

An Investigation into the Impacts Indoor Bouldering Has On Psychological State

by Morgan Evans

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Morgan Evans

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DECLARATION

I certify that the whole of this work is the result of my individual effort, and that all sources have been acknowledged.



Signed (Student)

Date 25/04/2024

DECLARATION

I am satisfied that this work is the result of the student's effort.

Signed (Lecturer)

Date

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Abstract:

This study investigates the impact of bouldering, a form of rock climbing characterized by short, intense routes, on participants' psychological state. The study aimed to assess changes in mood states and perceived stress levels among individuals engaging in bouldering sessions at an indoor bouldering centre. A sample of 25 participants with a mean age of 26.28 (SD 7.97), ranging in age from 18 to 49, with diverse gender identities, including 17 males, 6 females, and 2 individuals identifying as neither male nor female, were recruited from the bouldering centre. Participants were required to have prior experience with bouldering. The study employed standardized measures, including the Brunel Mood Scale (BRUMS) and the Perceived Stress Scale (PSS), to assess mood states and perceived stress levels, respectively. Procedures included the dissemination of study information, participant consent, and questionnaire administration. Data analysis involved paired t-tests to compare pre- and post-bouldering scores, along with descriptive statistics. The findings of the study provide insights into the psychological effects of bouldering and its potential implications for mental well-being. The results indicated significant ($p=0.01$) confusion reduction from before 2.44 (SD 3.25) to after 0.84 (SD 1.40). Depression also displayed a significant difference ($p<0.01$) with the means decreasing from 3.32 (SD 3.48) to 1.2 (SD 1.44). The last mood subscale that demonstrated a significant difference ($p<0.01$) was Tension with the mean decreasing from 2.88 (SD 3.27) to 1.00 (SD 1.00). However, perceived stress levels and mood subscales anger, vigour and fatigue showed no notable change. These results suggest that bouldering may positively impact certain aspects of psychological well-being. These results support previous research which also stipulated that indoor bouldering affords positive effects on elements of psychological wellbeing such as depression (Karg et al.). Further research is warranted to explore the mechanisms underlying these effects and to investigate potential moderators of bouldering's psychological benefits.

Introduction:

In recent years, there has been a growing recognition of the intricate relationship between physical activity and mental well-being. As individuals seek holistic approaches to enhance their mental health, unconventional forms of exercise are gaining popularity for their potential therapeutic benefits. Among these, indoor climbing has emerged as a unique and engaging activity that combines physical exertion with mental focus. This study delves into the impact of indoor bouldering on mental health, aiming to unravel the potential psychological benefits associated with this increasingly popular recreational pursuit.

Since its debut in the Tokyo Olympics rock climbing has grown exponentially and is becoming more of a mainstream pursuit (Hilditch-Short). Prior to this it has been described as a niche sport (Snow). Recently gaining coverage through the media with role models like Alex Honnold and Adam Ondra (Snow). In 2015, the British Mountaineering Council (BMC) released an article stating there were 5 million visits to indoor walls registered to their directory across 350 walls (Gardner). This information demonstrates the growth in the sport compared to an earlier report in 2003 stating that there were 1.27 million rock climbing participants and the number of indoor climbing walls had increased from 40 in 1988 to 254 in 2003 (BMC). Since rock climbing and its transition into its urbanization into indoor climbing is a relatively new endeavour for people its benefits are also new to the world of sport psychology. Existing research is limited generating a valid gap in literature to be explored by psychologists, health practitioners and enthusiasts alike.

The allure of indoor climbing lies not only in its physical challenges but also in its demand for mental resilience, problem-solving skills, and mindfulness. In 2018 The BMC annotates bouldering as a 'distillation of climbing movement; cutting out the rope-work and paraphernalia to tackle "problems" no more than a few metres above the ground' (Long). Climbers navigate intricate routes, employing strategic planning and concentration to overcome obstacles, all while suspended in an artificial vertical environment. This synthesis of physical and mental engagement prompts the question: could indoor bouldering serve as a catalyst for positive mental health outcomes?

Existing research highlighted the positive effects of exercise on mental health, attributing benefits such as stress reduction, mood enhancement, and improved cognitive function to regular physical activity. However, the unique nature of indoor climbing introduces an additional layer of complexity, as it intertwines physical prowess with a heightened sense of achievement and adventure. This study seeks to build upon the existing literature by specifically investigating the mental health implications of indoor bouldering, aiming to contribute valuable insights to both the fields of sport psychology and mental health promotion.

Understanding the prevalence of physical activity in the United Kingdom is essential, as it serves as a key indicator of societal engagement in health-promoting behaviours. Reports such as those by Public Health England (Office for Health Improvement and Disparities) and NHS Digital (NHS Digital) shed light on the current landscape, emphasizing the significance of regular physical activity for maintaining overall health and wellbeing. Extensive evidence, as outlined by Warburton (Warburton et al.) and the World Health Organization (World Health Organization),

underscores the importance of physical activity in reducing the risk of chronic diseases and improving overall health outcomes. Within this context, climbing emerges as a multifaceted activity offering both physical and psychological benefits. Research explores the psychological impacts of climbing, highlighting its potential to enhance mental wellbeing (Hrušová). Furthermore, studies such as that delve into the therapeutic effects of climbing on mental health (Luttenberger et al.), particularly in mitigating symptoms of depression. As discussed in an article, climbing offers a range of benefits for adults, including improved fitness, and reduced anxiety (Gallotta et al.). Understanding these benefits not only emphasizes the importance of promoting climbing as a means of enhancing overall health and wellbeing but also underscores the need for broader recognition of climbing as a valuable activity deserving of increased participation.

By adopting a multidimensional approach, encompassing questionnaires investigating mood and stress, this research aspires to unravel the intricate interplay between indoor climbing and mental well-being. As the global community grapples with rising concerns related to mental health (WHO), understanding the potential therapeutic benefits of novel recreational activities such as indoor climbing becomes crucial for promoting holistic well-being. This study thus stands at the forefront of exploring uncharted terrain, seeking to shed light on the psychological impact of scaling new heights within the confined spaces of indoor climbing facilities.

The aims of this study encompass several objectives. Firstly, it seeks to comprehensively investigate the effects of bouldering on various mood states, encompassing dimensions such as tension, depression, anger, vig¹⁹lance, fatigue, and confusion, as assessed by the well-established Brunel Mood Scale (BRUMS). Concurrently, the study aims to discern any notable changes in participants' perceived stress levels before and after engaging in bouldering sessions, utilizing the Perceived Stress Scale (PSS) as a quantitative measure.

Literature Review:

In the domain of research concerning the impacts of bouldering on psychological wellbeing, a thorough comprehension of existing literature serves as a cornerstone for advancing knowledge and addressing contemporary challenges. This literature review synthesizes a diverse array of scholarly works to illuminate key themes, debates, and gaps in the literature pertaining to both physical activity and mental health alongside the specific sport of indoor climbing.  22 critically examining relevant studies, this review aims to provide a foundation for further investigation, offering insights that can inform future research endeavours and contribute to the ongoing discourse within the field.

There are many studies that illustrate the broader implications of physical activity for mental health. One example is the study by Biddle.  23 This review article synthesizes existing evidence from numerous studies to highlight the positive  24 effects of physical activity on various aspects of mental health, including reducing the risk of depression, and overall psychological well-being. The findings of this study support the importance of promoting physical activity as a means of enhancing mental health across different populations (Biddle).  25 While not specific to bouldering, these findings contribute to the understanding of the psychological benefits of physical activity, laying the groundwork for investigating similar effects in the context of bouldering.

