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Investigating the psychological effects on mood in university students when comparing different environments settings during low intensity workouts

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A thesis submitted in partial fulfilment for the requirements for the degree of BSc in Psychology at the University of Central Lancashire

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1. Abstract

Exercise plays an important role in maintaining a healthy mental state, as it triggers the release of endorphins. The purpose of this present study was to compute the effect that exercising in an indoor and outdoor condition has on general mood. This was assessed using a Brunel Mood Scale (BRUMS). Furthermore, the study explored the effect of exercise on enjoyment levels when exercising indoor versus outdoor. Within this study, there were 50 participants collected however, six withdrew for medical reasons. Each participant was assigned a BRUMS test to complete before and after completing a 10-minute low intensity workout video. They were also asked a simple five-point Likert scale questionnaire concerning their enjoyments levels during the exercise. Results showed that there was a significant main effect of time thus, mood improved after exercising. However, only mood subsection vigour had a significant main effect of condition. There was a difference in mood scores when exercising indoor versus outdoor. Furthermore, vigour had a significant interaction effect of condition and time therefore, both exercising and being outdoor saw significant improvements. Subsequently, the study conducted displayed the potential for using low intensity workout sessions in combating the rise of mental health issues.

2. Introduction

According to the World Health Organisation (WHO, 2010) exercise is "any bodily movement that is produced by any skeletal muscles that requires energy expenditure". Exercise has been found to play a significant factor in improving the general mood states of individuals (Szabo, Griffiths & Demetrovics, 2019). Mood can be explained as a prolonged psychological feeling that can last anytime between several hours to even a few days (Szabo, Griffiths & Demetrovics, 2019). Completing exercise can help to alleviate negative mood states such as anxiety, guilt and irritability and therefore increase the sensation of positive feelings (Hamer & Karageorghis, 2007). It was found that only 10.8% of adults aged between 20-29 years old, completed the recommended 30 minutes of physical activity daily (Tucker, Welk & Beyler, 2011). Quantitively, the average mood improved by 50% when following a Robust exercise plan which further enforces the argument that a person's mood is significantly elevated by following a vigorous exercise workout (Szabo, Griffiths & Demetrovics, 2019). Moreover, animal studies on rats that performed exercise expressed an increase in their opioid receptor binding (Sforzo, Seeger, Pert, Pert & Dotson, 1986).

Exercises such as running, and walking produce a release of endorphins in the brain. The release of endorphins can cause changes in our mood and well-being, leading to happy state (Jain, Mishra, Shakkarpude & Lakhani, 2019). When endorphins are released, this can be directly proportional to its effect on changing mood (Jain, Mishra, Shakkarpude & Lakhani, 2019). When aerobically exercising due to acute body reaction it causes an increase in energy expenditure, repetitive muscle contractions and the release of anti-inflammatory and oxidative stress to repair muscles (Van Praag et al., 2014). The positive effects regular activity has on physical and psychological health (Scully et al., 1998) and higher health related quality of life (Gopinath et al., 2012) has been extensively documented. Meta- analyses and reviews into

exercise have labelled exercise as a support medicine (Pederson & Saltin, 2015; Gerber et al., 2016; Hallgren et al., 2016). Considerable research has demonstrated the positive health relevant changes that are brought by just a single bout of physical exercise such as psychological (Raedeke, 2007; Liao et al., 2015; Ensari et al., 2015) but also physiological (Macdonald, 2002) and neurophysiological changes (Crabbe & Dishman, 2004).

Only a single Pilates session resulted in a small to moderate significant improvement in anxiety and Total mood disturbance, whilst seeing a non-significant improvement in other symptoms such as worry, tension and depressive mood (Fleming, Campbell & Herring, 2020). The effects of moderately intense exercise on the moods of young adults can be seen from a single session regardless of the length of time (Crush et al., 2018) or the level of physical activity of the participants taking part (Brellenthin et al., 2017). Those who engaged in physical activity earlier in life saw an increased chance of delaying any cognitive decline Greene et al., 2019). Completing physical exercise over the course of a lifespan has demonstrated that it will cause improvements in mood (Poole et al., 2011) and lessen depressive symptoms (Bailey et al., 2018). Thus, creating a neuroprotective effect on neurogenesis within the brain which positively promotes any functions cognitively. At the same time lowers the risk of depressive and mood disorders across a lifespan (Saraulli et al., 2017).

Patients who were initially struggling with the process of regulation of emotions, particularly downplaying negative emotions, were facilitated with the downregulation of those negative emotions through introducing them to acute aerobic exercises (Bernstein & McNally, 2017). There is evidence that illustrates that doing physical exercise can affect the plasticity within the brain, resulting in an influence on brain cognition and well-being (Weinberg & Gould, 2014; Fernandes et al., 2017). It has been reported that physical exercise influences

both structural and functional changes within the brain, creating significant biological and psychological benefits (Mandolesi et al., 2018). These benefits effect the cognition of the brain and promotes wellbeing (Mandolesi et al., 2018). Those who suffer with Generalised Anxiety Disorder, particularly young women, support the evidence of exercise training and its positive effect on clinical severity (Herring et al., 2012). In addition, exercise training positively improved the feelings of worry, anxiety, feelings of energy and fatigue levels (Steiner et al., 2005; Vesga-Lopez et al., 2008; Herring et al., 2011). Exercising can improve the dimension of sleep quality and quantity (Herring, Kline & O'Connor, 2015). As well as overall health quality of life (Herring, Johnson & O'Connor, 2016). These improvements on mood were found to have ranged from moderate to large which is consistent with previous research findings into the effect of exercise on mood. (Loy, O'Connor & Dishman, 2013; Ensari et al., 2015; McDowell et al., 2016).

Our ancestors who adopted the roles of hunter-gatherer, spent majority of time in natural environments for thousands of years thus it is hypothesised that present day humans share similar innate affiliations with nature (Wilson, 1984). Nature, like exercise is also suggested to be a factor that can direct one's attention towards a more pleasant mood enhancing stimuli (Yeh et al., 2016). Scents that are found in nature that stimulate the olfactory systems, reduce anxiety and simultaneously improves mood (Lehrner et al., 2005). For those who spend their leisure time in nature, the environments can cause a positive effect on the prevalence of diseases, mortality rates, mental and overall health (Takano, Nakamura & Watanabe, 2002; Maas et al., 2006; Mitchell & Popham, 2008; Maas et al., 2009; Van den Berg et al., 2010; Beil & Hanes, 2013). There is also an ever increasing, growing body of research offering evidence that nature results in improved health (Rodiek, 2002; Pretty et al., 2007). Previous studies have reported that weather and seasons affect the amount of exercise individuals do with activity

and exercise time generally increasing during the warmer summertime and decreasing during the colder winter. (Tucker & Gilliland, 2007; Clemes et al., 2011; Lloyd & Miller, 2013; Hagströmer, Rizzo & Sjöström, 2014; Bento et al., 2014). Moreover, nature and green spaces offer a cheap alternative for enhancing physical activity hence reducing stress, obesity, burnout syndrome and even cardiovascular diseases (Barton, 2009; Stigsdotter & Grahn, 2011).

The benefits of interacting with green spaces has also been thoroughly researched (Park et al., 2010; Matsuura et al., 2001; Thompson Coon et al., 2001; Marselle et al., 2013; Haluza et al., 2014; Hartig et al., 2014). Tension and anxiety have been found to be increase when a window showing a view of nature or even an indoor plant were removed (Lawton, Brymer, Clough, & Denovan, 2017). Studies evaluating the relationship between stress and exposure to outdoors show a direct association between stress decreasing and long-term health benefits. (Kondo, Jacoby & South, 2018). In a meta-analysis it was found that thirteen articles saw at least one significant positive effect that nature had on psychological factors (Haluza, Schönbauer & Cervinka, 2014). Just the presence of trees seems to encourage the use of outdoors areas, and the experience with nature decreases mental fatigue and stress whilst having a positive effect on mood (De Vries et al., 2003). Furthermore, Grahn & Stigsdotter (2003) reported that there was a significant relationship between the frequency of visiting open green spaces and the reduction in levels of stress. There is also strong evidence to suggest that simply viewing nature can immunise the impact on levels of stress and wellbeing ((Thompson Coon et al., 2011), can improve mood (Diette et al., 2003; Pretty et al., 2007; Barton, Hine & Pretty, 2009) and also attention (Berto, 2005). There is also strong evidence to suggest that simply viewing nature can immunise the impact on levels of stress and wellbeing ((Thompson Coon et al., 2011), can improve mood (Diette et al., 2003; Pretty et al., 2007; Barton, Hine & Pretty, 2009) and also attention (Berto, 2005). When comparing a garden group to a non-garden

group, the mean anxiety level reduced by twice as much and saw four times as much reduction in negative mood in the gardening group (Rodiek, 2002). Thus, having regular contact with nature and green spaces enhances both mental and well-being (Pretty, 2007). When people are outside, they are often more physically active (Lee & Maheswaran, 2011).

The term "green exercise" was first expressed by researchers at the university of Essex in 2003. The concept of green exercise consists of combining psychological, physiological and social benefits originating from exercising in a nature-based setting and profiting from the effects of outdoor exercising (Pretty, Griffin, Sellens, & Pretty, 2003; Pretty, 2004; Pretty, Peacock, Sellens, & Griffin, 2005; Rogerson et al., 2019). Thus, green exercise is simply exercise completed within a natural environment (Mackay & Neill, 2010). Researchers have been investigating the environmental effects on individuals' when completing physical activities (Ekkekakis et al., 2000; Rogerson et al., 2019). Furthermore, how environments can shape and alter behaviours during exercise which indirectly have an effect on someone's mental health and well-being (Rogerson et al., 2019). Combining physical activity and nature offers greater advantage to health than completing either in isolation (Mackay & Neill, 2010). Additionally, it has more benefits to mental health than indoor activities (Thompson et al., 2011). Research shows convincing evidence that green exercise has valuable beneficial effects for everyone (Gladwell, Brown, Wood, Sandercock, & Barton, 2013). This association can be seen when comparing the regular use of a natural environment when completing a physical exercise, which lead to lowering the risk of developing mental health issues (Mitchell, 2013). Studies investigating the effect of green exercise in people who suffer from high levels of trait anxiety proved that short bouts of green exercise have been effective in reducing state anxiety than exercise on its own (Mackay & Neill, 2010). Another example also stated that that one small bout of exercise such as Shinrin-Yoku in a natural environment has positive long-term

benefits in reducing levels of stress (Park et al., 2010; Korpela et al., 2014; Takayama et al., 2014).

Moreover, the benefits of physical activity completed in nature have been very well documented such as walking in a forest, hiking, outdoor activities and gardening (Pretty et al., 2007; Page, 2008; Ryan et al., 2010; Pasanen et al., 2014; Passmore & Howell, 2014). Hence, performing physical activity in nature has been linked to improving mood (Hartig et al., 2003), enhancing the capacity for attention (Berman et al., 2008) as well as expanding cognitive capability (Berman et al., 2012). Furthermore Pretty et al. (2007) saw a considerable exercise outdoors saw a considerable improvement in self-esteem and their total mood disturbance. When nature is added to exercise, it adds more additional benefits such as self-esteem and mood (Teas et al., 2007; Barton et al., 2009, 2012; Barton & Pretty, 2010; Park et al., 2011; Thompson et al., 2012).

