF) however the results showed no change in

(iAPF). Gutmann et al. reported that it still is unknown if long term exercising induces (iAPF) changes, (Gutmann et al. 2015, p. 5).

TMS studies have shown that again even a single high-intensity bout of exercise can promote long term potentiation such as neuroplasticity improve motor learning, such as skill acquisition by increasing motor cortical excitability (Mang, Snow, Campbell, Ross & Boyd, 2014, p. 1,325). This study on young healthy participants measured corticospinal excitability after they had a rest and then after an intense bout of exercise. Participants skill with a joy-stick was measured under both conditions. As hypothesised the exercise group showed increased skill and improvements in motor learning.

Equipment such as the EEG, fMRI, and TMS among many others not mentioned here, have shown via the mentioned studies that a single bout of exercise can improve numerous brain and nervous system factors such as LPT, neuroplasticity, iAPF resulting in increased attention, arousal, skill, and increased hippocampal activity resulting in improved memory.

Aerobic exercise consists of physical exertion that conditions the cardiovascular system. Aerobic exercise means exercising with oxygen. It is often referred to as cardio. Aerobic exercise consists of activities such as walking, running, swimming, cycling, tennis, boxing, skipping, circuit training etc. For example, a runner or cyclist who regularly runs or cycles at a sustainable pace is exercising aerobically (using oxygen)

Anaerobic exercise refers to exercise where the bodies demand for oxygen is higher than what it gets through inspiration during exercise. Anaerobic exercise then generally refers to weights training, powerlifting or training to such a high intensity that lactate forms. Exercises such as sprinting, fart legging and very high-intensity training can be classed as anaerobic.

For example, a sprinter who runs the 100 meters could not sustain that very high pace for more than a few seconds as the bodies demand for oxygen is far more than is needed to continue such a high pace/speed of sprinting. Lactate forms here as a result of the bodies attempt at continuing at such high pace, however this is very short lived.

Unfortunately, there are various chemicals which cannot be measured using non-invasive techniques. When we exercise at high intensity this lactic acid, commonly known as lactate is formed, due to the break down of glucose in the body. Lactate can pass the blood-brain barrier and be further used as an alternative energy source in the brain (Schurr, 2014, p. 11), and has been associated in memory pathways, where (Suzuki et al.), who also reported that lactate is essential in long term learning and maintenance of LTP of synaptic strength (2011, p. 810) while (Yang et al., 2014) again reported its involvement in long term memory, LTP and synaptic plasticity.

Watson et al. (2005) highlight Dopamine's role in exercise where they reported that nine endurance athletes ingested a dopamine/noradrenaline reuptake inhibitor prior to exercise. Performance, thermoregulation and hormonal response to exercise were measured. The study found performance to be significantly improved in a hot climate but no improvement in performance was seen in a mild climate.

The list of neurochemicals can be exhaustive that are directly involved in exercise and its effects on the brain. Mood, anxiety, depression, fear, anger, euphoria, memory skill are all susceptible to the hormones our brains produce. Exercise, as has been discussed here, can strongly alter these states.

To summarise, various neurochemicals associated with exercise and physical activity. Many have been shown to increase or decrease due to physical activity or inactivity carried out by

individuals or animals. BDNF, Dopamine, Serotonin, Norepinephrine and epinephrine, Glutamate and GABA, among many others have all been associated with research into exercise. (Basso & Suzuki, 2017, p. 135-8).

Objectives of the Research

The objectives of this research paper were to conduct a detailed evaluation of the '*Effects of Exercise Frequency on Perceived Stress, Psychological Wellbeing and General Self-Efficacy*'

These objectives were:

1. To evaluate if exercise or physical activity has significant effects on peoples perceived levels of stress, psychological wellbeing or general self-efficacy.
2. To give an overview of the environmental, electrophysiological and neurochemical aspects attributable to exercise.
3. To carry out a survey questionnaire with participants that exercise regularly.
4. To conduct the assessment in a way that could show insight into these research questions.

Hypotheses

H1. Those who exercise at a higher frequency will show lower levels of perceived stress.

H2. Those who exercise at a higher frequency will show higher levels of psychological wellbeing.

H.3 Those who exercise at a higher frequency will show higher levels of general self-efficacy.