One article reviewed the correlation between physical activity and depression risk (Pearce et al.). The study aims to integrate existing evidence from previous research studies to determine the extent to which physical activity may influence the risk of developing depression. The research employs a systematic review and meta-analysis methodology, which involves systematically searching and evaluating relevant studies on the topic. By pooling data from multiple studies, the researchers can quantitatively assess the strength and direction of the association between physical activity and depression risk. The findings provide robust evidence supporting a protective effect of physical activity against the development of depression. The meta-analysis reveals a statistically significant inverse association between physical activity levels and the risk of depression, indicating that higher levels of physical activity are associated with a lower risk of developing depression.  26 However, it is important to note that the findings of this study are based on observational  27 data, which cannot establish causality. While the results suggest an association between physical activity and depression risk, other factors may also influence the relationship, and further research is needed to elucidate the underlying mechanisms. Overall, the authors have contributed valuable evidence to the literature on the potential mental health benefits of physical activity, which benefits the justification for the investigation into bouldering and its impact on psychological state.

The study by (Pascoe et al.) explores the role of physical activity and exercise in promoting mental health among young individuals. The scoping review conducted highlights the potential benefits of physical activity interventions in improving mental well-being among youth populations. While not directly focused on bouldering, this study provides valuable insights into

the broader context of physical activity's impact on mental health, which can inform the rationale for investigating the effects of bouldering on psychological state in the current study. 28

A comprehensive realist review examined the effectiveness of sport and exercise interventions for young people in alternative provisions. It investigates various aspects of their content, delivery methods, settings, and target populations (Simmons et al.). The review aims to uncover the underlying mechanisms that contribute to the success or failure of these interventions. This study provides valuable insights into the design and implementation of sport and exercise programs for vulnerable youth populations. This is a broader observation, but the themes can be carried through to the current study's more specific investigations. 29

One study investigated the complex interplay between physical and mental health across different demographic groups (Hugh-Jones et al.). Through quantitative analysis of a large sample, the researchers explore how age and gender influence the relationships between physical health indicators (such as chronic conditions or disability) and mental health outcomes (such as depression or anxiety). The findings suggest that these relationships vary across age and gender groups, with older adults exhibiting stronger associations between physical health conditions and mental health symptoms compared to younger age groups. Additionally, the study identifies gender differences in these relationships, highlighting the need to consider gender-specific health concerns and experiences. By examining age-gender differences in the relationships between physical and mental health, the study contributes valuable insights into the complex dynamics of health and well-being across the lifespan. These findings have important implications for healthcare providers and policymakers in developing targeted interventions and support services that address the unique needs of different demographic groups. 30 31 32

A research article that explores the role of culture in shaping individuals' experiences and motivations related to physical activity (Gurleyik et al.). The study investigates how cultural factors influence basic psychological needs and goal orientation in the context of physical activity engagement. The findings of the study contribute to our understanding of how cultural factors shape individuals' motivations and behaviours in relation to physical activity. By identifying cultural differences in basic psychological needs and goal orientations, the research highlights the importance of considering cultural contexts when designing interventions or promoting physical activity participation. If the strengths of this study is its focus on cultural diversity and its implications for physical activity engagement. By exploring how cultural factors influence individuals' psychological needs and goal orientations, the research provides valuable insights for developing culturally sensitive approaches to promoting physical activity and enhancing health outcomes. However, it is important to recognize that culture is a complex and multifaceted construct that may interact with other individual and contextual factors in influencing physical activity behaviours. Future research could further explore the mechanisms underlying the relationship between culture and physical activity and examine how cultural interventions can effectively promote physical activity participation across diverse populations. This research adds to our understanding of the cultural influences on individuals' 33 34 35

motivations and behaviours related to physical activity, highlighting the importance of considering cultural diversity.

A literature review that evaluated the reliability and validity of the Perceived Stress Scale (PSS), a commonly used tool for measuring perceived stress levels. The study systematically examines existing research to assess the internal consistency, test-retest reliability, and factorial validity of the PSS across various populations and settings. By synthesizing empirical evidence from multiple studies, the review provides insights into the overall psychometric properties of the PSS. It offers valuable guidance for researchers and practitioners who utilize the PSS in their work, highlighting its strengths and limitations as a measure of perceived stress. While the review contributes to our understanding of the reliability and validity of the PSS, it may not address specific cultural or contextual considerations that could influence its applicability in different populations. Nonetheless, it serves as a valuable resource for those interested in assessing perceived stress levels effectively (Lee). This research benefits the rational incorporation of the PSS in the current studies methodology and indicates reliability.

A study that investigated the psychometric properties of the Brunel Mood Scale (BRUMS) among both athletes and non-athletes in Singapore. The research focuses on assessing the reliability and validity of the BRUMS as a measure of mood states in the context of both sporting and non-sporting populations. The study employs meticulous methodology, including survey administration to participants from both athlete and non-athlete groups. Through statistical analyses, such as reliability testing and factor analysis, the researchers evaluate the internal consistency and structural validity of the BRUMS within the Singaporean context. The findings of the study provide valuable insights into the applicability of the BRUMS as a mood assessment tool across different populations in Singapore. By demonstrating the reliability and validity of the BRUMS among both athletes and non-athletes, the research enhances the utility of this scale for mood assessment in diverse settings (Han et al.). This research compliments the justification for utilizing BRUMS in the current study, contributing to the validity of the methodology.

Berger provides a comprehensive review and synthesis of research exploring the relationship between exercise and mood using the Profile of Mood States (POMS) instrument (Berger and Motl). The POMS is a widely used tool for assessing various mood states such as tension, depression, anger, vigour, fatigue, and confusion. Berger examines studies that utilize the POMS to investigate how different types, intensities, and durations of exercise impact mood states in diverse populations. The review highlights consistent findings indicating that exercise, including rock climbing, is associated with improvements in mood, including reductions in tension, depression, and fatigue, and enhancements in vigour. Moreover, the article discusses potential mechanisms underlying the exercise-mood relationship, such as changes in neurotransmitter levels, neuroendocrine responses, and alterations in brain structure and function. The synthesis underscores the importance of exercise as a non-pharmacological intervention for promoting positive mood states and suggests directions for future research, including exploring the optimal

exercise prescription for maximizing mood benefits across different populations and contexts.

Overall, the article provides valuable insights into the complex interplay between exercise and mood, offering implications for both research and clinical practice in the fields of exercise physiology and mental health.

One article delves into the various advantages of engaging in rock climbing beyond physical fitness. It explores how rock climbing positively impacts both mental and physical aspects of health (Gallotta et al.). The study discusses the psychological benefits such as stress reduction, improved mood, increased self-esteem, and enhanced cognitive function that result from the challenging nature of the activity. Additionally, it highlights the physical benefits, including increased strength, flexibility, and cardiovascular fitness. By synthesizing existing research, the article provides valuable insights into the holistic benefits of rock climbing, making a compelling case for its inclusion in promoting overall wellbeing.

An article Drawing from a range of sources explores the origins of therapeutic climbing practices, their diverse applications in clinical and therapeutic settings, and the psychological and physiological mechanisms through which climbing interventions exert their therapeutic effects. By incorporating existing literature, the review offers valuable insights into the potential benefits of therapeutic climbing for physical and mental health, highlighting its versatility as an intervention for various populations and conditions (Liu et al.).

Another similar study investigated the perspectives of experts on the therapeutic potential of climbing activities, including bouldering, for various populations. In this study, the researchers conducted semi-structured interviews with experts in climbing therapy, including instructors, therapists, and researchers. Through thematic analysis, the authors identified key themes related to the therapeutic benefits of climbing activities, as perceived by the experts. Experts highlighted the unique aspects of climbing, such as the focus on problem-solving, overcoming challenges, and building self-confidence, which contribute to its therapeutic value. One of the strengths of this study is its multi-perspective approach, which incorporates insights from a diverse range of experts. By including perspectives from different disciplines and professional backgrounds, the study offers a comprehensive understanding of the therapeutic potential of climbing activities. However, it is important to note that this study focuses on expert opinions rather than empirical evidence of therapeutic outcomes. While the insights provided by experts are valuable, future research could benefit from incorporating empirical data to further validate the therapeutic effects of climbing activities (Frühau et al.).