Previous studies by Mackay & Neill (2010); Bratman et al., (2012) and Reed et al., (2013) investigating green exercise and images related to nature without the other senses that are connected to nature, such as sound and smells, suggest that vision is the main dominating sensory that is manipulated by nature. Furthermore, indicated that the dominant and main sensory influence during green exercise is vision when comparing to the other senses (Wooller et al., 2016). When exercising and all the senses are triggered within a natural setting such as being in a park, there is a reduction in tension and vigour, and increase in fatigue which is consistent with previous findings of green exercise (Akers et al., 2012; Barton. et al., 2009, 2012; Barton & Pretty; 2010; Park et al., 2011).

Due to the worldwide pandemic caused by SARS-CoV-2 (Severe Acute Respiratory Syndrome- Corona Virus -2) (WHO, 2020), more commonly known as Covid or Coronavirus, there has been an increase of publications regarding the effect on people's well-being and how to reduce negative stimulus by means of physical exercise (Jiménez-Pavón et al., 2020). When people must isolate or quarantine during a pandemic, this can lead to many different emotional outcomes such as stress, depression, irritability, fear and anger (Pfefferbaum & North, 2020). Moreover, a prolonged time of being in quarantine and isolation has been correlated with higher risk of anxiety (Xiong et al., 2020). Frequent exposure to the news and social media about coronavirus, has also been found to be highly associated with symptoms of increased anxiety (Gao et al., 2020; Moghanibashi-Mansourieh, 2020). Furthermore, fear-related behaviours due to regular news about coronavirus causing extreme avoidance of social contact with others will significantly increase the risk of developing mental health issues (Amsalem, Dixon & Neria, 2021). Covid strategies adopted by the government has had a persistent impact on the mood and wellbeing of students, and universities should prepare to address the mental health impact this pandemic has caused (Copeland et al., 2021). Therefore, green exercise can be a valuable technique to prescribe to patients who feeling depressive symptoms as depression is prone to be a recurrence in patients who have the inability to regulate their low mood (Werner-Seidler & Moulds, 2012). Thus, as green exercise has the ability to create further health benefits such as preventing diseases (Shanahan et al., 2016) and improving self-esteem and mood (Barton & Pretty, 2010).

This study aimed to establish the psychological effects of indoor or outdoor exercise on adult participants. The main objective was to investigate the beneficial effects exercising has on participants mood. Whilst conducting a literature search, a gap in research was found as studies into green exercise, as studies into green exercise did not take into account enjoyment

levels. Therefore, this study aims to facilitate closing the gap in the current research by investigating if enjoyment levels during workout differs between indoor and outdoor exercise. The experiment in this study will develop existing knowledge in the current research into green exercise and the beneficial effects on mood compared to exercising indoors. Moreover, this study aimed to gather participants who attend university as university students experience moderate levels of stress (Thawabieh & Qaisy, 2012). Accordingly, the last 30 years has seen an ongoing rise in levels of stress amongst university students (Prichard et al., 2007; Mackenzie et al, 2011). Furthermore, the increase in competitive employment following students graduating has also heightened levels of stress and depression in students (Dusselier et al., 2005). This has subsequently caused a rapid increase in the social demands of obtaining a post-secondary degree and thus more circumstances for stress to be induced (Flynn & Chow, 2017). Therefore, with university experiencing moderate levels of stress they were used in this study to investigate exercise and environmental effects on the university student's mood and explore the idea that could be adopted as a practical application to help students battle the increasing levels of stress and anxiety that is on the rise.

3. Materials and Methods

3.1 Design

The design constructed for this study was a within subject's 2 (Environment: Indoor and outdoor exercise) x 2 design (Time: before and after exercising). The independent variable created for this study was the environment the participants exercised in, as they were required to exercise in both an indoor setting, such as a bedroom or a living room, and an outdoor setting, such as a garden or a park. They completed a ten-minute low intensity workout video in both environments. To control for exercise duration and intensity, participants watched the same 10-minute low intensity workout video in both conditions. Counterbalancing of the two conditions was utilised in this study to remove any practise effects. Each participant was explicitly told that they must wait at least between 24 hours to 5 days, before they were to complete the second conditions. This was to control any extraneous variables that would impact the results as if they were to complete both conditions in one day. Due to the impact on mood as the first exercise session would have impacted the second workout session to not be accurately tested. The dependant variable consists of the score on the Brunel Mood Scale (BRUMS) and the score on the Likert scale investigating enjoyment levels. The BRUMS test was completed before and after each workout session in the two environmental conditions. Whereas they were only asked to complete the Likert scale after each workout session.

3.2 Participants

During the study 50 participants were recruited using the psychology software Sona and via posts on social media (such as Instagram, Facebook, and WhatsApp). There was a total of 50 participants collected however, 6 withdrew from the study for medical reasons. Throughout this study, the gender split was 15 men and 28 women and 1 identified as other.

The age range from this study was 19-61 with the mean age being 25 and a standard deviation of 10.12. Due to the nature of recruitment, this study adopts a volunteer sampling method. Due to the design of this study, there was an inclusion criterion of being at least 18 years old. As this study involved exercise, the participants were at an increased risk of distress, discomfort, or harm thus, it was mandatory for all the participants to complete a Physical Activity Questionnaire (PAR-Q) (Appendix A). This health questionnaire asked participants a series of health questions with the aim of excluding any participants who have been highlighted as a risk due to underlying health problems. The participants who were at risk were redirected to a separate debrief (See Appendix B) explaining the reason why they have been excluded from the study.

3.3 Measures

The measures in this study involved completing a questionnaire called the Brunel Mood Score (BRUMS) (See Appendix C) test first devised by Terry et al (1999). This mood scale consisted of a 24 item six factor model aimed to allow responders to quickly assess their mood states at the time of them completing the test. For each of the 24 mood descriptors in the BRUMS test each participant was asked to score how often they feel each mood descriptors. The BRUMS test consists of 6 subsections Tension, Anger, Depression, Fatigue, Vigour and Confusion which all have 4 corresponding moods Where 0 = 'Not at all', '1' = 'A little', '2' = 'Moderately', 3 = 'Quite a bit', and '4' = 'extremely'. The BRUMS test was chosen as it is a shorter version of the Profile of Mood States (POMS) which has been criticized for its lengthy nature with 65 items (Lan et al., 2012). There is strong evidence to supports the validity of the BRUMS test specifically with adolescent to adult populations (Terry, Lane & Fogarty, 2003). Additionally, further studies have shown the validity of the BRUMS test across different cultures and athletes around the world such as Malaysia and China (Lan et al., 2012; Zhang et al., 2014).

The participants were required to fill the BRUMS test immediately before and after exercising in both environmental conditions to allow for a pre-post comparison. After they completed the post-exercise BRUMS test, the participants were also asked to fill out a five-point Likert scale. This simple five-point Likert scale enabled the exploration of whether the participants enjoyed the workout (See Appendix D), in the indoor setting or in the outdoor setting by examining how they answered this Likert scale. Furthermore, when the participants were inquired to complete the Likert scale, they were answering the following statement "I enjoyed the workout" where 1 = Strongly Disagree, 2 = Disagree, 3 = Neither agree nor Disagree, 4 = Agree and 5 = Strongly Agree.

Within the instructions and the software of Qualtrics, they were reminded that they were to answer to every mood descriptor, this is to avoid any sections or items they might have missed or didn't answer, this removed the chance of the participants accidental incompletion of the study. Within the instructions and the Qualtrics software, participants were reminded to answer every mood descriptor to avoid any sections of items from being missed or unanswered. This reduced the likelihood of participants accidentally submitting the study incomplete.

3.4 Procedure

Once the participant had chosen to participate in this study, they were asked to click the link which redirected them to a website called Qualtrics. Each participant first read the Participants information sheet (PIS) (See Appendix E) to develop a basic understanding of what the study involved, and what they were required to do throughout the study. Subsequently, they had to fill out the PAR-Q, then read the informed consent form (See Appendix F) which also contained the risk assessment. These contained information about the risks, aims, their

right to withdraw and informed participants that if they chose to withdraw, their answers would be impossible to be withdrawn due to anonymisation. Those who withdrew still had access to the debrief (See Appendix G).

Following this the participants were asked about their age and gender (See Appendix H). Afterwards, each participant was asked to complete the first BRUMS test prior to completing any exercise. They were then presented with a link to a YouTube video to complete the ten-minute low intensity Body Coach™ workout in the first condition. After finishing the first workout session the participants were advised to wait a minimum of 24 hour to a maximum of 5 days before completing the second condition. Following completion of the workout, they then immediately completed a second BRUMS test and the first enjoyment five-point Likert scale. Subsequently, they were then directed to a debrief where the participants are thanked for their participation in the study. They also were provided with the purpose of the study they had taken part in, and what is intended with the research with a further detailed explanation into the area of green exercise was attache

4. Results

The aim of this research was to investigate the effect of exercise on mood in an indoor or outdoor setting using a Two-way ANOVA. The BRUMS test has six subsections; Tension, Anger, Depression, Fatigue, Vigour and Confusion, each containing four mood scores that represent each subsection. The means (M) and the standard deviations (SD) were collected for each of the 24 mood scores and the mean and standard deviation was calculated for the 6 subsections (See Table 1). After exercising, the mood scores for each of the negative subsections improved after exercising such as depression (M= 0.63, SD= 0.91) improved in indoor (M= 0.18, SD= 0.49) and in outdoor (M= 0.15, SD= 0.48) environments. Whereas the positive mood subsection Vigour (M= 1.55, SD= 1.22) increased after exercising in both the indoor (M= 2.34, SD= 1.30) and outdoor (M= 2.60, SD= 1.30).

Table 1 Shows the mean score and standard deviation for each of the Subsections before and after exercising

	Mean Score Pre-Indoor	Standard Deviation	Mean Score Post Indoor	Standard Deviation	Mean Score Pre-Outdoor	Standard Deviation	Means Score Post Outdoor	Standard Deviation
Tension	0.91	1.16	0.19	0.45	0.91	1.16	0.21	0.53
Anger	0.37	0.65	0.14	0.49	0.37	0.65	0.08	0.39
Depression	0.63	0.91	0.18	0.49	0.63	0.91	0.15	0.48
Fatigue	1.31	1.24	1.45	1.13	1.31	1.24	1.30	1.22
Vigour	1.55	1.22	2.34	1.30	1.55	1.22	2.60	1.30
Confusion	0.54	0.81	0.21	0.65	0.54	0.81	0.19	0.55

4.1 Tension

The repeated measures ANOVA test was used (See Appendix I), which showed that a significant main effect of time was perceived for tension (F (1, 124) = 45.02, p =0.001, Eta^2 = .27 (27%). This demonstrates that tension scores were significantly lower after exercising then before exercising. A non-significant main effect of condition was shown (F (1, 124) = .22, p= .641, Eta^2 = .00 (0%). This indicates that there was no difference in tension scores between the conditions of indoor and outdoor. In contrast, there was no significant interaction effect between condition and time (F (1, 124) = .22, p= .641, Eta^2 = .00 (0%). There was no difference in time and condition where they exercise, on improving tension scores.