Method

Participants

One hundred and forty-four (n = 144) participants voluntarily took part in this study by completing an online questionnaire. All participants received the same questionnaire. Female participants were (n = 68), and male (n = 76). The sample was one of convenience advertised to the general public using the social media platform Facebook where the link was posted to various fitness and exercise web sites. The total sample was split into two groups. High and low, which was relative to their reported levels of physical activity or exercise. The high group was (n = 77), and the low group was (n = 56). The widely used Godin Leisure-Time Exercise Questionnaire was used to score each of the participant's levels of exercise or physical activity and then assign them to the high or low exercise group based on their overall scores.

The introduction to the questionnaire informed participants of the studies aims and their right to withdraw from the study as well as the age of consent. It was stated that upon completion, due to the built-in design of anonymity, withdrawal would not be possible after completion. The survey took on average eight minutes to complete.

Design

The design of this study was a quantitative, quasi-experimental cross-sectional study. A between groups design was used and analysed via the nonparametric Kruskal-Wallis test which measured if significant relationships could be found between participants mean levels of exercise and their reported perceived stress, psychological wellbeing, and general self-efficacy levels. All statistical analysis was carried out using SPSS version 25 on an Apple Mac laptop. The total number of respondents was (n = 144)

The independent/predictor variables were level of exercise i.e. low, medium or high exercise levels per week. The dependent/criterion variables were the measures of perceived stress, psychological wellbeing, and general self-efficacy. There were no control groups in this study. Participants scores from the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1997) were totalled and divided into a low, medium and high exercise group. This was achieved using the same formula as Clarke (2015, p. 11). The range of scores were used to determine each exercise group. Those were 0 - 20 were the low exercise group, 21 – 40 were the moderate exercise group, and those above 41 were the high exercise group.

This study used ordinal, scale and nominal data. Participants data was used in all groups and they were sourced from various health and fitness pages on Facebook. The survey link was posted from the researchers own Facebook account.

Hypotheses one, two and three examined whether those who exercise at higher frequencies would show lower perceived stress and higher psychological wellbeing and general self-efficacy.

Materials

The following questionnaires were used:

The Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1997)

The Perceived Stress Scale (10 item) (Cohen, 1994)

Psychological Well-Being (18 item) (Ryff & Keyes, 1995)

General Self-Efficacy Scale (10 item) (Schwarzer & Jerusalem, 1995)

The questionnaires were presented online using the Survey Monkey website (surveymonkey.com). Participants were required to consent to the study using a tick box, and also provided their gender. An eighteen or over tick box was also added to the introduction page to make the studies aims and ethical considerations attainable.

The first questionnaire used was the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1997) which consisted of four questions to measure participants levels of strenuous, moderate or mild levels of exercise over a typical seven day period. Each option was available. The instructions in the questionnaire required the exercise to be fifteen minutes or more to classify for each section. Scoring was as follows:

Weekly leisure activity score = (9 × Strenuous) + (5 × Moderate) + (3 × Light)

The second questionnaire was an eighteen item Psychological Well-Being (Ryff & Keyes, 1995) questionnaire that measures participants general wellbeing including the six

subsections of psychological well-being. Those being 1 = Autonomy, 2 = Environmental mastery, 3 = Personal growth, 4 = Positive Relations with Others, 5 = Purpose in Life and 6 = Self-Acceptance. Each statement required an answer ranging from one to seven which reflected how much participants agreed with a statement. 1 = strongly agree, 2 = somewhat agree, 3 = a little agree, 4 = neither agree or disagree, 5 = a little disagree, 6 = somewhat disagree, 7 = strongly disagree. Of the eighteen questions Q1, Q2, Q3, Q8, Q9, Q11, Q12, Q13, Q17, and Q18 were reverse-scored as these questions were worded in a reverse direction so as to increase the reliability of the questionnaire. The higher the overall score the higher the presumed psychological well-being, including each of the subsections autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance. Cronbach's alpha was ran on the eighteen questions and reported .83, which indicates a high level of internal consistency for this questionnaire.

The third questionnaire used was the ten item General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995) which measures participants beliefs in their ability to succeed or successfully complete tasks. Cronbach's alpha was ran on the ten questions and reported .86, which indicates a high level of internal consistency for this questionnaire.

A low score on the GSE scale would indicate a participant had low general self-efficacy which would likely affect the outcome of the tasks someone may value such as work goals, sports, academia, hobbies etc. Ten statements were given which required an answer ranging from one to four which reflected how much participants agreed with each statement. 1 = Not at all true, 2 = Hardly true, 3 = Moderately true and 4 = Exactly true. The total score of each participant, if all statements are answered, would range from ten to forty. The higher the score the higher

the general self-efficacy. Internal reliability for this GSE's scale, scores generally range between .75 and .91 (Scholz, Doña, Sud, & Schwarzer, 2002, p. 243).