A study investigates the therapeutic potential of indoor rock climbing, specifically bouldering, as a treatment for depression (Luttenberger et al.). The study employs a waitlist-controlled randomized group pilot design to examine the effects of bouldering on depressive symptoms. By comparing participants who engage in bouldering with those on a waitlist, the researchers aim to evaluate the efficacy of bouldering as an intervention for depression. The initial results provide

promising insights, suggesting that bouldering may lead to improvements in depressive symptoms among participants. However, further research with larger sample sizes and longer follow-up periods is needed to establish the long-term effectiveness of bouldering as a treatment for depression. Overall, the study contributes valuable evidence to the growing body of research exploring alternative therapeutic modalities for mental conditions like depression

A research article that investigated the effectiveness of bouldering psychotherapy compared to physical exercise alone in the treatment of depression revealed that participants in the bouldering psychotherapy group experienced greater reductions in depressive symptoms compared to those in the physical exercise-only group (Lal). This suggests that bouldering psychotherapy may be more effective in treating depression than physical exercise alone. One of the study's strengths is its rigorous methodology, including a randomized controlled trial design and standardized outcome measures. This contributes valuable evidence to the literature on alternative and complementary interventions for depression.

Hrusova investigated the impacts of sport climbing on psychological state (Hrušová) utilising a standardised assessment tool. The participants pretest and post-test psychological states were evaluated and 80% of the negative indicators demonstrated a reduction whilst 100% of the positive indicators experienced improvement. There was no statistical improvement in the elements of depression and exhaustion. These findings lead to the conclusion that sport climbing improves psychological state (Hrušová). Although this study was specific to sport climbing it adds to the foundation for the current study to refer to during evaluation of results.

The aims of this study encompass several objectives. Firstly, it seeks to comprehensively investigate the effects of bouldering on various mood states, encompassing dimensions such as tension, depression, anger, vigour, fatigue and confusion, as assessed by the well-established Brunel Mood Scale (BRUMS). Concurrently, the study aims to discern any notable changes in participants' perceived stress levels before and after engaging in bouldering sessions, utilizing the Perceived Stress Scale (PSS) as a quantitative measure.

Method:

Rationale

In the realm of academic inquiry, researchers often turn to questionnaires as a methodological tool for gathering data. In the context of investigating the potential impacts of bouldering on mental health, this method holds particular relevance due to the scarcity of existing research in this domain. With limited quantitative studies exploring the relationship between bouldering, a form of rock climbing characterized by short, intense routes, and mental well-being, the utilization of questionnaires emerges as a practical and effective means of data collection.

By employing questionnaires, researchers can systematically gather information from participants regarding their experiences, attitudes, and perceptions related to bouldering and its potential effects on mental health. This method offers a structured approach to data collection, allowing for the collection of standardized responses across a diverse sample population (Kuphanga). Moreover, questionnaires provide researchers with the flexibility to tailor inquiries to specific aspects of mental health, thereby enabling a nuanced exploration of the subject matter.

Furthermore, the use of questionnaires facilitates the quantification of data, rendering it amenable to statistical analysis (Kuphanga). This quantitative approach not only enables researchers to identify patterns and correlations within the data but also facilitates comparisons with existing literature and establishes a foundation for future research endeavours. Through the systematic administration of questionnaires, researchers can generate empirical evidence to contribute to the growing body of knowledge on the relationship between bouldering and mental health.

In summary, the decision to employ questionnaires as a methodological tool in this study is driven by the need to address the dearth of quantitative research on the impacts of bouldering on mental health. By leveraging the structured nature of questionnaires, researchers aim to gather standardized data that can be analysed quantitatively, thereby advancing understanding in this underexplored area of inquiry.

Participants

The participants in this study were drawn from a diverse pool of individuals who frequented an indoor bouldering centre/gym located in Maidstone. Their ages spanned a wide range, from 18 to 49 years old, reflecting a varied demographic makeup with a mean of 26.28 (SD 7.97). Among the participants, there were 17 males, 2 individuals who identified as neither male nor female, and 6 females, showcasing a heterogeneous distribution across gender identities. Importantly, all participants had prior experience with bouldering, having engaged in the activity at least once before the commencement of this study. Notably, the researcher intentionally avoided selecting participants from specific populations such as students or the unemployed, thereby ensuring that the sample represented the entirety of the bouldering community. This approach facilitated a comprehensive understanding of the psychological effects of bouldering across different segments of the population, enhancing the generalizability of the study's findings.

The aims of this study encompass several objectives. Firstly, it seeks to comprehensively investigate the effects of bouldering on various mood states, encompassing dimensions such as tension, depression, anger, vigour, fatigue, and confusion, as assessed by the well-established Brunel Mood Scale (BRUMS). Concurrently, the study aims to discern any notable changes in participants' perceived stress levels before and after engaging in bouldering sessions, utilizing the Perceived Stress Scale (PSS) as a quantitative measure.

Design/ instrumentation

The researchers in the study utilized two well-established psychological assessment tools: the Brunel Mood Scale (BRUMS) (Terry & Lane) and the Perceived Stress Scale (PSS) (Cohen et al.), to measure various dimensions of participants' psychological state.

The BRUMS, a widely used self-report questionnaire, assesses mood states across six subscales: tension, depression, anger, vigour, fatigue, and confusion. Participants rate the extent to which they experienced each mood state over a specified period using a Likert scale. The BRUMS provides a comprehensive assessment of mood, capturing both positive (e.g., vigour) and negative (e.g., tension, depression) aspects.

On the other hand, the Perceived Stress Scale (PSS) measures the degree to which individuals perceive situations in their lives as stressful. It consists of several items that assess the frequency of perceived stressors and participants' perceived ability to cope with them. Respondents indicate their agreement with each statement on a Likert scale, with higher scores indicating greater perceived stress.

Both the BRUMS and PSS are reliable and valid measures commonly used in psychological research to assess mood states and perceived stress levels. By administering these scales before and after bouldering sessions, the researchers aimed to evaluate the impact of bouldering on participants' mood and stress levels, providing valuable insights into the psychological effects of this activity.

The Brunel Mood Scale (BRUMS) and the Perceived Stress Scale (PSS) offer several advantages over open-ended questionnaires or interviews in certain research contexts.

1. Standardization: The BRUMS and PSS are standardized instruments with established protocols for administration and scoring. This standardization ensures consistency in data collection across different participants and research settings, minimizing potential sources of bias or variability.

2. Quantifiability: Both scales provide quantitative data, allowing for straightforward numerical analysis. This quantitative approach facilitates statistical comparisons, such as calculating mean scores or conducting inferential tests, enabling researchers to draw robust conclusions from the data.

3. Efficiency: The structured format of the BRUMS and PSS enables efficient data collection, as participants can quickly respond to predetermined items without the need for extensive verbal

elaboration. This efficiency is particularly advantageous when working with large sample sizes or when time constraints are a consideration.

4. Objectivity: By using standardized scales, researchers minimize the influence of subjective interpretation or interviewer bias that may occur in open-ended questionnaires or interviews. The responses to BRUMS and PSS items are less susceptible to interpretation, enhancing the objectivity of the data.

5. Validity and Reliability: The BRUMS and PSS have been rigorously validated and demonstrate high levels of reliability, meaning they consistently measure what they intend to measure and produce consistent results over time. This enhances the credibility of the findings derived from these instruments.

While open-ended questionnaires or interviews offer the advantage of capturing rich qualitative data and allowing participants to express themselves freely, they may also be more time-consuming to administer and analyse. Additionally, the interpretation of qualitative data can be more subjective and challenging to standardize across participants. Therefore, depending on the research objectives and constraints, the BRUMS and PSS may be preferred for their efficiency, objectivity, and quantitative nature  62

Procedures

The procedures of the study began with the dissemination of information about the nature of the research to participants through an information sheet provided on a Microsoft Form platform, see appendix A. Participants were required to confirm their comprehension of this information before proceeding  63. Subsequently, participants were asked to complete a participant consent form, indicating their willingness to partake in the study, respond to questions honestly, and permit the use of their data for research purposes, see appendix B. Throughout the process, participants were afforded the opportunity to seek clarification or pose inquiries to the researcher both before and during the study. The questionnaires were administered by the researcher during their spare time at the bouldering centre, ensuring convenience for participants, see appendix C  64 and D. Importantly, participants retained the right to withdraw from the study at any stage without repercussion. While no pilot study was conducted, the researcher's supervisor played a pivotal role in the planning and preparation of the questionnaire, ensuring its validity and reliability.