4.2 Anger

When analysing the subsection of Anger using ANOVA (See Appendix J), a significant main effect of time was perceived (F (1, 124) = 18.37, p= .001, Eta^2 = .13 (13%). Thus, anger scores lowered after exercising compared to before exercising. A non-significant main effect of condition was illustrated F (1, 124) = 1.69, p= .196, Eta^2 = .01(1%). Therefore, there was no difference in anger scores between the two conditions indoor and outdoor. On the other hand, there was no significant interaction effect between condition and time (F (1, 124) = 1.69, p= .196, Eta^2 = .01(1%). Thus, there was no difference in scores when comparing time and condition.

4.3 Depression

For subsection of depression the ANOVA (See Appendix K) showed a significant main effect of time (F (1, 124) = 31.66, p= .001, Eta^2 = .21 (21%). After exercising the depression scores lowered compared to before exercising. The ANOVA also showed a non-significant main effect of condition (F (1, 124) = .24, p= .624, Eta^2 = .00 (0%). Therefore, when comparing

indoor and outdoor there was no difference in depression scores. Nonetheless, there was no significant interaction effect between condition and time (F (1, 124) = .24, p= .624, Eta^2 = .00 (0%). Overall, when accounting for both condition and time, there was no difference.

4.4 Fatigue

With subsection fatigue the ANOVA (See Appendix L) the ANOVA resulted in a non-significant main effect of time (F (1, 124) = .15, p= .699, Eta^2 = .00 (0%). Thus, the scores weren't different before and after exercising. There was also a non-significant main effect of condition (F (1, 124) = 2.01, p= .159, Eta^2 = .02 (2%). When comparing indoor and outdoor there was no difference between the fatigue scores. Nevertheless, there was no significant interaction effect between condition and time (F (1, 124) = 2.01, p= .159, Eta^2 = .02 (2%). Thus, when analysing interaction of time and condition there was no difference.

4.5 Vigour

When analysing subsection vigour, the ANOVA (See Appendix M) saw a significant main effect of time (F (1, 124) = 64.56, p= .001, Eta^2 = .34 (34%). There was a difference in scores and vigour increased after exercising. Furthermore, there was a significant main effect of condition (F (1, 124) = 6.75, p= .011, Eta^2 = .05 (5%). Thus, there was a difference between the indoor and outdoor condition as exercising outside has a higher vigour score than indoor. There was a significant interaction effect between condition and time (F (1, 124) = 6.75, p= .011, Eta^2 = .05 (5%). As the interaction was significant, this suggests that exercising outside improved mood better than exercising indoors.

4.6 Confusion

Finally, when analysing the subsection Confusion (See Appendix N), the ANOVA produced a significant effect of time (F (1, 124) = 19.07, p= .001, Eta^2 = .13 (13%). There was a difference in confusion scores before and after exercising. There was no significant main effect of condition (F (1, 124) = .08, p= .783, Eta^2 = .00 (0%). Thus, there was no difference in scores between indoor and outdoor. Additionally, there was no significant interaction effect between time and condition (F (1, 124) = .08, p= .783, Eta^2 = .00 (0%). There was no difference in scores when both time and condition are accounted for.

4.7 Post Hoc

With subsection Vigour having a significant interaction effect a post hoc test was conducted to further investigate the interaction. A paired samples test (See Appendix O) was utilised to investigate pre-indoor to post-indoor and pre-outdoor and post-outdoor. When analysing pre-indoor and post-indoor it was significant (t (163) = -6.97, p <.001). Thus, there was a difference between before exercising and after exercising in the indoor condition. Furthermore, when analysing pre-outdoor and post-outdoor it was significant (t (136) = -9.34, p <.001). Hence, there was a difference before and after exercising in the outdoor condition.

4.8 Enjoyment Levels

After exercising, participants rated how much they enjoyed the workout. A paired sample T-Test (See Appendix P) analysis was run to calculate the means between the indoor and outdoor conditions regarding Enjoyment. The mean enjoyment for exercising indoors (*M*= 3.90, *SD*= 1.16) was slightly lower than the mean enjoyment level for exercising outdoor (M= 4.29, *SD*= 0.86). However, the analysis displayed that the difference in moods in the two environments was not statistically significant (t (30) = -1.88, p=.0.70).

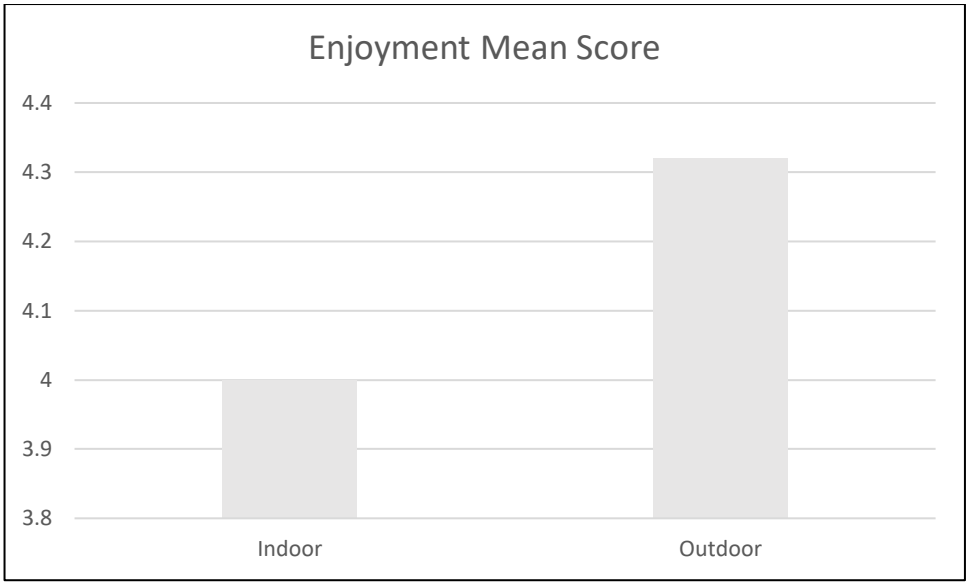

Figure 1 shows the means scores for enjoyment in both indoor and outdoor conditions.

5. Discussion

The research aims of this study was to investigate the effects of exercise on mood between two environments - indoor versus outdoor. Furthermore, another aim of this study was investigating enjoyment levels when exercise in the two environments. Therefore, this study aimed to investigate the benefits and the enjoyment levels during exercising. The mean scores from the BRUMS test were compared for before exercising and after exercising in both indoor and outdoor conditions. The results of this study found that when investigating time as a main effect, it was significant proving that exercise improved mood scores. However, when investigating the main effect of condition, only the subsection of Vigour was significant. This demonstrates that exercising in outdoor conditions is significant in improving positive moods in comparison to indoor conditions. Furthermore, when investigating an interaction effect of condition and time, only subsection Vigour was significant. Accordingly, this shows that when combined it saw an improvement in the participants mood score. Vigour is a positive mood described as excitement, being alert and having lot of energy physically (Terry et al., 1999). Thus, vigour being significant shows that exercising and being outdoor improves positive mood (Scully et al., 1998). Additionally, this study also investigated the enjoyment levels during exercise between the two environments. The mean score was higher in outdoor condition however, it was not statistically significant. A post hoc test was conducted, and it was found that for subsection vigour it was significant. Thus, for both indoor and outdoor the mood scores improved after exercising.

It is widely accepted that exercising can improve someone's average mood by up to 50% (Szabo, Griffiths & Demetrovics, 2019). Furthermore, combining that with nature adds additional positive benefits such as prevalence of diseases, mortality rates, mental and overall health (Takano, Nakamura & Watanabe, 2002; Maas et al., 2006; Mitchell & Popham, 2008;

Maas et al., 2009; Van den Berg et al., 2010; Beil & Hanes, 2013). It was anticipated that after exercising the mood scores would improve in both environmental conditions (Jain, Mishra, Shakkarpude & Lakhani, 2019). Therefore, the hypothesis was created that by combining the benefits of nature (Haluza, Schönbauer & Cervinka, 2014) with the additional benefits of exercise (Scully et al., 1998), the benefits of exercise will be increased and offer a greater advantage than in isolation (Mackay & Neill, 2010). Additionally, previous studies have indicated that exercising outdoors significantly improves mood states when compared to exercising indoors (Thompson et al., 2011). In parallel, it follows previous studies which show that exercise can enhance both mood and wellbeing. This study also highlights and emphasises that exercise does not have to be highly intensive to achieve improvements in mood state and overall physical and mental health. The chosen workout for this study was a simple 10-minute low intensity workout. This follows other studies (Rogerson et al., 2019) verifying that to help improve mental health someone is not required to follow strict plans to maximise improving their mental health. This study showed that vigour was significantly improved after exercising in both conditions, also the study conducted by Frodl et al., (2019) which also presented that following aerobic exercise the subsection vigour saw significant improvements. Furthermore, when completing a simple acute short exercise in naturalistic environments, it facilitates improvements in both self-esteem and mood irrespective of length, how intense, gender, how old they are and how regularly they exercise (Barton & Pretty, 2010). Therefore, for an individual to improve their self-esteem and mood, they can add a short low intensity workout to be completed outdoors to their day.

This emphasises the research of previous studies which have concluded that the negative moods decreased after exercising (Hamer & Karageorghis, 2007). Furthermore, with vigour a positive subsection increasing after exercising, this conveys that after exercising, a

more positive mindset is formed (Hamer & Karageorghis, 2007). Additionally, when looking at the mean scores of the mood subsections, it was evident that exercising decreased the negative moods whilst the positive moods increased. These findings follow previous studies and further emphasis the effects exercising can have in improving mood and well-being (Poole et al., 2011). Subsequently, this mean scores of this study showed that the outdoor condition using nature and exercise, implicated a stronger positive mood. However, there was a contradicting mean score as the subsection of tension was lower in the indoor condition than the outdoor condition. This could perhaps be accounted for by the ongoing circumstances caused by SARS-CoV-2 news (Gao et al., 2020; Moghanibashi-Mansourieh, 2020) thus, adding additional tension when exercising outside and entering close proximity with other people. The demand from scientists and the government to follow strict social distancing measures to help prevent the spread of by SARS-CoV-2, and the continuous barrage of news (Amsalem, Dixon & Neria, 2021). Being continuously hit by negativity daily about the lockdown news, number of cases daily, hospital visits and deaths surrounding SARS-CoV-2. Thus, amounting an increase in participants tension which resulted in a higher mean score when exercising outdoors.

Due to the current circumstances resulting from COVID-19 and its impact on the world's population, there were several limitations of this study. Most notably, new methodological considerations had to be put into place which altered the way in which the design of this study was implemented. This included accounting for social distancing which directly impacted the study due to the need for the tasks to be completed remotely. Firstly, with Covid-19 it meant accounting for social distancing, which directly affected the study as it had to be done remotely. These influences on the study enabled two limitations. Due to the remote nature of the study, this made it difficult to prove and ensure that participants were confidently

and properly completing the study without monitoring. Parameters were developed to limit this problem. However, there was no concrete method of preventing participants from simply answering the questionnaires and Likert scales without completing the exercise sessions. A second limitation is that the nature of mood tests and questionnaires such as BRUMS, can be deemed too personal. Therefore, by being a remote-based study which requires answering personal questions, the investigation risks participants developing social desirability bias. This can also be partly attributed to Covid-19 as the pandemic has induced increase feelings of negative emotions such as stress, depression, irritability, fear and anger (Pfefferbaum & North, 2020).