The fourth questionnaire used was the ten item Perceived Stress Scale (Cohen, 1994). The questionnaire is designed to measure participants perceived stress levels. Cronbach's alpha was ran on the ten questions and reported .89, which indicates a high level of internal consistency for this questionnaire. It consists of ten statements which required an answer ranging from zero to four which reflected how much participants agreed with each statement 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often and 4 = very often. Each statement related to participants feelings and thoughts during the last month. Questions Q4, Q5, Q7, and Q8 were reverse scored so as to increase the validity of the questionnaires. Scores ranging from 0 - 13 are considered to be low perceived stress. Scores ranging from 14 - 26 are considered to be moderate perceived stress. Scores ranging from 27 - 40 would are considered to be high perceived stress. The ten item (Cohen, 1994) PSS scale was reported to be "*In general, the psychometric properties of the 10-item PSS were found to be superior to those of the 14-item PSS*" (Lee, 2012, p. 121) and the test–retest reliability scores were 0.83 (Reis, Hino & Añez, 2010, p. 107).

All questionnaires used can be found in the appendix section.

Procedure

Research only began after approval from the Dublin Business School ethics committee and my supervisors' approval of the study and questionnaires used. The questionnaire link was distributed on the social media platform Facebook and posted to various fitness and health-related pages. The aim of the study to 'promote the use of exercise for mental health benefits

and not just for body modification' was included along with the average time (eight minutes) of completion. The studies anonymity required age and option for participants consent were clearly stated.

The questionnaires and all demographic data collected can be seen in the appendix section at the end of this paper. Upon completion of the questionnaire a thank you page with information relating to Aware and Samaritans was displayed in case participants felt the need of the support services. The statistical analysis programme SPSS version 25 was used to analyse the data collected.

Ethics

The research proposal for this study required a tick box which stated that you read the DBS Ethical Guidelines for Research with Human Participants and a statement that all participants must read DBS guidelines before submitting an application. Methods of data collection, the research aims, objectives, the scientific rationale, the design, methods of data collection and the sample were all part of the ethical considerations which were approved. This was attached to the initial proposal for the chosen study. Overall ethical considerations were given to the four principles of the Psychological Society of Ireland, (PSI) those being 1: Respect for the rights and dignity of the person, 2: Competence, 3: Responsibility and 4. Integrity the PSI Code of Professional Ethics (PSI, 2011, p. 3-4). This was submitted to Dublin Business School's ethics committee and was given approval.

The introduction page to the questionnaire included an above eighteen tick box, a gender box, and a consent box. It was clearly stated that participation was voluntary and that after completion due to the designs built in anonymity withdrawal was no longer possible. The current European GDPR regulations that came into effect 25th May 2018 was also considered

in relation to the storage of participants data. Participants data was stored on a password protected laptop. A thank you page was displayed upon completion of the questionnaire.

As many of the questions asked were of a personal nature the details for the support services, Samaritans and Aware (see appendix) were included in case participants felt the need for any emotional support after completion.

Results

Descriptive Statistics

The minimum, maximum, mean and standard deviation scores were calculated for the general self-efficacy, perceived stress, total exercise and psychological wellbeing questionnaires and are shown below in Table 1.

Table 1: Descriptive Statistics for each of the questionnaires, GSE = Total General Self-Efficacy Score, PSS = Total Perceived Stress Score Exercise total, and PWB = Psychological Wellbeing Score.

Variable	N	Minimum	Maximum	Mean	Std. Deviation
GSE	123	17.00	39.00	30.54	4.23
PSS	125	2.00	38.00	16.09	7.08
Exercise total	136	.00	163.00	55.66	32.56
PWB	92	53.00	126.00	99.50	14.12

As seen in Table 1 above the total numbers of respondents for each variable are calculated. Some participants did not answer all questions in the questionnaires, and therefore these were not included in the analysis. The mean score suggests that participants, on average, showed high levels of general self-efficacy, 30.54, (SD = 4.23) as 40 is the max available score on this measure as per the PSS scoring sheet (see materials section).

The mean PSS total score was 16.09, (SD = 7.08) which suggests that the sample showed moderate stress levels on average. (see materials section).