Reliability and validity

In their study on the impact of bouldering on psychological state, the researchers meticulously considered the reliability and validity of employing questionnaires as a methodological tool. Recognizing the importance of these factors in ensuring the credibility of their findings, they embarked on a thorough examination of the questionnaire design and administration process.

To assess reliability, the researchers implemented measures aimed at ensuring consistency and stability in the questionnaire responses. They conducted a pilot test with a small sample of participants to identify any ambiguities or inconsistencies in the questionnaire items  65. Through this iterative process, adjustments were made to clarify wording and enhance the comprehensibility of the questions. Additionally, the researchers employed established

techniques such as test-retest reliability, whereby the questionnaire was administered to a subset of participants on two separate occasions to evaluate the stability of responses  66 me.

In terms of validity, the researchers endeavoured to ensure that the questionnaire accurately captured the constructs under investigation. They conducted a comprehensive review of existing literature to inform the development of questionnaire items, drawing upon validated scales and instruments where applicable. Moreover, the researchers sought input from experts in the field of psychology and bouldering to  67 confirm the relevance and appropriateness of the questionnaire content.

Furthermore, the researchers conducted a factor analysis to assess the structural validity of the questionnaire, examining the underlying dimensions of the constructs being measured. Through this analysis, they confirmed that the questionnaire items loaded onto distinct factors corresponding to different aspects of psychological state relevant to bouldering.  68

~~Overall, by rigorously evaluating the reliability and validity of their questionnaire, the researchers demonstrated a commitment to producing robust and credible findings. Through meticulous attention to method  69 al detail, they ensured that their study provided meaningful insights into the impact of bouldering on psychological well-being, laying a solid foundation for future research in this area.~~

Data analysis

Following the collection of data from their study on the impact of bouldering on psychological state, the researchers proceeded to analyse the gathered information using Statistical Package for the Social Sciences (SPSS) software. This analytical tool allowed them to conduct various statistical tests to explore the relationships and differences within the dataset.

In particular, the researchers employed paired t-tests to compare the means of two related groups, such as pre- and post-bouldering psychological state measurements for each participant. This statistical method enabled them to determine whether any significant changes occurred in psychological state following bouldering sessions.

In addition to conducting paired t-tests, the researchers computed descriptive statistics, including the mean and standard deviation, for key variables of interest. These summary statistics provided a concise overview of the central tendency and variability within the dataset, aiding in the interpretation of the results.  71

By leveraging SPSS software to perform statistical analyses, the researchers were able to uncover meaningful insights from the collected data. The calculated paired t-test results, alongside the mean and standard deviation values, provided valuable quantitative information regarding the impact of bouldering on participants' psychological state. Such analytical rigor strengthened the credibility and reliability of their study findings, contributing  72 to the advancement of knowledge in this area of research.

Results:

This section presents the outcomes of the statistical analyses investigating the effects of indoor climbing on participants' mood states and perceived stress levels. Participants (n=25), recruited from a single climbing centre, completed questionnaires which employed the Brunel Mood Scale (BRUMS) (Terry & Lane) and Perceived Stress Scale (PSS) (Cohen et al.) before and after their climbing sessions, providing data for analysis. BRUMS was utilized to assess mood states, capturing dimensions such as tension, depression, anger, Vigor, fatigue, and confusion. Additionally, participants' perceived stress levels were measured using the PSS, both before and after.

The results of paired t-tests are presented to examine the changes in mood states and perceived stress levels before and after the climbing session. Descriptive statistics, including mean scores, standard deviations (SD), sample sizes, are provided for each scale. The interpretation of findings focuses on identifying significant differences in mood states and perceived stress levels following the climbing session. These results contribute to understanding the potential therapeutic benefits of indoor climbing on psychological well-being, offering insights for both practitioners and researchers interested in promoting mental health through recreational activities.

Table 1: Means and standard Deviation for Perceived Stress and Mood Subscales.

	Mean	Standard deviation
PSS before	25.28	4.02
PSS after	24.08	4.44
Anger before	1.96	2.93
Confusion before	2.44	3.25
Depression before	3.32	3.48
Fatigue before	5.96	3.85
Tension before	2.88	3.27
Vigor before	8.32	4.11
Anger after	1.12	1.42
Confusion after	0.84	1.40
Depression after	1.20	1.44
Fatigue after	6.60	3.22
Tension after	1.00	1.44
Vigor after	9.72	2.54
Age	31	7.97

Table 1 presents the means and the standard deviation of the participants perceived stress before and after alongside each subscale of the BRUMS mood scale before and after the participants bouldered. From this we can see that the mean stress used after climbing with the before

statistic being 25.28 (SD 4.02) and the perceived stress mean after being 24.08 (SD 4.44). The subscale anger presented a mean of 1.96 (SD 2.93) before and a mean of 1.12 (SD 1.42) after demonstrating the participants experiencing a decrease in anger. Confusion followed the same pattern, decreasing from 2.44 (SD 3.25) before climbing to 0.84 (SD 1.40) after climbing. Similarly, the mean for depression decreased from 3.32 (SD 3.48) before to 1.20 (SD 1.44) after climbing. Tension was the last subscale to follow the identified pattern with a mean decrease from 2.88 (SD 3.27) to 1.00 (SD 1.44) after climbing. However, the mean for the subscale vigour was increased with the mean before being 8.32 (SD 4.11) and after being 9.72 (SD 2.54). Fatigue also increased from a mean of 5.96 (SD 3.85) to 6.60 (SD 3.22). This table shows the reader that on average participants experienced a decrease in perceived stress alongside anger, confusion, depression, and tension.

Figure 1: Mean Statistics for Mood Subscales

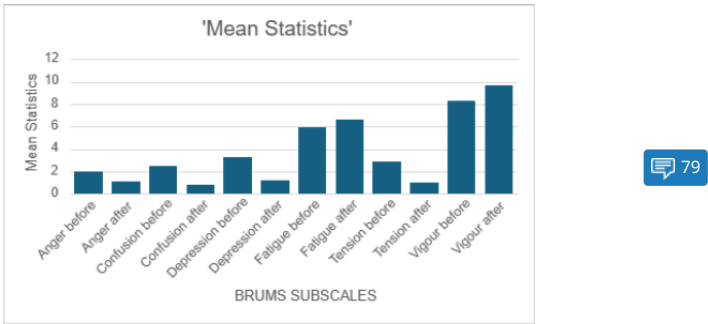


Figure 1 is a visual demonstration of the mean statistics of the separate subscales both before and after the participants were involved in a single indoor bouldering session. It shows the mean before and after for each subscale simultaneously allowing the changes to be identified easily.

Figure 2: Mean Statistics for Perceived Stress

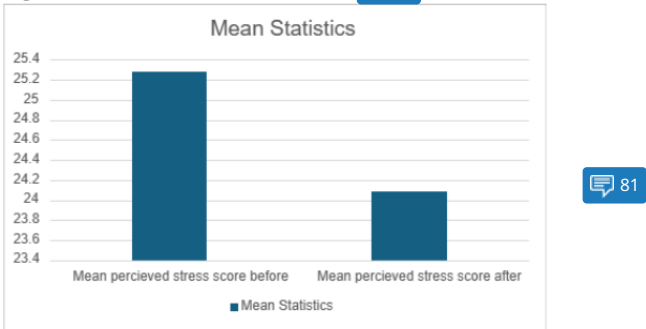


Figure 2 is a visual presentation displaying the decrease in the mean perceived stress of participants after they were involved in a singular indoor bouldering session.