Consequently, social desirability can be capable of compromising the validity and results of the study. Additionally, demand characteristics posed a risk on the study. Thus, leading them to answer the question in a way that would project them in a superior fashion (Grim, 2010). Due to the study investigating the effect of exercise on mood, the participants can adopt a bias within the experiments if they make an interpretation of the purpose of the study. This directly influences the research when a bias is created. This depends on a person's individual opinion and life experiences (Orne, 1996). As a result, both social desirability and demand characteristics impede the validity of the study. If the result of this research has low validity, the measurements this study was set out to analyse, would not establish if exercising does improve mood and well-being. Furthermore, this affects the ability to accurately state that mood directly was influenced by exercise.

There are many ways this study could be adapted to improve our knowledge and understanding of exercise in outdoor environments, one way would include investigating blue exercise. Blue exercise is discussed as an alternative to green exercise, as blue exercise involves

exercising close to aquatic environments such as lakes (White et al., 2016) and can include man-made locations such as fountains (Finlay et al., 2015; Gascon et al., 2015, 2017; de Bell et al., 2017).

There is strong evidence that those who engage in blue exercise have access to similar health benefits that are available through green exercise (Gascon et al., 2017; Völker & Kistemann, 2011). Blue exercise also facilitates the management of mental health as it has been found to reduce depressive symptoms (Korpeka, Stengård & Jussila, 2016). Water-based activity either paves the way to allow for improvement of cognitive functions which carries mental health benefits (Ayán et al., 2017; Fedor, Garcia & Gunstad, 2015) or the natural context (Thompson & Wilkie, 2020). Thus, by utilising blue exercise it allows the ability to be physically active, improve mental health and social isolation (Thompson & Wilkie, 2020). In spite of this, the majority of studies investigating environment and exercise focus on green exercise resulting in a gap in research concerning blue exercise and its effects (Ashbullby et al., 2013; Papathanasopoulou et al., 2016; Thompson & Wilkie, 2020). It would therefore be important to continue investigating and comparing and contrasting green exercise and blue exercise.

For future studies, this study has allowed a path to further investigate the effect of exercise and how it can improve mood. A rise in mental health issues alongside Covid-19 has made researching improving moods difficult however, this study provides an avenue to investigate the impact of implementing exercise on improving mental health. The patients who may feel depressed could be asked to add a low intensity workout into their daily life which improves their mental health. Hence, the results show that incorporating exercise can have a positive effect and decrease levels of depression. Thus, it has the potential to allow for the

improvement in mood, well-being and the overall quality of life as they have lower depressed feelings and higher positive moods. Moreover, Covid-19 has changed the way people live their lives. Multiple lockdowns, isolating and social distancing has brought about a serious impact in those who suffer mental health issues (Xiong et al., 2020). This study has illustrated that even with restrictions and needing to isolate inside homes with no access to public social spaces, gyms and additional paranoia to stepping outdoors, short bouts of exercise can significantly improve people's mood states. Hence, those who are shielding and isolating for long periods of time can be advised to utilise the effectiveness of low intensity. As a result, this study has many applications that can be implemented in the continuous battle with people struggling with mental health. Indeed, exercise has been found to significantly reduce depressive symptoms (Bailey et al., 2018). Furthermore, for more vulnerable elderly people, implementing aerobic and flexibility programs has been found to improve the severity of depression in older adults (Perez-Sousa et al., 2020). This is especially important during this current time as the pandemic has restricted the ability for everyone to exercise freely (Shahidi, Stewart Williams & Hassani, 2020)

6. Conclusion

The aim of the study was to investigate the effects of exercising on mood and whether enjoyment levels differ in different environments when exercising. The results of this study did observe that there was a significant main effect of time. Thus, the mood scores significantly improved after exercising. However, only vigour had a significant main effect of condition. Therefore, only vigour had a significant difference between the scores in the two environmental conditions of indoor versus outdoor. Moreover, vigour had an interaction effect of condition and time. Accordingly, its mood scores saw an interaction between the two main effect of condition and time causing a significant improvement in mood score. Ultimately, this study allows for future studies to investigate the use of low intensity workouts in overcoming the rise in mental health issues. In particular, those that have been induced and heightened since the start of the SARS-CoV-2 pandemic.

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References

Akers, A., Barton, J., Cossey, R., Gainsford, P., Griffin, M., & Micklewright, D. (2012). Visual color perception in green exercise: Positive effects on mood and perceived exertion. Environmental science & technology, 46(16), 8661-8666.

Amsalem, D., Dixon, L. B., & Neria, Y. (2021). The coronavirus disease 2019 (COVID-19) outbreak and mental health: current risks and recommended actions. JAMA psychiatry, 78(1), 9-10.

Ashbullby, K. J., Pahl, S., Webley, P., & White, M. P. (2013). The beach as a setting for families' health promotion: A qualitative study with parents and children living in coastal regions in Southwest England. Health & Place, 23, 138-147.

Ayán, C., Carvalho, P., Varela, S., & Cancela, J. M. (2017). Effects of water-based exercise training on the cognitive function and quality of life of healthy adult women. Journal of Physical Activity and Health, 14(11), 899-904.

Bailey, A. P., Hetrick, S. E., Rosenbaum, S., Purcell, R., & Parker, A. G. (2018). Treating depression with physical activity in adolescents and young adults: a systematic review and meta-analysis of randomised controlled trials. Psychological Medicine, 48(7), 1068-1083.

Barton, H. (2009). Land use planning and health and well-being. Land use policy, 26, S115-S123.

Barton, J., Hine, R., & Pretty, J. (2009). The health benefits of walking in greenspaces of high natural and heritage value. Journal of Integrative Environmental Sciences, 6(4), 261-278.

Barton, J., Griffin, M., & Pretty, J. (2012). Exercise-, nature-and socially interactive-based initiatives improve mood and self-esteem in the clinical population. Perspectives in public health, 132(2), 89-96.

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. Environmental science & technology, 44(10), 3947-3955.

Barton, J., Wood, C., Pretty, J., & Rogerson, M. (2016). Green exercise for health. Green exercise: Linking nature, health and well-being, 26.

Beil, K., & Hanes, D. (2013). The influence of urban natural and built environments on physiological and psychological measures of stress—A pilot study. International journal of environmental research and public health, 10(4), 1250-1267.

Bento, T. C., Romero, F., Leitão, J. C., & Mota, M. P. (2014). Portuguese adults' physical activity during different periods of the year. European journal of sport science, 14(sup1), S352-S360.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. Psychological science, 19(12), 1207-1212.

Berman, M. G., Kross, E., Krpan, K. M., Askren, M. K., Burson, A., Deldin, P. J., ... & Jonides, J. (2012). Interacting with nature improves cognition and affect for individuals with depression. Journal of affective disorders, 140(3), 300-305.

Bernstein, E. E., & McNally, R. J. (2017). Acute aerobic exercise helps overcome emotion regulation deficits. Cognition and emotion, 31(4), 834-843.

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. Journal of environmental psychology, 25(3), 249-259.

Brandt, R., Herrero, D., Massetti, T., Crocetta, T. B., Guarnieri, R., de Mello Monteiro, C. B., ... & Andrade, A. (2016). The Brunel Mood Scale rating in mental health for physically active and apparently healthy populations. Health, 8(2), 125-132.

Bratman, G. N., Hamilton, J. P., & Daily, G. C. (2012). The impacts of nature experience on human cognitive function and mental health. Annals of the New York academy of sciences, 1249(1), 118-136.

Brellenthin, A. G., Crombie, K. M., Hillard, C. J., & Koltyn, K. F. (2017). Endocannabinoid and mood responses to exercise in adults with varying activity levels. Translational Journal of the American College of Sports Medicine, 2(21), 138-145.

Clemes, S. A., Hamilton, S. L., & Griffiths, P. L. (2011). Summer to winter variability in the step counts of normal weight and overweight adults living in the UK. Journal of Physical Activity and Health, 8(1), 36-44.

Colley, R. C., Bushnik, T., & Langlois, K. (2020). Exercise and screen time during the COVID-19 pandemic. Heal. Reports, 31, 3-11.

Copeland, W. E., McGinnis, E., Bai, Y., Adams, Z., Nardone, H., Devadanam, V., ... & Hudziak, J. J. (2021). Impact of COVID-19 Pandemic on College Student Mental Health and Wellness. Journal of the American Academy of Child & Adolescent Psychiatry, 60(1), 134-141.

Crabbe, J. B., & Dishman, R. K. (2004). Brain electrocortical activity during and after exercise: a quantitative synthesis. Psychophysiology, 41(4), 563-574.

Crush, E. A., Frith, E., & Loprinzi, P. D. (2018). Experimental effects of acute exercise duration and exercise recovery on mood state. Journal of affective disorders, 229, 282-287.

De Bell, S., Graham, H., Jarvis, S., & White, P. (2017). The importance of nature in mediating social and psychological benefits associated with visits to freshwater blue space. Landscape and Urban Planning, 167, 118-127.

De Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments—healthy environments? An exploratory analysis of the relationship between greenspace and health. Environment and planning A, 35(10), 1717-1731.

Diette, G. B., Lechtzin, N., Haponik, E., Devrotes, A., & Rubin, H. R. (2003). Distraction therapy with nature sights and sounds reduces pain during flexible bronchoscopy: A complementary approach to routine analgesia. Chest, 123(3), 941-948.

Donnelly, A. A., & MacIntyre, T. E. (Eds.). (2019). Physical Activity in Natural Settings: Green and Blue Exercise. Routledge.

Dusselier, L., Dunn, B., Wang, Y., Shelley iI, M. C., & Whalen, D. F. (2005). Personal, health, academic, and environmental predictors of stress for residence hall students. Journal of American college health, 54(1), 15-24.

Ekkekakis, P., Hall, E. E., VanLanduyt, L. M., & Petruzzello, S. J. (2000). Walking in (affective) circles: can short walks enhance affect?. Journal of behavioral medicine, 23(3), 245-275.

Ensari, I., Greenlee, T. A., Motl, R. W., & Petruzzello, S. J. (2015). Meta-analysis of acute exercise effects on state anxiety: An update of randomized controlled trials over the past 25 years. Depression and anxiety, 32(8), 624-634.

Farrell, P. A., Gates, W. K., Maksud, M. G., & Morgan, W. P. (1982). Increases in plasma beta-endorphin/beta-lipotropin immunoreactivity after treadmill running in humans. Journal of Applied Physiology, 52(5), 1245-1249.

Fedor, A., Garcia, S., & Gunstad, J. (2015). The effects of a brief, water-based exercise intervention on cognitive function in older adults. Archives of clinical neuropsychology, 30(2), 139-147.

Fernandes, J., Arida, R. M., & Gomez-Pinilla, F. (2017). Physical exercise as an epigenetic modulator of brain plasticity and cognition. Neuroscience & Biobehavioral Reviews, 80, 443-456.

Ferroni. E. (2020). The physiological and psychological effects of indoor versus outdoor aerobic exercise in female cancer survivors: A literature review.

Finlay, J., Franke, T., McKay, H., & Sims-Gould, J. (2015). Therapeutic landscapes and wellbeing in later life: Impacts of blue and green spaces for older adults. Health & place, 34, 97-106.

Fleming, K. M., Campbell, M., & Herring, M. P. (2020). Acute effects of Pilates on mood states among young adult males. Complementary therapies in medicine, 49, 102313.