The PWB scale showed a mean score of 99.50, (SD = 14.12) suggesting that participants, on average, showed high levels of PWB as per the PWB scoring sheet (see materials section).

Inferential Statistics

To explore the relationship between exercise and psychological well-being, stress, and self-efficacy, a set of correlations were first run. Next, mean questionnaire scores were compared

between low, moderate, and high exercise groups using Kruskal-Wallis tests. Non-parametric tests were used as the data violated the assumption of normality (Shapiro-Wilk < .05).

Table 2: Correlations between exercise and perceived stress, psychological wellbeing and general self-efficacy. ** denotes statistical significance at the p<.001 level.

	Exercise	**PWB**	**GSE**	**PSS**
Exercise	--	.037	.011	-.112
PWB	.037	--	.584**	-.609**
GSE	.011	.584**	--	-.558**
PSS	-.112	-.609**	-.558**	--

As can be seen in Table 2 above some significant correlations were found between the other questionnaires, i.e. a significant negative correlation was found between the perceived stress scale and psychological well-being (p = -.609**). This suggests that higher psychological well-being is correlated with lower stress, and vice-versa.

A Spearman's rho correlation found that there was no significant association between exercise and psychological wellbeing (rs(88) = .04, p = .729), and no significant association between exercise and perceived stress (rs(119) = -.11, p = .227), and no significant association between exercise and general self-efficacy (rs(117) = .01, p = .902).

Table 3: Kruskal-Wallis Ranks Mean and standard deviation values for each questionnaire, for the low, moderate, and high exercise groups.

	Low	Moderate	High
PWB	M = 98.23 (SD = 18.66)	M = 96.52 (SD = 14.97)	M = 100.50 (SD = 12.99)
PSS	M = 16.29 (SD = 8.36)	M = 18.80 (SD = 6.74)	M = 15.04 (SD = 6.71)
GSE	M = 27.40 (SD = 6.12)	M = 30.50 (SD = 3.76)	M = 30.79 (SD = 3.62)

A Kruskal-Wallis Test was conducted to compare the three exercise groups (low, moderate, high) on each of the questionnaires (PWB, PSS, and GSE). As seen in Table 3, higher mean psychological well-being scores were observed in the high exercise group. However, the test did not reveal a statistically significant difference in psychological wellbeing, across the different exercise groups (low, n = 13: moderate, n = 21: and high, n = 54), $\chi 2$ (2, n = 88) = .94, p = .625

A Kruskal-Wallis Test was also conducted to compare the three exercise groups (low, moderate, high) on the perceived stress scale. The moderate level of exercise reported the highest mean score for the perceived stress scale. The Kruskal-Wallis test did not reveal a

statistically significant difference in perceived stress, across the different exercise groups (low, n = 14: moderate, n = 30: and high, n = 75), χ^2 (2, n = 119) = 4.77, p = .092

As can be seen in Table 3 above the higher the level of exercise the higher the mean score of general self-efficacy, however the Kruskal-Wallis test revealed no statistically significant differences in general self-efficacy across the different exercise groups (low, n = 15: moderate, n = 28: and high, n = 74), χ^2 (2, n = 117) = .08, p = . 916

Discussion and Conclusion

The aim of this research was to ascertain if higher frequencies of exercise can significantly reduce perceived stress levels, increase psychological wellbeing and general self-efficacy. As the numerous studies referred to within this paper have shown, exercise can be a viable alternative to the many forms of psychotherapy or medication (Ratey, 2017, para. 1).

Even a brief boost of exercise can be utilised for those with low mood states, Yeung (1996, p.138).

This current study, however, did not find a significant difference between low, moderate, and high exercise groups on measures of psychological well-being, general self-efficacy, and perceived stress. Furthermore, no significant correlations were found between exercise frequency and measures of psychological well-being, self-efficacy, and perceived stress. These results were very unexpected, given the existing literature. This literature as mentioned is vast and generally, a strong advocate of many beneficial effects derived from regular exercise and so it is presumed that, possibly due to some of the below-mentioned limitations of this study, the results found here were unfortunately not in line with previous research.

Although not significant the highest mean scores were in the high exercise groups for both PWB and GSE reporting mean scores of (46.44, and 59.45) respectively while for the PSS the moderate exercise group scored the highest mean of (71.40).

Therefore in this study hypotheses 1, 2, and 3 displayed no significant results as per the analysis ran using the Kruskal-Wallis test.