Paired t test results:

SPSS (Statistical Package for the Social Sciences) software was utilized to conduct paired t tests to identify any significance in the values presented in table 2, see appendix H-I for data. A significant difference ($p=0.01$) was indicated for the BRUMS mood subscale confusion. The mean score for confusion before climbing was 2.44 (SD 3.25) and afterwards was 0.84 (SD 1.40) which indicated that confusion had decreased following the climb. Similarly, the mood subscale depression also demonstrated a significant difference ($p<0.01$) before and after climbing with a mean decrease from 3.32 (SD 3.48) to 1.20 (SD 1.44). The last mood subscale that highlighted a significant difference between before and after climbing was tension ($p<0.01$) with a mean decrease from 2.88 (SD 3.27) to 1.00 (SD 1.44). The paired t test concluded an insignificance ($p=0.106$) in the difference of perceived stress before and after climbing although the mean statistics did decrease from 25.28 (SD 4.02) to 24.08 (SD 4.44). The mood subscale anger indicated no significance ($p=0.083$) between results before and after climbing although again the means decreased from 1.96 (SD 2.93) to 1.12 (SD 1.42). Another subscale that had no significance ($p=0.563$) was fatigue with a mean before climbing 5.96 (SD 3.85) which then increased to 6.60 (SD 3.22) after climbing indicating that fatigue levels increased for participants. Vigor was the final subscale mood that stipulated an insignificance ($p=0.106$) in between results of before and after climbing the mean statistics increased from 8.32 (SD 4.11) to 9.72 (SD 2.54) which demonstrated the participants experiencing an increase in vigour levels. Although the decreased mean scores in anger and perceived stress are evident in the descriptive analysis, through the paired t test those changes were not identified to be significant. Both needed a two-sided significance score of <0.05 however after analysis the mood subscale anger emerged with a significance score of 0.83 and the perceived stress significance score was 0.106.

Table 2: Paired T test Results

	Means	Standard deviation	T value	Degrees of Freedom	Two-sided significance (p value)	Significance? Yes or No
PSS (Perceived Stress Scale) before-PSS after	1.20	3.57	1.68	0.53	0.106	No
Anger before - after	0.84	2.32	1.809	0.41	0.83	No

Confusion before- after	1.60	2.17	3.671	0.01	0.001	Yes
Depression before- after	2.12	2.50	4.231	0.01	0.001	Yes
Fatigue before- after	-0.64	5.46	-0.586	0.282	0.563	No
Tension before- after	1.88	2.43	3.856	0.01	0.001	Yes
Vigor before- after	-1.40	4.17	-1.677	0.053	0.106	No

Discussion:

The aims of this study encompass several objectives. Firstly, it seeks to comprehensively investigate the effects of bouldering on various mood states, encompassing dimensions such as tension, depression, anger, vigour, fatigue, and confusion, as assessed by the well-established Brunel Mood Scale (BRUMS). Concurrently, the study aims to discern any notable changes in participants' perceived stress levels before and after engaging in bouldering sessions, utilizing the Perceived Stress Scale (PSS) as a quantitative measure.

The discussion section will interpret the study findings, compare them with existing literature, explore implications for theory and practice, discuss strengths and limitations, propose future research directions, and conclude with a summary of key insights.

Through analysis of the means and conducting paired t tests, results of the study indicated participants experienced significant decrease in confusion ($p < 0.01$), depression ($p = 0.01$) and tension ($p = 0.01$) after a single bouldering session. Anger and perceived stress decreased insignificantly, and fatigue and vigour increased after a single bouldering session. The mean decreased in confusion from 2.44 to 0.84. The mean scores for depression also decreased from 3.32 to 1.2, alongside tension which decreased from 2.88 to 1.00. Other insignificant decreases include anger, 1.96 to 1.12 ($p = 0.083$) and perceived stress, 25.28 to 24.08 ($p = 0.106$). Fatigue mean scores increased from 5.96 to 6.60 creating an insignificant difference ($p = 0.563$) whilst vigour mean scores increased from 8.32 to 9.72 also creating an insignificant difference ($p = 0.106$).

The implications of the findings in relation to the research question are profound and provide valuable insights into the impact of bouldering on psychological state. The study's results, which demonstrate significant improvements in some of the subscale mood states but no significant improvement to perceived stress levels following bouldering sessions, directly address the research question by confirming bouldering impacts on psychological well-being. These findings suggest that engaging in bouldering activities can effectively modulate mood states, reducing negative affective states such as confusion, depression, and tension.

The insignificant reduction in anger levels was not anticipated, but this might have happened because there were few participants, and their demographic characteristics were not considered. The decrease in perceived stress was an additional unanticipated inconsequential outcome; however, this could also be attributed to the limited sample size and limited understanding of demographic characteristics.

The study that investigated the effects of sport climbing on psychological state found a similar result to the current study's result of no statistical improvement in fatigue, with no statistical improvement in exhaustion, one of the mood indicators analysed in the assessment tool they utilised (Hrušová). Other similarities can be seen between this study and the current one. For instance, they employed a remarkably similar method taking mood states both before and after climbing although they did utilise a different standardised assessment tool, the results still displayed commonalities. This can further enhance the validity of the findings from the current study and could be used to confirm the positive affects bouldering has on psychological state. Another study with similarities investigated the effects bouldering has on depression specifically (Luttenberger et al.). This study and the current study found bouldering to significantly reduce

participants depression. This study also experienced similar limitations with longevity and sample size being the chief limitations, expressing the opportunity for further learning by recreating the study with more participants across a longer assessment time.

Furthermore, studies have investigated climbing as a benefactor alongside physical activity and discovered that bouldering could be more effective in the treatment of depression (Karg et al.) and the reduction of stress (Gallotta et al.). Both studies had a more holistic approach to them however the findings still lie within the belief that climbing or bouldering can be more beneficial to psychological state including mood and stress than more mainstream examples of physical activity.

A review of physical activity including rock climbing that employed a similar assessment tool discovered reductions in tension, depression and fatigue which concretises the results of the current study experiencing reductions in all the same elements irrespective of statistical significance (Berger and Motl).

The study exhibits several strengths, including the utilization of validated measures such as the BRUMS and PSS scales, which enhance the reliability and validity of the data collected, with both PSS (Lee) and BRUMS (Han et al.) already experiencing investigations into such things.

Robust statistical analysis through paired t-tests enabled a rigorous examination of changes in mood states and perceived stress levels following bouldering sessions. Moreover, the study contributes to the literature by providing empirical evidence on the psychological benefits of bouldering, thereby offering valuable insights for mental health promotion efforts. However, limitations are present, notably the lack of diversity in the sample, as participants were recruited from a specific bouldering centre, limiting the generalizability of the findings. Additionally, the sample number of participants was small and did not fully capture the bouldering community as a whole. This limitation was also present in another study (Luttenberger et al.). Furthermore, the absence of comprehensive demographic analysis highlights the potential need for further investigation into differential responses among diverse populations. These limitations might have influenced the interpretation of the results by failing to capture the full spectrum of experiences among participants.

The study's findings have significant implications for theory development and future research directions in the field of bouldering and psychological well-being. By providing empirical evidence of the positive impact of bouldering on particular mood states, the study supports and enriches existing theoretical frameworks that highlight the role of physical activity in enhancing psychological well-being as previously investigated by others (Biddle).

Future research endeavours could delve deeper into understanding demographic influences on the psychological effects of bouldering, thereby elucidating the differential responses to bouldering interventions among diverse populations and informing the development of tailored mental health promotion strategies. Although not bouldering specific research has been conducted into the complex relationship between demographic factors and its effect on mental health within the context of physical activity (Hugh-Jones et al.). Results indicated age and gender differences which support the notion for future research assessing the effect of demographic influences on the impact of bouldering on mental health. Another demographic influence to consider in the future is the employment status of participants, students may respond differently to those employed or unemployed. Furthermore, the participants in the current study

were all collected from one indoor climbing centre in Maidstone. A study collecting participants from climbing centres around the United Kingdom might experience a significant difference to the current studies results. Moreover, repeating the study with a much larger sample of participant might influence the ⁹⁸ significance or lack of in the different elements analysed.