Flowers, E. P., Freeman, P., & Gladwell, V. F. (2018). Enhancing the acute psychological benefits of green exercise: An investigation of expectancy effects. Psychology of Sport and Exercise, 39, 213-221.

Flynn, D. M., & Chow, P. (2017). Self-efficacy, self-worth and stress. Education, 138(1), 83-88.

Frodl, T., Strehl, K., Carballedo, A., Tozzi, L., Doyle, M., Amico, F., ... & O'Keane, V. (2019). Aerobic exercise increases hippocampal subfield volumes in younger adults and prevents volume decline in the elderly. *Brain imaging and behavior*, 1-11.

Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., ... & Dai, J. (2020). Mental health problems and social media exposure during COVID-19 outbreak. Plos one, 15(4), e0231924.

Gascon, M., Triguero-Mas, M., Martínez, D., Dadvand, P., Forns, J., Plasència, A., & Nieuwenhuijsen, M. J. (2015). Mental health benefits of long-term exposure to residential green and blue spaces: a systematic review. International journal of environmental research and public health, 12(4), 4354-4379.

Gascon, M., Zijlema, W., Vert, C., White, M. P., & Nieuwenhuijsen, M. J. (2017). Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. International journal of hygiene and environmental health, 220(8), 1207-1221.

Gladwell, V. F., Brown, D. K., Wood, C., Sandercock, G. R., & Barton, J. L. (2013). The great outdoors: how a green exercise environment can benefit all. Extreme physiology & medicine, 2(1), 1-7.

Glover, N., & Polley, S. (2019). GOING GREEN: The Effectiveness of a 40-Day Green Exercise Intervention for Insufficiently Active Adults. Sports, 7(6), 142.

Gopinath, B., Hardy, L. L., Baur, L. A., Burlutsky, G., & Mitchell, P. (2012). Physical activity and sedentary behaviors and health-related quality of life in adolescents. Pediatrics, 130(1), e167-e174.

Grahn, P., & Stigsdotter, U. A. (2003). Landscape planning and stress. Urban forestry & urban greening, 2(1), 1-18.

Greene, C., Lee, H., & Thuret, S. (2019). In the long run: physical activity in early life and cognitive aging. Frontiers in neuroscience, 13, 884.

Grimm, P. (2010). Social desirability bias. Wiley international encyclopedia of marketing.

Hagströmer, M., Rizzo, N. S., & Sjöström, M. (2014). Associations of season and region on objectively assessed physical activity and sedentary behaviour. Journal of sports sciences, 32(7), 629-634.

Haluza, D., Schönbauer, R., & Cervinka, R. (2014). Green perspectives for public health: a narrative review on the physiological effects of experiencing outdoor nature. International journal of environmental research and public health, 11(5), 5445-5461.

Hamer, M., & Karageorghis, C. I. (2007). Psychobiological mechanisms of exercise dependence. Sports medicine, 37(6), 477-484.

Han, K. T. (2017). The effect of nature and physical activity on emotions and attention while engaging in green exercise. Urban Forestry & Urban Greening, 24, 5-13.

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Gärling, T. (2003). Tracking restoration in natural and urban field settings. Journal of environmental psychology, 23(2), 109-123.

Hartig, T., Mitchell, R., De Vries, S., & Frumkin, H. (2014). Nature and health. Annual review of public health, 35, 207-228.

Herring, M. P., Jacob, M. L., Suveg, C., Dishman, R. K., & O'Connor, P. J. (2012). Feasibility of exercise training for the short-term treatment of generalized anxiety disorder: a randomized controlled trial. Psychotherapy and psychosomatics, 81(1), 21-28.

Herring, M. P., Jacob, M. L., Suveg, C., & O'Connor, P. J. (2011). Effects of short-term exercise training on signs and symptoms of generalized anxiety disorder. Mental Health and Physical Activity, 4(2), 71-77.

Herring, M. P., Johnson, K. E., & O'Connor, P. J. (2016). Exercise training and health-related quality of life in generalized anxiety disorder. Psychology of sport and exercise, 27, 138-141.

Herring, M. P., Kline, C. E., & O'Connor, P. J. (2015). Effects of exercise on sleep among young women with generalized anxiety disorder. Mental health and physical activity, 9, 59-66.

Jain, A., Mishra, A., Shakkarpude, J., & Lakhani, P. (2019). Beta endorphins: The natural opioids. IJCS, 7(3), 323-332.

Jiménez-Pavón, D., Carbonell-Baeza, A., & Lavie, C. J. (2020). Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. Progress in cardiovascular diseases.

Kondo, M. C., Jacoby, S. F., & South, E. C. (2018). Does spending time outdoors reduce stress? A review of real-time stress response to outdoor environments. Health & place, 51, 136-150.

Korpela, K., Borodulin, K., Neuvonen, M., Paronen, O., & Tyrväinen, L. (2014). Analyzing the mediators between nature-based outdoor recreation and emotional well-being. Journal of environmental psychology, 37, 1-7.

Korpela, K. M., Stengård, E., & Jussila, P. (2016). Nature walks as a part of therapeutic intervention for depression. Ecopsychology, 8(1), 8-15.

Lahart, I., Darcy, P., Gidlow, C., & Calogiuri, G. (2019). The effects of green exercise on physical and mental wellbeing: A systematic review. International journal of environmental research and public health, 16(8), 1352.

Lan, M. F., Lane, A. M., Roy, J., & Hanin, N. A. (2012). Validity of the Brunel Mood Scale for use with Malaysian athletes. Journal of sports science & medicine, 11(1), 131.

Lawton, E., Brymer, E., Clough, P., & Denovan, A. (2017). The relationship between the physical activity environment, nature relatedness, anxiety, and the psychological well-being benefits of regular exercisers. Frontiers in psychology, 8, 1058.

Lee, A. C., & Maheswaran, R. (2011). The health benefits of urban green spaces: a review of the evidence. Journal of public health, 33(2), 212-222.

Lehrner, J., Marwinski, G., Lehr, S., Johren, P., & Deecke, L. (2005). Ambient odors of orange and lavender reduce anxiety and improve mood in a dental office. Physiology & Behavior, 86(1-2), 92-95.

Liao, Y., Shonkoff, E. T., & Dunton, G. F. (2015). The acute relationships between affect, physical feeling states, and physical activity in daily life: a review of current evidence. Frontiers in Psychology, 6, 1975.

Lloyd, L., & Miller, B. (2013). The impact of seasonality on changes in body weight and physical activity in Mexican-American women. Women & health, 53(3), 262-281.

Loy, B. D., O'Connor, P. J., & Dishman, R. K. (2013). The effect of a single bout of exercise on energy and fatigue states: a systematic review and meta-analysis. Fatigue: Biomedicine, Health & Behavior, 1(4), 223-242.

Maas, J., Verheij, R. A., Groenewegen, P. P., De Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: how strong is the relation?. Journal of Epidemiology & Community Health, 60(7), 587-592.

Maas, J., Verheij, R. A., De Vries, S., Spreeuwenberg, P., Schellevis, F. G., & Groenewegen, P. P. (2009). Morbidity is related to a green living environment. Journal of Epidemiology & Community Health, 63(12), 967-973.

MacDonald, J. R. (2002). Potential causes, mechanisms, and implications of post exercise hypotension. Journal of human hypertension, 16(4), 225-236.

Mackay, G. J., & Neill, J. T. (2010). The effect of "green exercise" on state anxiety and the role of exercise duration, intensity, and greenness: A quasi-experimental study. Psychology of sport and exercise, 11(3), 238-245.

Mackenzie, S., Wiegel, J. R., Mundt, M., Brown, D., Saewyc, E., Heiligenstein, E., ... & Fleming, M. (2011). Depression and suicide ideation among students accessing campus health care. American journal of orthopsychiatry, 81(1), 101.

Mandolesi, L., Polverino, A., Montuori, S., Foti, F., Ferraioli, G., Sorrentino, P., & Sorrentino, G. (2018). Effects of physical exercise on cognitive functioning and wellbeing: biological and psychological benefits. Frontiers in psychology, 9, 509.

Marselle, M. R., Irvine, K. N., & Warber, S. L. (2013). Walking for well-being: are group walks in certain types of natural environments better for well-being than group walks in urban environments?. International journal of environmental research and public health, 10(11), 5603-5628.

Matsuura, A., Nagai, N., Funatsu, A., Irimajiri, M., Yamazaki, A., & Hodate, K. (2011). Comparison of the short-term effects of horse trekking and exercising with a riding simulator on autonomic nervous activity. Anthrozoös, 24(1), 65-77.

McDowell, C. P., Campbell, M. J., & Herring, M. P. (2016). Sex-related differences in mood responses to acute aerobic exercise.

Mitchell, R. (2013). Is physical activity in natural environments better for mental health than physical activity in other environments?. Social science & medicine, 91, 130-134.

Moghanibashi-Mansourieh, A. (2020). Assessing the anxiety level of Iranian general population during COVID-19 outbreak. Asian journal of psychiatry, 102076.

Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: an observational population study. The lancet, 372(9650), 1655-1660.

Orne, M. T. (1996). Demand characteristics. In Introducing psychological research (pp. 395-401). Palgrave, London.

Page, M. (2008). Gardening as a therapeutic intervention in mental health. Nursing Times, 104(45), 28-30.

Papathanasopoulou, E., White, M. P., Hattam, C., Lannin, A., Harvey, A., & Spencer, A. (2016). Valuing the health benefits of physical activities in the marine environment and their importance for marine spatial planning. Marine Policy, 63, 144-152.

Park, B. J., Tsunetsugu, Y., Kasetani, T., Kagawa, T., & Miyazaki, Y. (2010). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. Environmental health and preventive medicine, 15(1), 18.

Park, B. J., Furuya, K., Kasetani, T., Takayama, N., Kagawa, T., & Miyazaki, Y. (2011). Relationship between psychological responses and physical environments in forest settings. Landscape and Urban Planning, 102(1), 24-32.

Parkinson, B., Totterdell, P., Briner, R. B., & Reynolds, S. (1996). Changing moods: The psychology of mood and mood regulation. London: Longman.

Pasanen, T. P., Tyrväinen, L., & Korpela, K. M. (2014). The relationship between perceived health and physical activity indoors, outdoors in built environments, and outdoors in nature. Applied psychology: Health and Well-being, 6(3), 324-346.

Passmore, H. A., and Howell, A. J. (2014). Nature involvement increases hedonic and eudaimonic well-being: a two-week experimental study. Ecopsychology 6, 148–154.

Peacock, J., Hine, R., & Pretty, J. (2007). The mental health benefits of green exercise activities and green care. Report for MIND

Perez-Sousa, M. A., Olivares, P. R., Gonzalez-Guerrero, J. L., & Gusi, N. (2020). Effects of an exercise program linked to primary care on depression in elderly: fitness as mediator of the improvement. Quality of life research, 29(5), 1239-1246.

Pfefferbaum, B., & North, C. S. (2020). Mental health and the Covid-19 pandemic. New England Journal of Medicine.

Poole, L., Steptoe, A., Wawrzyniak, A. J., Bostock, S., Mitchell, E. S., & Hamer, M. (2011). Associations of objectively measured physical activity with daily mood ratings and psychophysiological stress responses in women. Psychophysiology, 48(8), 1165-1172.

Pretty, J. (2004). How nature contributes to mental and physical health. Spirituality and Health International, 5(2), 68-78.