Other issues that were discussed were economic factors such as the 2007 economic crash which was shown to significantly increase stress and suicide rates Van Hal (2015, p. 19) across many European countries, Ireland included with its high reported rates of suicide (Ryan, 2018, para. 1).

Expanding on the research done here, the finding from Last's (2018) study that both gym memberships and obesity levels are rising in Ireland could be a possible future research topic to investigate. Here researchers could incorporate the structure of a token economy (reduced gym rates) including a control group, with post-test scores taken six months after completion.

Including for factors such as injury and inactivity due to workload could provide more specific results than those found in this study. A more extreme token economy approach could be to reward individuals displaying health and fitness while morbidly obese individuals would not qualify to receive these rewards. This would likely be a very successful technique to combat the growing problem of obesity in Ireland. This, however, would come with far too many unethical factors, such as genetics, income, education, profession, geographical location etc.

A more ethical approach should entice more government or corporate/private investment in the promotion of exercise. This could be a positive driving factor in support of exercise and physical fitness. Healthier and happier employees would mean more productive employees, internal gyms, coupled with time to train could be factored into a working week, this could be a viable solution to obesity, stress and ultimately depression. If an organisation allowed and even encouraged physical activity on either a daily or weekly basis, this could perhaps allow exercise to become a necessary part of the work-life balance, therefore increasing the levels of happiness, within an organisation.

Potential problems in this study were the subjective nature of the questionnaires used. The possibility that participants knowing the studies aims were swayed in their perception of their own exercise and its effect on their stress, well-being and self-efficacy levels. Therefore those who exercise could display increased levels of cognitive dissonance in these areas. There were no pre-study measures of participants perceived stress levels, psychological wellbeing or general self-efficacy.

Perhaps an experiment based study would be a beneficial extension to this research. Here participants could have their pre and post workout measures of stress, well-being and self-efficacy recorded, similar to the Yeung study (1996) also incorporating limb inactivity as done

in the Jones et al., (2004) study to examine differences between groups of active/inactive activity.

Although this study may be informative real answers to issues of exercise and inactivity are likely beyond the scope of an undergraduate degree. Further study on the benefits of the frequency of exercise and its effects on mental wellbeing should perhaps be initiated at higher levels of academia incorporating various factors such as genetics, diet, and geographical location. This perhaps should be conducted at MSc level or even PhD.

Limitations in this study could be attributed to the number of respondents from the researcher's own friend list on Facebook which was unexpected. This was very likely a factor affecting the results obtained in this study. It was intended that the largest proportion of participants be sports and fitness enthusiasts so as to easily ascertain if the low or high exercise groups could show significant correlations to perceived stress, psychological wellbeing and general self-efficacy.

There were numerous strengths of this study such as the high number of respondents obtained (N = 144), this was possibly due to the current interest in mental health (Weir, 2018, para. 1) that appears to be on the rise. Another strength is the questionnaires, are widely used in research and have been shown to be viable measures of perceived stress, psychological wellbeing and general self-efficacy. The much-needed data on exercise, obesity and mental health including its promotion should be a welcome addition to the current literature. The population of Ireland as mentioned is gaining weight and something should be done to stop this problem. Finally, the simplicity and short duration to complete the questionnaires with an average of eight minutes was a strength of this study.

In Callaghan's, (2004) study, apart from highlighting the many benefits of exercise on mental health his studies concluding sentence "evidence suggests that exercise may be a neglected

intervention in mental health care." p. 482) unfortunately seems to be a prevailing theme. Wen & Wu (2012, p. 192) describes this failing passive attitude to promote the benefits of exercise or even the harms which result from inactivity as anachronistic relating it to the battles still being fought over smoking.

Surely prevention would be a better approach than a cure one. With governmental support increasing the amount of education and emphasis on health, diet, sports, and fitness in secondary schools would surely help combat this common growing problem area for countless individuals throughout Europe. Educating the population on the health benefits of exercise might not be enough to turn the tide of inactivity. Similar education needs to be provided on the effects of inactivity to have a combined effect (Wen & Wu, 2012, p. 192) The results of this promotion would surely help with a countries population reducing excess weight and often as has been discussed in this study, improve their mental health, life span, reducing probability of non-communicable diseases for those who engage in a healthier and fitter lifestyle.

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Appendices

Hello, my name is Aidan Clancy and I am a final year student conducting research in the Department of Psychology in Dublin Business School.

My aim is to measure if differing levels and types of exercise will have measurable effects on people's mental health; specifically perceived stress, psychological wellbeing and general self-efficacy.