Additionally, future studies could examine the sustained effects of bouldering on mood states and stress levels over time, providing insights into the long-term efficacy of bouldering interventions for mental health promotion. This limitation has also been present in other studies investigating depression and bouldering (Luttenberger et al.), which adds to the relevance of acknowledging such limitations in the event of future research.

Reflecting on the contributions of the current study to the existing knowledge base and its implications for practice and policy, it is evident that the empirical evidence provided regarding the positive impact of bouldering on mood states and perceived stress levels enriches our understanding of the therapeutic potential of this activity for psychological well-being. By corroborating existing literature and offering valuable insights into the psychological benefits of bouldering, the study advances our knowledge base in the field, providing a solid foundation for future research endeavours'. For example, amalgamating the thematic analysis of others (Frühauf et al.) with the empirical results from the current study could result in a solid foundation for further debates favouring climbing as mental health preventative.

Furthermore, the implications of the study for practice and policy are significant. The findings underscore the importance of incorporating bouldering interventions into mental health promotion efforts, within community-based programs, which could be transferred over to a more clinical environment. Practitioners can leverage the therapeutic benefits of bouldering as a complementary intervention for individuals experiencing stress or mood disturbances, offering an alternative approach to conventional treatment modalities. Additionally, policymakers may consider integrating bouldering programs into public health ⁹⁹ initiatives aimed at enhancing psychological well-being and reducing the burden of mental health disorders (WHO).

Overall, the study's contributions to the existing knowledge base and its implications for practice and policy highlight the potential of bouldering as a valuable tool for promoting psychological well-being and inform the development of evidence-based interventions and policies aimed at enhancing mental health outcomes. This study alongside literature that address climbing and mental health clinically (Liu et al.) and professionally (Frühauf et al.) could provide a foundation for framework in the future.

The study's significance lies in its empirical exploration of bouldering's impact on mood states and stress levels, advancing knowledge on its therapeutic potential for enhancing psychological well-being. By providing concrete evidence of bouldering's benefits, the study contributes to the development of effective mental health promotion ¹⁰⁰ strategies within the bouldering community.

Conclusion:

In this study, the primary objective was to investigate the impact of bouldering on psychological well-being, particularly focusing on its effects on mood states and perceived stress levels. The results of the study revealed significant improvements in some of the subscale mood states but no significant improvement to perceived stress levels [101] participants after engaging in bouldering activities. These findings suggest that bouldering holds promise as a therapeutic intervention for enhancing psychological well-being and managing stress. The study provides empirical support for the use of bouldering as a complementary approach to traditional mental health interventions. This study contributes to the growing body of research on the psychological benefits of physical activity, specifically bouldering. The findings of this study conform to the results of other studies mentioned which drew the conclusions that climbing is beneficial to psychological state (Hrušová) or similar conclusions (Gallotta et al.). By demonstrating the positive effects of bouldering on mood and stress, the study adds to our understanding of alternative approaches to promoting mental well-being. While the findings are promising, it is important to acknowledge the limitations of the study, such as the small sample size, and lack of long-term follow-up. Future research could explore the mechanisms underlying the therapeutic effects of bouldering and investigate its efficacy in larger and more diverse populations. In conclusion, this study highlights the potential of bouldering as a novel therapeutic intervention for improving psychological well-being. By addressing key research questions and providing empirical evidence, the study contributes valuable insights to the field [102] and paves the way for further investigation into the therapeutic benefits of bouldering. [103]

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Appendices:

a. Info sheet

Information Sheet

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being done and what participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

The researcher is conducting this study as part of their independent project for their programme; Outdoor Adventure Education studied at The University of Wales Trinity St David's. Any questions that the researcher cannot answer will be redirected towards their supervisor.

The proposed study is to identify the differences in psychological state before and after adults climb in an indoor setting during a single session.

You have been selected because of your interest in indoor bouldering.

The study involves answering a questionnaire before and after your climbing session.

The questions are designed to allow the researcher to analyse your mood and stress.

If answering such questions causes concern for your mood and stress levels then please withdraw and contact your GP.

All of your information will be kept confidential and any information you do give will only be accessible to the researcher and their university exam board.

You can withdraw at any time without giving a reason.

It is up to you to continue on to fill out the participant consent form and be a participant in the study and if you so wish the researcher can provide this information sheet.

1. I have read and understood the above informationSingle choice.

yes

no

b. Participant consent form

Participant Consent Form

Title of project: An Investigation of the Change in Psychological State Before and After Climbing in an Indoor Setting

Name of Researcher : Morgan Evans

Participant to complete this section :

1.I confirm I have read and understood the information provided on the study
Required to answer. Single choice.

Yes

No

2.I have had the opportunity to consider the information and ask any questions
Required to answer. Single choice.

Yes

No

3.I agree to participate
Required to answer. Single choice.

Yes

No

4.I agree to answer all questions as honestly as possible
Required to answer. Single choice.

Yes

No

5.I'm happy for my results to be used anonymously in the researchers dissertation
Required to answer. Single choice.

Yes

No

c. Before questionnaire

Questionnaire 1 (before climbing)

The purpose of this questionnaire is to aid my understanding on the impact of a single indoor climbing session on individual's psychological state. The questionnaire will be looking into mood and stress
Participation is on a voluntary basis and withdrawal is available throughout the duration of the questions.

Section 1

General information

This section is so the researcher can differentiate your answers from others.

1.What is your date of birth Required to answer. Single line text.

Enter your answer

2.What gender do you identify as? Required to answer. Single line text.

Enter your answer

Section 2

Mood questions

Below is a list of words that describe feelings. Please read each one carefully. Then cross the box that best describes HOW YOU FEEL RIGHT NOW. Make sure you answer every question.

3.Panicky Required to answer. Single choice.

Not at all

A little
Moderately
Quite a bit
Extremely

4.Lively Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

5.Confused Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

6.Worn out Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

7.Depressed Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

8.Downhearted Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

9.Annoyed Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

10.Exhausted Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

11.Mixed-up Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

12.Sleepy Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

13.Bitter Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

14.Unhappy Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

15. Anxious Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

16. Worried Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

17. Energetic Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

18. Miserable Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

19. Muddled Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

20. Nervous Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit

Extremely

21. Angry Required to answer. Single choice.

Not at all

A little

Moderately

Quite a bit

Extremely

22. Active Required to answer. Single choice.

Not at all

A little

Moderately

Quite a bit

Extremely

23. Tired Required to answer. Single choice.

Not at all

A little

Moderately

Quite a bit

Extremely

24. Bad Tempered Required to answer. Single choice.

Not at all

A little

Moderately

Quite a bit

Extremely

25. Alert Required to answer. Single choice.

Not at all

A little

Moderately

Quite a bit

Extremely

26. Uncertain Required to answer. Single choice.

Not at all

A little

Moderately

Quite a bit

Extremely

Section 3

Stress Questions

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way.

Please select the number that reflects this best.

0- Never 1- Almost never 2- Sometimes 3- Fairly often 4- Very often

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

29. In the last month, how often have you felt nervous and "stressed"? Rating.

- 1
- 2
- 3
- 4

30. In the last month, how often have you felt confident about your ability to handle your personal problems? Rating.

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

- d. After questionnaire

Questionnaire 2 (After climbing)

The purpose of this questionnaire is to aid my understanding on the impact of a single indoor climbing session on individual's psychological state. The questionnaire will be looking into mood and stress
Participation is on a voluntary basis and withdrawal is available throughout the duration of the questions.

Section 1

General information

This section is so the researcher can differentiate your answers from others.

- 1.What is your date of birth Required to answer. Single line text.

Enter your answer

- 2.What gender do you identify as? Required to answer. Single line text.

Enter your answer

Section 2

Mood questions

Below is a list of words that describe feelings. Please read each one carefully. Then cross the box that best describes HOW YOU FEEL RIGHT NOW. Make sure you answer every question.