Pretty, J., Griffin, M., & Sellens, M. (2003). Is nature good for you?. *ECOS-British Association of Nature Conservationists*, *24*(3/4), 2-9.

Pretty, J., Griffin, M., Sellens, M., & Pretty, C. (2003). Green exercise: complementary roles of nature, exercise and diet in physical and emotional well-being and implications for public health policy. CES occasional paper, 1, 1-39.

Pretty, J., Peacock, J., Hine, R., Sellens, M., South, N., & Griffin, M. (2007). Green exercise in the UK countryside: Effects on health and psychological well-being, and implications for policy and planning. Journal of environmental planning and management, 50(2), 211-231.

Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. International journal of environmental health research, 15(5), 319-337.

Pritchard, M. E., Wilson, G. S., & Yamnitz, B. (2007). What predicts adjustment among college students? A longitudinal panel study. Journal of American college health, 56(1), 15-22.

Raedeke, T. D. (2007). The relationship between enjoyment and affective responses to exercise. Journal of Applied Sport Psychology, 19(1), 105-115.

Reed, K., Wood, C., Barton, J., Pretty, J. N., Cohen, D., & Sandercock, G. R. (2013). A repeated measures experiment of green exercise to improve self-esteem in UK school children. PloS one, 8(7), e69176.

Rodiek, S. (2002). Influence of an outdoor garden on mood and stress in older persons. Journal of Therapeutic Horticulture, 13(1), 13-21.

Rogerson, M. (2016). Green exercise: Combined influence of environment and exercise to promote wellbeing (Doctoral dissertation, University of Essex).

Rogerson, M., Barton, J., Pretty, J., & Gladwell, V. (2019). THE GREEN EXERCISE CONCEPT. Physical Activity in Natural Settings: Green and Blue Exercise, 73.

Rogerson, M., Colbeck, I., Bragg, R., Dosumu, A., & Griffin, M. (2020). Affective Outcomes of Group versus Lone Green Exercise Participation. International Journal of Environmental Research and Public Health, 17(2), 624.

Saraulli, D., Costanzi, M., Mastrorilli, V., & Farioli-Vecchioli, S. (2017). The long run: neuroprotective effects of physical exercise on adult neurogenesis from youth to old age. Current neuropharmacology, 15(4), 519-533.

Scully, D., Kremer, J., Meade, M. M., Graham, R., & Dudgeon, K. (1998). Physical exercise and psychological well being: a critical review. British journal of sports medicine, 32(2), 111-120.

Sforzo, G. A., Seeger, T. F., Pert, C. B., Pert, A., & Dotson, C. O. (1986). In vivo opioid receptor occupation in the rat brain following exercise. Medicine & Science in Sports & Exercise.

Shahidi, S. H., Stewart Williams, J., & Hassani, F. (2020). Physical activity during COVID-19 quarantine. Acta Paediatrica, 109(10), 2147-2148.

Shanahan, D. F., Franco, L., Lin, B. B., Gaston, K. J., & Fuller, R. A. (2016). The benefits of natural environments for physical activity. Sports Medicine, 46(7), 989-995.

Steiner, M., Allgulander, C., Ravindran, A., Kosar, H., Burt, T., & Austin, C. (2005). Gender differences in clinical presentation and response to sertraline treatment of generalized anxiety disorder. Human Psychopharmacology: Clinical and Experimental, 20(1), 3-13.

Stigsdotter, U. K., & Grahn, P. (2011). Stressed individuals' preferences for activities and environmental characteristics in green spaces. Urban forestry & urban greening, 10(4), 295-304.

Szabo, A., Griffiths, M. D., & Demetrovics, Z. (2019). Psychology and exercise. In Nutrition and enhanced sports performance (pp. 63-72). Academic Press.

Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces. Journal of Epidemiology & Community Health, 56(12), 913-918.

Takayama, N., Korpela, K., Lee, J., Morikawa, T., Tsunetsugu, Y., Park, B. J., ... & Kagawa, T. (2014). Emotional, restorative and vitalizing effects of forest and urban environments at four sites in Japan. International journal of environmental research and public health, 11(7), 7207-7230.

Teas, J., Hurley, T., Msph, S. G., & Mph, K. O. (2007). Walking outside improves mood for healthy postmenopausal women. Clinical medicine. Oncology, 1, CMO-S343.

Terry, P. C., Lane, A. M., & Fogarty, G. J. (2003). Construct validity of the Profile of Mood States—Adolescents for use with adults. Psychology of sport and exercise, 4(2), 125-139.

Terry, P. C., Lane, A. M., Lane, H. J., & Keohane, L. (1999). Development and validation of a mood measure for adolescents. Journal of Sports Sciences, 17, 861-872.

Thawabieh, A. M., & Qaisy, L. M. (2012). Assessing stress among university students. American International Journal of Contemporary Research, 2(2), 110-116.

Thompson Coon, J., Boddy, K., Stein, K., Whear, R., Barton, J., & Depledge, M. H. (2011). Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. Environmental science & technology, 45(5), 1761-1772.

Thompson, C. W., Roe, J., Aspinall, P., Mitchell, R., Clow, A., & Miller, D. (2012). More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. Landscape and urban planning, 105(3), 221-229.

Thompson, N., & Wilkie, S. (2020). 'I'm just lost in the world': the impact of blue exercise on participant well-being. Qualitative Research in Sport, Exercise and Health, 1-15.

Totsch, S. L. (2019). Effects of Increased Indoor Cycling Activity on Exercise Motivation, Body Image, and Health Perception in the Adult Female Population. The University of Alabama in Huntsville.

Tucker, P., & Gilliland, J. (2007). The effect of season and weather on physical activity: a systematic review. Public health, 121(12), 909-922.

Tucker, J. M., Welk, G. J., & Beyler, N. K. (2011). Physical activity in US adults: compliance with the physical activity guidelines for Americans. American journal of preventive medicine, 40(4), 454-461.

Van den Berg, A. E., Maas, J., Verheij, R. A., & Groenewegen, P. P. (2010). Green space as a buffer between stressful life events and health. Social science & medicine, 70(8), 1203-1210.

Van Praag, H., Fleshner, M., Schwartz, M. W., & Mattson, M. P. (2014). Exercise, energy intake, glucose homeostasis, and the brain. Journal of Neuroscience, 34(46), 15139-15149.

Vesga-López, O., Schneier, F., Wang, S., Heimberg, R., Liu, S. M., Hasin, D. S., & Blanco, C. (2008). Gender differences in generalized anxiety disorder: results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). The Journal of clinical psychiatry, 69(10), 1606.

Völker, S., & Kistemann, T. (2011). The impact of blue space on human health and well-being–Salutogenetic health effects of inland surface waters: A review. International journal of hygiene and environmental health, 214(6), 449-460.

Wade, L., Lubans, D. R., Smith, J., & Duncan, M. J. (2020). The impact of exercise environments on adolescents' cognitive and psychological outcomes: A randomised controlled trial. Psychology of Sport and Exercise, 101707.

Ward Thompson, C., & Aspinall, P. A. (2011). Natural environments and their impact on activity, health, and quality of life. Applied Psychology: Health and Well-Being, 3(3), 230-260.

Weinberg, R. S., & Gould, D. (2014). Foundations of sport and exercise psychology. Human Kinetics.

Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2009). Can nature make us more caring? Effects of immersion in nature on intrinsic aspirations and generosity. Personality and Social Psychology Bulletin, 35(10), 1315-1329.

Werner-Seidler, A., & Moulds, M. L. (2012). Mood repair and processing mode in depression. Emotion, 12(3), 470.

World Health Organization, T. (2010). Global recommendations on physical activity for health. World Health Organization.

WHO, 2020. Accessed: 10.10.2020. Coronavirus disease (COVID-19) advice for the public. URL: https://covid19.who.int

White, M. P., Bell, S., Elliott, L. R., Jenkin, R., Wheeler, B. W., & Depledge, M. H. (2016). The health benefits of blue exercise in the UK. Green exercise: Linking nature, health and well-being, 69-78.

Wilson, E. O. (1984). Biophillia: The human bond with other species.

Wooller, J. J., Barton, J., Gladwell, V. F., & Micklewright, D. (2016). Occlusion of sight, sound and smell during Green Exercise influences mood, perceived exertion and heart rate. International Journal of Environmental health research, 26(3), 267-280.

Wooller, J. J., Rogerson, M., Barton, J., Micklewright, D., & Gladwell, V. (2018). Can simulated green exercise improve recovery from acute mental stress?. Frontiers in psychology, 9, 2167.

Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M., Gill, H., Phan, L., ... & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. Journal of affective disorders.

Yeh, H. P., Stone, J. A., Churchill, S. M., Brymer, E., & Davids, K. (2016). Designing physical activity environments to enhance physical and psychological effects. Procedia engineering, 147, 793-798.

Yin, J., Yuan, J., Arfaei, N., Catalano, P. J., Allen, J. G., & Spengler, J. D. (2020). Effects of biophilic indoor environment on stress and anxiety recovery: A between-subjects experiment in virtual reality. Environment International, 136, 105427.

Zhang, C. Q., Si, G., Chung, P. K., Du, M., & Terry, P. C. (2014). Psychometric properties of the Brunel Mood Scale in Chinese adolescents and adults. Journal of sports sciences, 32(15), 1465-1476.

Appendices

Appendix A- PAR-Q

Physical Activity Readiness Questionnaire (PAR-Q)

Please read carefully and answer each one honestly:

1. Has your doctor ever said you have a heart condition and that you should only do physical activity recommended by a doctor?

2. Do you feel pain in your chest when you do physical activity?

3. In the past month, have you had a chest pain when you were not doing physical activity?

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

5. Do you have a bone or joint problem (For example, back, knee or hip) that could be made worse by a change in your physical activity?

6. Is your doctor currently prescribing medication for your blood pressure or heart condition?

7. Do you know of any other reason why you should not do physical activity?

I have read and understood this questionnaire and if I select 'no' below, I am confirming that I am voluntarily engaging in an acceptable level of exercise, and my participation involves a risk of injury.

If you answer 'yes' to any of the above questions, you will be unable to participate in the study.

Do any of the points above apply to you?

Yes

Appendix B- Withdrawal Debrief

Debrief Sheet

Thank you for your interest in the study. You are unable to proceed with the study due to health reasons.

The purpose of this study was to investigate the psychological and physiological effects when exercising in an outdoor and indoor setting. Those who exercise outdoors experience a stronger positive effect than those who exercise indoors (Rogerson et al., 2019) this shows environments can indirectly affect health and well-being. Hartig et al. (2003) established a link between nature and the improvement of one's mood. Furthermore, studies investigating green exercise with those who suffer from high levels of anxiety revealed that small bouts of exercise outdoors have been more effective in reducing anxiety rather than exercising without taking the environment into consideration (Mackay & Neill, 2010).

If you have any further questions, please contact myself at ccollison@uclan.ac.uk or my supervisor at hmassey@uclan.ac.uk.

If you have any concerns about the research that you wish to raise with somebody who is independent of the research team, you should raise this with the university officer for ethics, OfficerForEthics@uclan.ac.uk.

If you have been affected by the content of the study you can call the helplines below for support

Samaritans at **116 123**
Mind at **0300 123 3393**
Rethink at **0300 5000 927**

If you would like further information and more background research, I have provided references below:
These are accessible through google scholar.