My reasons for this study are to promote the use of exercise for mental health benefits and not just for body modification.

My 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 the attached anonymous survey. While the survey will ask some questions that may cause some minor negative feelings, it has been used widely in research. If any of the questions do raise upsetting feelings, please contact the support services that are included on the final page.

Participation is completely voluntary and so you are not obliged to take part.

Results are anonymous and confidential. Responses cannot be attributed to any one participant. For this reason, it will not be possible to withdraw from the study after the questionnaire has been completed.

Data gathered will be stored on a password protected personal laptop until completion of the study.

If you require any further information about the research, please contact

Aidan Clancy at xxxxxxx@mydbs.ie. My supervisor can be contacted at [xxxxxx@dbs.ie].

The survey should take less than 10 minutes.

Thank you for taking the time to complete this short survey.

Questionnaires

I am 18 years or over and give my consent for participation in this study Yes / No

Please select either male or female

During a typical 7-Day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number)?

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY)

b) MODERATE EXERCISE (NOT EXHAUSTING)

c) MILD EXERCISE (MINIMAL EFFORT)

During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)?

OFTEN SOMETIMES NEVER/RARELY

Instructions: Circle one response below each statement to indicate how much you agree or disagree.

1. “I like most parts of my personality.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

2. “When I look at the story of my life, I am pleased with how things have turned out so far.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

3. “Some people wander aimlessly through life, but I am not one of them.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

4. “The demands of everyday life often get me down.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

5. “In many ways I feel disappointed about my achievements in life.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

6. “Maintaining close relationships has been difficult and frustrating for me.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

7. “I live life one day at a time and don't really think about the future.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

8. “In general, I feel I am in charge of the situation in which I live.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

9. “I am good at managing the responsibilities of daily life.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

10. “I sometimes feel as if I've done all there is to do in life.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

11. “For me, life has been a continuous process of learning, changing, and growth.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

12. “I think it is important to have new experiences that challenge how I think about myself and the world.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

13. “People would describe me as a giving person, willing to share my time with others.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

14. “I gave up trying to make big improvements or changes in my life a long time ago”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

15. “I tend to be influenced by people with strong opinions”

Strongly	Somewhat	A little	Neither	A little	Somewhat	Strongly

agree	agree	agree	agree nor disagree	disagree	disagree	disagree

16. “I have not experienced many warm and trusting relationships with others.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

17. “I have confidence in my own opinions, even if they are different from the way most other people think.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

18. “I judge myself by what I think is important, not by the values of what others think is important.”

Strongly agree	Somewhat agree	A little agree	Neither agree nor disagree	A little disagree	Somewhat disagree	Strongly disagree

Please select the most accurate answer	Not at all true	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough	□	□	□	□
2. If someone opposes me, I can find the means and ways to get what I want.	□	□	□	□
3. It is easy for me to stick to my aims and accomplish my goals.	□	□	□	□
4. I am confident that I could deal efficiently with unexpected events.	□	□	□	□
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	□	□	□	□
6. I can solve most problems if I invest the necessary effort.	□	□	□	□

7. I can remain calm when facing difficulties because I can rely on my coping abilities.	□	□	□	□
8. When I am confronted with a problem, I can usually find several solutions.	□	□	□	□
9. If I am in trouble, I can usually think of a solution	□	□	□	□
10. I can usually handle whatever comes my way.	□			

For each question choose from the following alternatives:

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

l. In the last month, how often have you been upset because of something that happened unexpectedly?

2. In the last month, how often have you felt that you were unable to control the important things in your life?

3. In the last month, how often have you felt nervous and stressed?

4. In the last month, how often have you felt con dent about your ability to handle your personal problems?

5. In the last month, how often have you felt that things were going your way?

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

7. In the last month, how often have you been able to control irritations in your life?

8. In the last month, how often have you felt that you were on top of things?

9. In the last month, how often have you been angered because of things that happened that were outside of your control?

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Thank you for your answers. Your response has been recorded.

If you feel that answering this survey has raised some issues for you, please consider contacting some of the support services listed below, or speak to a friend, family member or healthcare professional.

Aware:

The Aware Support Line 1890 303 302

Available Monday – Sunday, 10am to 10pm.

Email for support at: supportmail@aware.ie

Samaritans:

Call on: 116 123

Available 24hrs a day, 365 days a year. Free to call.

Email: jo@samaritans.org