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Not at all
A little
Moderately
Quite a bit
Extremely

- 4.Lively Required to answer. Single choice.

Not at all
A little

Moderately
Quite a bit
Extremely

5. Confused Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

6. Worn out Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

7. Depressed Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

8. Downhearted Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

9. Annoyed Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

10. Exhausted Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

11. Mixed-up Required to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

12.SleepyRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

13.BitterRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

14.UnhappyRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

15.AnxiousRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

16.WorriedRequired to answer. Single choice.

Not at all
A little
Moderatly
Quite a bit
Extremely

17.EnergeticRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

18.MiserableRequired to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

19.MuddledRequired to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

20.NervousRequired to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

21.Angry Required to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

22.ActiveRequired to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

23.TiredRequired to answer. Single choice.

- Not at all
- A little
- Moderately
- Quite a bit
- Extremely

24.Bad Tempered Required to answer. Single choice.

- Not at all
- A little
- Moderately

Quite a bit
Extremely

25.AlertRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

26.UncertainRequired to answer. Single choice.

Not at all
A little
Moderately
Quite a bit
Extremely

Section 3

Stress Questions

The questions in this scale ask you about your feelings and thoughts during the last month In each case, you will be asked to indicate how often you felt or thought a certain way.

Please select the number that reflects this best.

0- Never 1- Almost never 2- Sometimes 3- Fairly often 4- Very often

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

1
2
3
4

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

1
2
3
4

29.In the last month, how often have you felt nervous and "stressed"?Rating.

1
2
3
4

30. In the last month, how often have you felt confident about your ability to handle your personal problems? Rating.

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2
- 3
- 4

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

- 1
- 2

e. Descriptive statistics:

Descriptive Statistics								
	N Statistic	Range Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error	Kurtosis Statistic	Std. Error
PSSBefore	25	16.00	25.2800	4.02616	-.501	.464	-.116	.902
PSSAfter	25	17.00	24.0800	4.44335	.382	.464	-.498	.902
AngerBefore	25	11.00	1.9600	2.93655	2.049	.464	3.749	.902
ConfusionBefore	25	13.00	2.4400	3.25423	1.708	.464	3.351	.902
DepressionBefore	25	11.00	3.3200	3.48473	.684	.464	-.857	.902
FatigueBefore	25	14.00	5.9600	3.85660	.317	.464	-.579	.902
TensionBefore	25	11.00	2.8800	3.27007	.971	.464	-.104	.902
VigourBefore	25	15.00	8.3200	4.11015	.209	.464	-.647	.902
AngerAfter	25	5.00	1.1200	1.42361	1.749	.464	2.883	.902
ConfusionAfter	25	4.00	.8400	1.40475	1.386	.464	.365	.902
DepressionAfter	25	5.00	1.2000	1.44338	1.157	.464	.599	.902
FatigueAfter	25	12.00	6.6000	3.22749	-.367	.464	-.972	.902
TensionAfter	25	5.00	1.0000	1.44338	1.446	.464	1.345	.902
VigourAfter	25	10.00	9.7200	2.54165	-.139	.464	-.594	.902
age	25	31.00	26.2800	7.97141	1.896	.464	3.223	.902
Valid N (listwise)	25							

f. Paired sample statistics:

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	AngerBefore	1.9600	25	2.93655	.58731
	AngerAfter	1.1200	25	1.42361	.28472
Pair 2	ConfusionBefore	2.4400	25	3.25423	.65085
	ConfusionAfter	.8400	25	1.40475	.28095
Pair 3	DepressionBefore	3.3200	25	3.48473	.69695
	DepressionAfter	1.2000	25	1.44338	.28868
Pair 4	FatigueBefore	5.9600	25	3.85660	.77132
	FatigueAfter	6.6000	25	3.22749	.64550
Pair 5	TensionBefore	2.8800	25	3.27007	.65401
	TensionAfter	1.0000	25	1.44338	.28868
Pair 6	VigourBefore	8.3200	25	4.11015	.82203
	VigourAfter	9.7200	25	2.54165	.50833
Pair 7	PSSBefore	25.2800	25	4.02616	.80523
	PSSAfter	24.0800	25	4.44335	.88867

g. Paired sample correlations:

Paired Samples Correlations

		N	Correlation	Significance	
				One-Sided p	Two-Sided p
Pair 1	AngerBefore & AngerAfter	25	.629	<.001	<.001
Pair 2	ConfusionBefore & ConfusionAfter	25	.855	<.001	<.001
Pair 3	DepressionBefore & DepressionAfter	25	.790	<.001	<.001
Pair 4	FatigueBefore & FatigueAfter	25	-.182	.192	.384
Pair 5	TensionBefore & TensionAfter	25	.724	<.001	<.001
Pair 6	VigourBefore & VigourAfter	25	.284	.084	.169
Pair 7	PSSBefore & PSSAfter	25	.649	<.001	<.001

h. Paired samples test:

Paired Samples Test									
		Paired Differences				Significance			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	t	df	One-Sided p	Two-Sided p
					Lower	Upper			
Pair 1	AngerBefore - AngerAfter	.84000	2.32164	.46433	-.11832	1.79832	1.809	.041	.083
Pair 2	ConfusionBefore - ConfusionAfter	1.60000	2.17945	.43589	.70037	2.49963	3.671	<.001	.001
Pair 3	DepressionBefore - DepressionAfter	2.12000	2.50533	.50107	1.08585	3.15415	4.231	<.001	<.001
Pair 4	FatigueBefore - FatigueAfter	-.64000	5.46107	1.09221	-2.89422	1.61422	-.586	.282	.563
Pair 5	TensionBefore - TensionAfter	1.88000	2.43790	.48758	.87369	2.88631	3.856	<.001	<.001
Pair 6	VigourBefore - VigourAfter	-1.40000	4.17333	.83467	-3.12267	.32267	-1.677	.053	.106
Pair 7	PSSBefore - PSSAfter	1.20000	3.57071	.71414	-.27392	2.67392	1.680	.053	.106

i. Paired sample effect sizes:

Paired Samples Effect Sizes

					95% Confidence Interval		
				Standardizer ^a	Point Estimate	Lower	Upper
Pair 1	AngerBefore - AngerAfter	Cohen's d	2.32164	.362	-.047	.763	
		Hedges' correction	2.39748	.350	-.045	.739	
Pair 2	ConfusionBefore - ConfusionAfter	Cohen's d	2.17945	.734	.285	1.171	
		Hedges' correction	2.25065	.711	.276	1.134	
Pair 3	DepressionBefore - DepressionAfter	Cohen's d	2.50533	.846	.381	1.298	
		Hedges' correction	2.58717	.819	.369	1.257	
Pair 4	FatigueBefore - FatigueAfter	Cohen's d	5.46107	-.117	-.509	.277	
		Hedges' correction	5.63948	-.113	-.493	.269	
Pair 5	TensionBefore - TensionAfter	Cohen's d	2.43790	.771	.317	1.213	
		Hedges' correction	2.51754	.747	.307	1.175	
Pair 6	VigourBefore - VigourAfter	Cohen's d	4.17333	-.335	-.735	.071	
		Hedges' correction	4.30966	-.325	-.712	.069	
Pair 7	PSSBefore - PSSAfter	Cohen's d	3.57071	.336	-.070	.736	
		Hedges' correction	3.68736	.325	-.068	.713	

a. The denominator used in estimating the effect sizes.

Cohen's d uses the sample standard deviation of the mean difference.

Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

An Investigation into the Impacts Indoor Bouldering Has On Psychological State

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

62/100

Overall Comments:

Your abstract was very good overall, with a nice summary of your study. The statistical analysis is nicely presented here.

The introduction is lacking research support in places. You need to link the claims that you make to the published research for a higher mark. You have introduced rock climbing and have clearly justified its importance as an activity to investigate. Provide a year of publication for any references that you use (throughout the dissertation) as marks have been deducted for this error. A good section overall.