Barton, J., Wood, C., Pretty, J., & Rogerson, M. (2016). Green exercise for health. Green exercise: Linking nature, health and well-being, 26.

Colley, R. C., Bushnik, T., & Langlois, K. (2020). Exercise and screen time during the COVID-19 pandemic. Heal. Reports, 31, 3-11.

Gladwell, V. F., Brown, D. K., Wood, C., Sandercock, G. R., & Barton, J. L. (2013). The great outdoors: how a green exercise environment can benefit all. Extreme physiology & medicine, 2(1), 1-7.

Appendix C- BRUMS test

Below is a BRUMS test where you must respond to each mood on how strongly you felt each mood statement before completing this workout.

	Not at all	A little	Moderately	Quite a bit	Extremely
1. Panicky	○	○	○	○	○
2. Lively	○	○	○	○	○
3. Confused	○	○	○	○	○
4. Worn out	○	○	○	○	○
5. Depressed	○	○	○	○	○
6. Downhearted	○	○	○	○	○
7. Annoyed	○	○	○	○	○
8. Exhausted	○	○	○	○	○
9. Mixed-up	○	○	○	○	○
10. Sleepy	○	○	○	○	○
11. Bitter	○	○	○	○	○
12. Unhappy	○	○	○	○	○
13. Anxious	○	○	○	○	○
14. Worried	○	○	○	○	○
15. Energetic	○	○	○	○	○
16. Miserable	○	○	○	○	○
17. Muddled	○	○	○	○	○
18. Nervous	○	○	○	○	○
19. Angry	○	○	○	○	○
20. Active	○	○	○	○	○
21. Tired	○	○	○	○	○
22. Bad tempered	○	○	○	○	○
23. Alert	○	○	○	○	○
24. Uncertain	○	○	○	○	○

Appendix D- Enjoyment Levels Likert Scale

For the following statement, please select the response that best describes how you feel about the statement.

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
I enjoyed the workout	○	○	○	○	○

Appendix E- Participant Information Sheet

Participant information Sheet

I am enquiring if you want to take part in my study about exercise environment and its effect on mood. This study will take place within your own home. You will be required to complete two 10-minute Body Coach workout videos; once indoors (e.g., front room, bedroom) and once outdoors (e.g., garden). Before and after each workout session you will be asked to complete questionnaires about your mood and enjoyment.

Participation- If you are interested in taking part, you will be asked to complete a Physical Activity Readiness Questionnaire on the next page. **You should not take part if you have any pre-existing injuries or health conditions that prevent you from exercising or if you are under the age of 18.** You will then tick the box on the informed consent form if you are happy to proceed and have confirmed that you have no underlying health conditions. You will perform two 10-minute, low intensity workout on two separate occasions. No exercise equipment is needed and there should be at least 24 hours between each workout, but no more than five days. For each workout, you will need to fill out a mood test (BRUMS) before and after each exercise session and respond to a question about enjoyment of the exercise. This study will follow counterbalancing method where some participants will complete the outdoor task first whilst others will complete the indoor condition first.

Confidentiality- You will not be asked to provide any personal information during the study therefore the data will be confidential. Each participant will assign themselves a random number to protect your identity and keep anonymity. In the first exercise condition, you will be asked to enter a random 4-digit number. You will then use this same number for the second condition to allow for comparisons between the data. Please keep note of the number by either writing it down or keeping a note on your mobile device. Myself, my supervisor and anyone else with legitimate academic need will be the only ones who have access to the raw data of the study and the data will be destroyed after 5 years.

Withdrawal- Participation in this study is completely voluntary and all participants have full rights to withdraw from the study at any point without giving a reason. To do so, you can close the browser at any time or chose to not click 'submit' at the end of the Qualtrics questionnaire. Furthermore, if you don't submit the results for the second condition within five days of the first condition then you will be automatically removed. After submitting the results to Qualtrics for both conditions, it is no longer possible to withdraw the results due to anonymity of the data.

For further questions or enquires please do not hesitate to contact me at ccollison@uclan.ac.uk or my supervisor Dr. Hollie Masey at hmasey@uclan.ac.uk.

If you have any concerns about the research that you wish to raise with somebody who is independent of the research team, you should raise this with the university officer for ethics, OfficerForEthics@uclan.ac.uk.

By clicking next I am confirming I have read through all information above and that I fully understand the aims of the study

Appendix F- Informed Consent

Informed Consent Form

I am confirming that I have read and fully understand the participant information sheet for the above study. I was given the needed information as well as the opportunity to ask questions and have them answered satisfactorily answered.

I understand that participating in this study is completely voluntary and that I am free to withdraw from the study at any given time without providing any reasons. By not submitting data to Qualtrics you will be automatically withdrawn from the study and all data will be destroyed. Once data is submitted to Qualtrics it is no longer possible to withdraw your data due to anonymity of the data.

I fully understand that any information used within the study may be used in future reports, presentation, publications of studies and articles by the researcher.

Please read the following statements in order to ensure appropriate safety procedures are in place when you are taking part in the exercise. This guidance is in line with the risk assessment completed for this study.

I will wear suitable footwear and be aware of my surroundings.

I will move any objects proposing a trip hazard, creating a safe area to exercise

I will follow all governments guidelines surrounding Covid-19, maintaining social distancing and high hygiene levels

When exercising outside, I will avoid dangerous weather conditions (i.e., severe wind, ice, snow)

I will give passers-by space to avoid collision and any accidents

Appendix G- Debrief

Debrief Sheet

Thankyou for your interest in this study.

The purpose of this study was to investigate the psychological and physiological effects when exercising in an outdoor and indoor setting. Those who exercise outdoors experience a stronger positive effect than those who exercise indoors (Rogerson et al., 2019) which shows that environments can indirectly affect health and well-being. Hartig et al. (2003) established a link between nature and the improvement of one's mood. Furthermore, studies investigating green exercise with those who suffer from high levels of anxiety revealed that small bouts of exercise outdoors have been more effective in reducing anxiety compared to exercise indoors (Mackay & Neill, 2010).

Thus, as part of this study participants were asked to complete BRUMS (mood) tests before and after completing a 10-minute Body Coach video indoors and outdoors. By completing the BRUMS test, it will be possible to compare the effect of exercise environment on mood. Furthermore, this study will explore whether exercising outside is more enjoyable when compared to indoor exercise. This study also enables a comparison of obtained results with previous research that has explored the benefits of outdoor exercising.

As you have submitted your data you will not be able to withdraw due to anonymity and removing data will be impossible. If you have any questions about this matter, please contact myself at ccollison@uclan.ac.uk or my supervisor at hmassey@uclan.ac.uk. All data will be completely confidential and will be stored anonymously using random numbers as codes throughout the study and analysis process. All raw data will be destroyed after 5 years of the completion of my dissertation.

What steps will be followed to ensure the safety of data storage?

All personal data will be collected in full confidentiality and will be stored on my personal password protected MacBook, which only I, my supervisor and anyone else with legitimate academic need will have access to.

If you have any concerns about the research that you wish to raise with somebody who is independent of the research team, you should raise this with the university officer for ethics, OfficerForEthics@uclan.ac.uk.

If you have been affected by the content of the study, you can call the helplines below for support:

Samaritans at **116 123**
Mind at **0300 123 3393**
Rethink at **0300 5000 927**

If you would like further information and more background research, I have provided references below:
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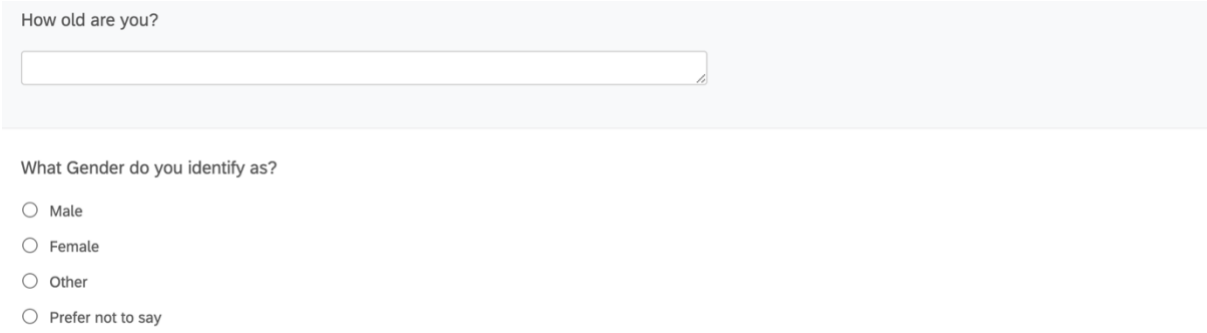
Gladwell, V. F., Brown, D. K., Wood, C., Sandercock, G. R., & Barton, J. L. (2013). The great outdoors: how a green exercise environment can benefit all. Extreme physiology & medicine, 2(1), 1-7.

Appendix H- Age and Gender



Appendix I- Tension ANOVA

Descriptive Statistics

	Mean	Std. Deviation	N
PreIndoors	.9120	1.15714	125
PostIndoors	.1920	.45252	125
PreOutdoors	.9120	1.15714	125
PostOutdoors	.2160	.53255	125

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Condition	Sphericity Assumed	.018	1	.018	.218	.641	.002
	Greenhouse-Geisser	.018	1.000	.018	.218	.641	.002
	Huynh-Feldt	.018	1.000	.018	.218	.641	.002
	Lower-bound	.018	1.000	.018	.218	.641	.002
Error(Condition)	Sphericity Assumed	10.232	124	.083			
	Greenhouse-Geisser	10.232	124.000	.083			
	Huynh-Feldt	10.232	124.000	.083			
	Lower-bound	10.232	124.000	.083			
Time	Sphericity Assumed	62.658	1	62.658	45.017	.000	.266
	Greenhouse-Geisser	62.658	1.000	62.658	45.017	.000	.266
	Huynh-Feldt	62.658	1.000	62.658	45.017	.000	.266
	Lower-bound	62.658	1.000	62.658	45.017	.000	.266
Error(Time)	Sphericity Assumed	172.592	124	1.392			
	Greenhouse-Geisser	172.592	124.000	1.392			
	Huynh-Feldt	172.592	124.000	1.392			
	Lower-bound	172.592	124.000	1.392			
Condition * Time	Sphericity Assumed	.018	1	.018	.218	.641	.002
	Greenhouse-Geisser	.018	1.000	.018	.218	.641	.002
	Huynh-Feldt	.018	1.000	.018	.218	.641	.002
	Lower-bound	.018	1.000	.018	.218	.641	.002
Error(Condition*Time)	Sphericity Assumed	10.232	124	.083			
	Greenhouse-Geisser	10.232	124.000	.083			
	Huynh-Feldt	10.232	124.000	.083			
	Lower-bound	10.232	124.000	.083			

1. Condition

Measure: MEASURE_1

Condition	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.552	.057	.439	.665
2	.564	.059	.447	.681

2. Time

Measure: MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.912	.103	.707	1.117
2	.204	.036	.133	.275

Appendix J- Anger ANOVA

Descriptive Statistics

	Mean	Std. Deviation	N
PreIndoor	.3680	.65422	125
PostIndoor	.1440	.48699	125
PreOutdoor	.3680	.65422	125
PostOutdoor	.0800	.39350	125

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Condition	Sphericity Assumed	.128	1	.128	1.694	.196	.013
	Greenhouse-Geisser	.128	1.000	.128	1.694	.196	.013
	Huynh-Feldt	.128	1.000	.128	1.694	.196	.013
	Lower-bound	.128	1.000	.128	1.694	.196	.013
Error(Condition)	Sphericity Assumed	9.372	124	.076			
	Greenhouse-Geisser	9.372	124.000	.076			
	Huynh-Feldt	9.372	124.000	.076			
	Lower-bound	9.372	124.000	.076			
Time	Sphericity Assumed	8.192	1	8.192	18.366	.000	.129
	Greenhouse-Geisser	8.192	1.000	8.192	18.366	.000	.129
	Huynh-Feldt	8.192	1.000	8.192	18.366	.000	.129
	Lower-bound	8.192	1.000	8.192	18.366	.000	.129
Error(Time)	Sphericity Assumed	55.308	124	.446			
	Greenhouse-Geisser	55.308	124.000	.446			
	Huynh-Feldt	55.308	124.000	.446			
	Lower-bound	55.308	124.000	.446			
Condition * Time	Sphericity Assumed	.128	1	.128	1.694	.196	.013
	Greenhouse-Geisser	.128	1.000	.128	1.694	.196	.013
	Huynh-Feldt	.128	1.000	.128	1.694	.196	.013
	Lower-bound	.128	1.000	.128	1.694	.196	.013
Error(Condition*Time)	Sphericity Assumed	9.372	124	.076			
	Greenhouse-Geisser	9.372	124.000	.076			
	Huynh-Feldt	9.372	124.000	.076			
	Lower-bound	9.372	124.000	.076			

1. Condition

Measure: MEASURE_1

Condition	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.256	.038	.180	.332
2	.224	.038	.149	.299

2. Time

Measure: MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.368	.059	.252	.484
2	.112	.031	.051	.173

Appendix K- Depression ANOVA

Descriptive Statistics

	Mean	Std. Deviation	N
PreIndoor	.6290	.91481	124
PostIndoor	.1774	.49466	124
PreOutdoor	.6290	.91481	124
PostOutdoor	.1532	.47787	124

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Conditon	Sphericity Assumed	.018	1	.018	.242	.624	.002
	Greenhouse-Geisser	.018	1.000	.018	.242	.624	.002
	Huynh-Feldt	.018	1.000	.018	.242	.624	.002
	Lower-bound	.018	1.000	.018	.242	.624	.002
Error(Conditon)	Sphericity Assumed	9.232	123	.075			
	Greenhouse-Geisser	9.232	123.000	.075			
	Huynh-Feldt	9.232	123.000	.075			
	Lower-bound	9.232	123.000	.075			
Time	Sphericity Assumed	26.663	1	26.663	31.660	.000	.205
	Greenhouse-Geisser	26.663	1.000	26.663	31.660	.000	.205
	Huynh-Feldt	26.663	1.000	26.663	31.660	.000	.205
	Lower-bound	26.663	1.000	26.663	31.660	.000	.205
Error(Time)	Sphericity Assumed	103.587	123	.842			
	Greenhouse-Geisser	103.587	123.000	.842			
	Huynh-Feldt	103.587	123.000	.842			
	Lower-bound	103.587	123.000	.842			
Conditon * Time	Sphericity Assumed	.018	1	.018	.242	.624	.002
	Greenhouse-Geisser	.018	1.000	.018	.242	.624	.002
	Huynh-Feldt	.018	1.000	.018	.242	.624	.002
	Lower-bound	.018	1.000	.018	.242	.624	.002
Error(Conditon*Time)	Sphericity Assumed	9.232	123	.075			
	Greenhouse-Geisser	9.232	123.000	.075			
	Huynh-Feldt	9.232	123.000	.075			
	Lower-bound	9.232	123.000	.075			

1. Time

Measure: MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	.629	.082	.466	.792
2	.165	.036	.094	.237

2. Conditon

Measure: MEASURE_1

Conditon	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	.403	.051	.303	.504
2	.391	.049	.295	.488

Appendix L- Fatigue ANOVA

Descriptive Statistics

	Mean	Std. Deviation	N
PreIndoor	1.3145	1.23872	124
PostIndoor	1.4516	1.12874	124
PreOutdoor	1.3145	1.23872	124
PostOutdoor	1.2984	1.21628	124

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Conditon	Sphericity Assumed	.728	1	.728	2.011	.159	.016
	Greenhouse-Geisser	.728	1.000	.728	2.011	.159	.016
	Huynh-Feldt	.728	1.000	.728	2.011	.159	.016
	Lower-bound	.728	1.000	.728	2.011	.159	.016
Error(Conditon)	Sphericity Assumed	44.522	123	.362			
	Greenhouse-Geisser	44.522	123.000	.362			
	Huynh-Feldt	44.522	123.000	.362			
	Lower-bound	44.522	123.000	.362			
Time	Sphericity Assumed	.454	1	.454	.150	.699	.001
	Greenhouse-Geisser	.454	1.000	.454	.150	.699	.001
	Huynh-Feldt	.454	1.000	.454	.150	.699	.001
	Lower-bound	.454	1.000	.454	.150	.699	.001
Error(Time)	Sphericity Assumed	370.796	123	3.015			
	Greenhouse-Geisser	370.796	123.000	3.015			
	Huynh-Feldt	370.796	123.000	3.015			
	Lower-bound	370.796	123.000	3.015			
Conditon * Time	Sphericity Assumed	.728	1	.728	2.011	.159	.016
	Greenhouse-Geisser	.728	1.000	.728	2.011	.159	.016
	Huynh-Feldt	.728	1.000	.728	2.011	.159	.016
	Lower-bound	.728	1.000	.728	2.011	.159	.016
Error(Conditon*Time)	Sphericity Assumed	44.522	123	.362			
	Greenhouse-Geisser	44.522	123.000	.362			
	Huynh-Feldt	44.522	123.000	.362			
	Lower-bound	44.522	123.000	.362			

1. Time

Measure: MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	1.315	.111	1.094	1.535
2	1.375	.090	1.196	1.554

2. Conditon

Measure: MEASURE_1

Conditon	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	1.383	.071	1.242	1.524
2	1.306	.069	1.170	1.443

Appendix M- Vigour ANOVA

Descriptive Statistics

	Mean	Std. Deviation	N
PreIndoor	1.5520	1.22116	125
PostIndoor	2.3440	1.29580	125
PreOutdoor	1.5520	1.22116	125
PostOutdoor	2.5920	1.30196	125

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Condition	Sphericity Assumed	1.922	1	1.922	6.746	.011	.052
	Greenhouse-Geisser	1.922	1.000	1.922	6.746	.011	.052
	Huynh-Feldt	1.922	1.000	1.922	6.746	.011	.052
	Lower-bound	1.922	1.000	1.922	6.746	.011	.052
Error(Condition)	Sphericity Assumed	35.328	124	.285			
	Greenhouse-Geisser	35.328	124.000	.285			
	Huynh-Feldt	35.328	124.000	.285			
	Lower-bound	35.328	124.000	.285			
Time	Sphericity Assumed	104.882	1	104.882	64.585	.000	.342
	Greenhouse-Geisser	104.882	1.000	104.882	64.585	.000	.342
	Huynh-Feldt	104.882	1.000	104.882	64.585	.000	.342
	Lower-bound	104.882	1.000	104.882	64.585	.000	.342
Error(Time)	Sphericity Assumed	201.368	124	1.624			
	Greenhouse-Geisser	201.368	124.000	1.624			
	Huynh-Feldt	201.368	124.000	1.624			
	Lower-bound	201.368	124.000	1.624			
Condition * Time	Sphericity Assumed	1.922	1	1.922	6.746	.011	.052
	Greenhouse-Geisser	1.922	1.000	1.922	6.746	.011	.052
	Huynh-Feldt	1.922	1.000	1.922	6.746	.011	.052
	Lower-bound	1.922	1.000	1.922	6.746	.011	.052
Error(Condition*Time)	Sphericity Assumed	35.328	124	.285			
	Greenhouse-Geisser	35.328	124.000	.285			
	Huynh-Feldt	35.328	124.000	.285			
	Lower-bound	35.328	124.000	.285			

1. Condition

Measure: MEASURE_1

			95% Confidence Interval	
Condition	Mean	Std. Error	Lower Bound	Upper Bound
1	1.948	.093	1.764	2.132
2	2.072	.096	1.883	2.261

2. Time

Measure: MEASURE_1

			95% Confidence Interval	
Time	Mean	Std. Error	Lower Bound	Upper Bound
1	1.552	.109	1.336	1.768
2	2.468	.106	2.258	2.678

Appendix N- Confusion ANOVA

Descriptive Statistics

	Mean	Std. Deviation	N
PreIndoor	.5440	.80826	125
PostIndoor	.2080	.65125	125
PreOutdoor	.5440	.80826	125
PostOutdoor	.1920	.54913	125

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Condition	Sphericity Assumed	.008	1	.008	.076	.783	.001
	Greenhouse-Geisser	.008	1.000	.008	.076	.783	.001
	Huynh-Feldt	.008	1.000	.008	.076	.783	.001
	Lower-bound	.008	1.000	.008	.076	.783	.001
Error(Condition)	Sphericity Assumed	12.992	124	.105			
	Greenhouse-Geisser	12.992	124.000	.105			
	Huynh-Feldt	12.992	124.000	.105			
	Lower-bound	12.992	124.000	.105			
Time	Sphericity Assumed	14.792	1	14.792	19.065	.000	.133
	Greenhouse-Geisser	14.792	1.000	14.792	19.065	.000	.133
	Huynh-Feldt	14.792	1.000	14.792	19.065	.000	.133
	Lower-bound	14.792	1.000	14.792	19.065	.000	.133
Error(Time)	Sphericity Assumed	96.208	124	.776			
	Greenhouse-Geisser	96.208	124.000	.776			
	Huynh-Feldt	96.208	124.000	.776			
	Lower-bound	96.208	124.000	.776			
Condition * Time	Sphericity Assumed	.008	1	.008	.076	.783	.001
	Greenhouse-Geisser	.008	1.000	.008	.076	.783	.001
	Huynh-Feldt	.008	1.000	.008	.076	.783	.001
	Lower-bound	.008	1.000	.008	.076	.783	.001
Error(Condition*Time)	Sphericity Assumed	12.992	124	.105			
	Greenhouse-Geisser	12.992	124.000	.105			
	Huynh-Feldt	12.992	124.000	.105			
	Lower-bound	12.992	124.000	.105			

1. Condition

Measure: MEASURE_1

Condition	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.376	.050	.278	.474
2	.368	.046	.277	.459

2. Time

Measure: MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.544	.072	.401	.687
2	.200	.045	.110	.290

Appendix O- Vigour Paired Samples Test

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PreIndoor & PostIndoor	164	.390	.000
Pair 2	PreOutdoor & PostOutdoor	137	.437	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PreIndoor - PostIndoor	-.76829	1.41247	.11030	-.98608	-.55050	-6.966	163	.000
Pair 2	PreOutdoor - PostOutdoor	-1.06569	1.33507	.11406	-1.29126	-.84013	-9.343	136	.000

Appendix P- Enjoyment Levels Paired Samples T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Indoor	3.9032	31	1.16490	.20922
	Outdoor	4.2903	31	.86385	.15515

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Indoor - Outdoor	-.38710	1.14535	.20571	-.80721	.03302	-1.882	30	.070