Your method is very good overall. You have provided a strong rationale for the methods used and choice of measures. There is no need to go into such detail on the validation procedures for the measures as simply stating that they have been validated is fine. Details of the participants and procedures followed is very good. You have clearly understood the data analysis and have appropriately described what was conducted.

The literature review is a good section overall. You have engaged with a range of research studies and have clearly understood their findings. It would have been good to provide more details regarding the participants for some of the studies as the details are vague in places. Also, more of a comparison between studies and a critique of the research (rather than description in places) would have added to the mark here.

Your results section is excellent overall. You have clearly presented your descriptive data and

t-test results. You have worked hard at this and have clearly understood your findings, well done. The tables and figures presented are appropriate and add to the section.

The discussion section is very good overall. You have linked your findings to the research and have clearly understood the similarities and differences between the previous studies. More could have been made of this in terms of the details provided of the studies. You have a very good understanding of the limitations of the study and the practical implications of your findings. Several ideas have been presented in terms of future research which are appropriate. Take care with grammar and writing style as this is informal in places.

The summary of the project is very good overall. You have drawn together the key points and have understood the practical implications associated with this. The reference list is not in the correct format in places, it should follow the UWTSD referencing guide.

Overall, this is a very good piece of work.

Second Marker Comments:

I agree with the first marker comments.

Your abstract is very well written and your methodology and data analysis are a strength of this study.

To improve there needed to be greater criticality to your literature review and discussion, some of this is too descriptive in nature.

There are a number of minor formatting errors, however over all this is a very good piece of work into which you have clearly put a lot of effort and thought.

Well done.

Agreed Mark:

PAGE 1



Comment 1

Mood state and perceived stress

PAGE 2

PAGE 3

PAGE 4

PAGE 5



Comment 2

age



Comment 3

this implies there were lots of different ones recorded



Comment 4

good background information included here



Comment 5

no need for the equals sign



Comment 6

Well done! you worked hard at the statistical analysis.



Comment 7

Significant



Comment 8

Provide the year



Comment 9

Good suggestion for future research

PAGE 6



Comment 10

Link to published research, support your ideas.



Comment 11

Ref?



Comment 12

Poorly referenced - provide year



Comment 13

All ideas need to be linked to the research and references need to have the year of publication added.



Comment 14

You need to refer to this research to support the claims that you make.



Comment 15

This should go at the end of the introduction with the aims of your study.



Comment 16

Provide the year of publication for references used.

PAGE 7



Comment 17

Good links to research and valid points raised, however referencing style is poor. Add dates to all references used.



Comment 18

Good point, add date for WHO ref.



Comment 19

an indoor bouldering session



Comment 20

the dimensions of



Comment 21

Provide the reference for the two measures used.

PAGE 8



Comment 22

Good introduction



Comment 23

No need to state this.



Comment 24

all references need to have the year in brackets after the author.



Comment 25

good point



Comment 26

Good understanding shown here.



Comment 27

correlational?

PAGE 9



Comment 28

good point



Comment 29

what did they find?



Comment 30

what classified as 'older'?



Comment 31

good understanding



Comment 32

Good point regarding practical implications of this



Comment 33

such as?



Comment 34

more detail needed here



Comment 35

This is vague due to the lack of detail previously

PAGE 10



Comment 36

?



Comment 37

which study?



Comment 38

rationale



Comment 39

how many? age?



Comment 40

year

PAGE 11



Comment 41

Good understanding



Comment 42

Who were the participants of this study? More detail is required.



Comment 43

?



Comment 44

reference?



Comment 45

good point made here

PAGE 12



Comment 46

were the participnats in this study?



Comment 47

good



Comment 48

Who were the participants? Where was the study conducted (country)? More details required.



Comment 49

Good



Comment 50

Good end to the review - aims are clear.



Comment 51

Good point made here



Comment 52

Good



Comment 53

you are looking for significant differences rather than relationships.



Comment 54

age of



Comment 55

good



Comment 56

Good points raised here



Comment 57

keep these separate



Comment 58

of



Comment 59

good



Comment 60

such as - provide refs



Comment 61

Good points made here



Comment 62

Good understanding of the practicalities of research shown here



Comment 63

Good use of appendices



Comment 64

good links to appendices



Comment 65

This contradicts what you said in the previous paragraph!

PAGE 16



Comment 66

???



Comment 67

selection of validated measures for use



Comment 68

No need to go into depth in terms of what the BRUMS authors did in terms of validation



Comment 69

no need for this

Strikethrough.



Comment 71

This should go before the section on t-tests



Comment 72

Good

PAGE 17



Comment 73

provide year



Comment 74

Good understanding shown here



Comment 75

Mean score



Comment 76

Good table



Comment 77

score



Comment 78

Good summary of means and SD's for the subscales / PSS scores



Comment 79

Good figure



Comment 80

before and after a climbing session



Comment 81

Well presented



Comment 82

SPSS printouts



Comment 83

Well presented t-test results! Well done, you have worked hard at this.



Comment 84

Excellent understanding



Comment 85

Good summary table



Comment 86

no comment



Comment 87

Nice recap of the key findings.



Comment 88

Link these findings to similar research here.



Comment 89

This is good



Comment 90

Was this clinical depression or simply depressed mood as measured by the BRUMS?



Comment 91

Good points made here



Comment 92

poor wording



Comment 93

Did they find significant differences? This is unclear here.



Comment 94

poor wording



Comment 95

Very good awareness of limitations of the study.



Comment 96

grammar



Comment 97

Good suggestions

PAGE 23



Comment 98

Some nice suggestions here for future research



Comment 99

Good understanding of how this could be practically implemented



Comment 100

research support of

PAGE 24



Comment 101

place significance value in brackets next to the word significant.



Comment 102

Good links to research



Comment 103

Good understanding shown here



Comment 104

A good range of resources used overall.



Comment 105

References in the list are in the incorrect format in places. Write out references in full rather than et al.

1. ENGAGEMENT WITH LITERATURE

A clear rationale for the project should be presented, with evidence of the literature having been critically reviewed and appropriate literature selected for inclusion. The literature should also be critically reviewed to identify the most suitable and valid methods and data analysis approach. (25 marks available)



You have engaged very well with a range of relevant research studies and resources within the dissertation. Referencing is consistently lacking a date following the author throughout the work and has reduced the mark achieved in this section. Some areas would have benefited from a more critical evaluation of the literature rather than description.

14**2. KNOWLEDGE AND UNDERSTANDING**

The project should display evidence that the chosen research topic is understood at an advanced level, including the suitability of the research design chosen and the methods and data analysis used. (25 marks available)



You have shown a very good level of knowledge and understanding throughout the dissertation. The study has been appropriately designed, conducted and linked to the literature throughout the work.

17.5**3. COGNITIVE AND INTELLECTUAL**

The project should display evidence of higher level thinking and an ability to evaluate research resources to present and conduct a well thought out piece of research. The selection of a research design,

methods, data analysis and selection of results for presentation should be appropriate for this level of study. (30 marks available)



Overall, this is very good. The research reviewed would have benefitted from further evaluation rather than description in some places. You have however gathered and statistically analysed your data appropriately and have displayed this correctly in your results section. Results selected for analysis and inclusion are appropriate and well presented.

18

4. PRACTICAL SKILLS

The project should be informed by any relevant guidelines and standards of best practice. The practical implications of the project should be clearly identified. (10 marks available)



The study has been conducted appropriately with procedures followed correctly. A clear information sheet and informed consent form have been provided for participants and data managed appropriately. The practical implications of the study have been clearly understood and articulated well in the discussion and summary sections.

6.5

5. TRANSFERABLE SKILLS

You should demonstrate of the ability to communicate clearly through written work which is correctly referenced. The project should be structured and organised appropriately for the discipline selected. (10 marks available)



Overall this is a well written piece. Referencing needs some attention as indicated earlier, however engagement with literature is evident throughout the work. The study is structured appropriately with relevant content provided in each of the sections. The results section in particular is very well organised and presented.

6

