

**Investigating the Moderating Role of Transcendence in the Relationship  
between Gym Participation and Mental Well-Being**

Lynn-Kristin Niederwemmer (s2508214)

University of Twente

Faculty of Behavioural, Management and Social Sciences

Department of Psychology

202000381: Bachelor Thesis Positive Clinical Psychology and Technology

First Supervisor: Nienke Peeters

Second Supervisor: Dr. Lean Kramer

July 1<sup>st</sup>, 2024

APA 7<sup>th</sup>

### **Abstract**

Previous research has led to the expectation that the virtue transcendence positively influences gym participation and mental well-being. Therefore, this research aimed to examine the moderating function of transcendence in the association between gym participation and mental well-being among individuals over the age of 18. Hence, a correlational study design was applied which utilised non-probability sampling methods, primarily convenience and snowball sampling. Although the existing literature had predominantly anticipated that gym participation positively influences mental well-being, the findings disclosed a weak negative correlation between gym participation and mental well-being. However, a significant positive correlation between the virtue transcendence and mental well-being was evidenced in this study. Furthermore, the predicted positive moderation of transcendence on the relationship between gym involvement and mental health was confirmed. The virtue transcendence consists of the character strengths appreciation of beauty and excellence, gratitude, hope, humour, and spirituality which were assessed individually. This subsequent investigation proved no statistically significant interaction effect for appreciation of beauty and excellence but found significant negative moderating effects for gratitude and hope. Humour and spirituality moderated the relationship between gym participation and mental well-being significantly positively. The obtained knowledge can be embedded into interventions aiming at enhancing adults' mental health by developing and promoting the character strengths of the virtue transcendence among gym participants. Nonetheless, the limitations of the current study should be addressed in future research, and it should further expand on these fluctuating relationships through longitudinal and qualitative methods.

*Keywords:* gym participation, mental well-being, transcendence, character strengths, moderation

## **Investigating the Moderating Role of Transcendence in the Relationship between Gym Participation and Mental Well-Being**

Over the past few years, mental health has gained increasing importance due to heightened awareness of mental health issues, rising rates of mental health disorders, and the recognised link between mental and physical well-being (World Health Organization, 2022). As evidenced by a large-scale study by McGrath et al. (2023), nearly one in two adults worldwide will experience a mental health disorder at least once in their lifetime. This growing recognition of mental health's significance has prompted a shift in psychology from its traditional emphasis on negative aspects, such as dysfunction and disorders, towards a more positive approach, known as positive psychology, which seeks to understand what contributes to a fulfilling life (Peterson, 2006; Lomas & Ivtzan, 2015). This transition highlights the growing recognition of the importance of studying and promoting psychological well-being to protect and support mental health.

### **Positive Psychology and Well-Being**

The World Health Organization (WHO) defines mental well-being as a person's ability to reach their full potential, work creatively and productively, build strong interpersonal relationships, and make a meaningful contribution to their community (World Health Organization, 2004). In that regard, positive psychology focuses on the feelings, behaviours, environments, and connections that promote the best possible functioning and thriving in individuals, aiming to enhance an individual's well-being rather than solely addressing symptoms of psychological disorders (Carr et al., 2021; Waters et al., 2022). Supported by research demonstrating that increased well-being can lead to longer life and reduced symptom recurrence (Lamers et al., 2012; Wood & Joseph, 2010), identifying factors that support well-being is crucial in reducing the risk of developing these disorders in adulthood. Therefore, this investigation aims to explore the factors that contribute to psychological well-being among adults and how these factors may mitigate the development of mental health disorders.

### **Role of Physical Exercise in Mental Health**

One factor determined to significantly enhance psychological well-being is physical exercise (Arsović et al., 2020). Exercise has been shown to elevate serotonin levels, a neurotransmitter that assists with regulating mental health and induces the neurotransmitter noradrenaline, which acts like a natural mood elevator (Pahlavani, 2023). Engaging in physical activity is considered an effective strategy to release tension and cope with life's challenges and aid stress management and resilience building (Martín-Rodríguez et al., 2024; Vella et al.,

2023). Overall, it becomes evident that physical exercise plays an integral role in improving mental health.

### **Individual Sports and Fitness Activities**

Building on this understanding, the focus on individual sports, particularly narrowed down to fitness activities, is motivated by the fact that individual sports often provide a more personalised and self-directed approach to physical activity, allowing individuals to set and pursue their own goals at their own pace. This autonomy and self-determination can lead to a greater sense of agency and accomplishment, which are important components of psychological well-being (Deci & Ryan, 2008). Moreover, fitness activities typically involve a combination of cardiovascular, strength, and flexibility exercises, offering comprehensive physical benefits that contribute to overall health and well-being. These activities are often accessible and adaptable to individuals of varying fitness levels and abilities, making them suitable for a wide range of participants (Belcher et al., 2021). It was proven that participation in individual sports such as attending the fitness studio has favourable physical, and psychological health effects since it promotes physical activity, opportunities for personal achievement and stress relief, all of which contribute to overall well-being (Chekroud et al., 2018; Eime et al., 2013). However, some adults tend to engage in the gym excessively which manifests itself through physical symptoms such as chronic fatigue, frequent injuries and loss of performance, as well as psychological signs like emotional and behavioural disorders because of inadequate rest and recovery periods or disrupted hormonal balances (Mikkelsen et al., 2017). Exceeding the recommended 150-300 minutes per week can be seen as excessive, but according to various studies, there are no exact numbers that can be used to directly determine whether someone is exercising excessively because the physical and psychological signs must be considered as well (Bull et al., 2020; Lichtenstein et al., 2018; Trott et al., 2020). This emphasises the need for a nuanced exploration into the dynamic of gym participation and mental well-being in adulthood.

### **Target Group**

The target group of adults is chosen for investigation due to their significant engagement in physical activity since it was identified by several studies that the age group of 18 to 34 years exercises the most compared to other age groups (Antunes et al., 2020; Varma et al., 2021). In addition to that, this age group is often in a transitional phase of life in which they are faced with challenges such as entering the work life, establishing independence and developing personal or professional relationships. A study by Arnett et al. (2014) identified these circumstances as having a major impact on their mental health. This is particularly concerning given the fact that one in two adults will suffer from a mental disorder at least once in their lives

(McGrath et al., 2023) and this requires further research into these linkages to preserve their mental health and decrease the occurrence of mental disorders.

### **Character Strengths and Mental Well-Being**

Amidst exploring how gym engagement impacts mental well-being, it is evident that the dynamics extend beyond mere physical activity. The relationship between the gym and mental health accentuates the importance of acquiring a comprehensive understanding. In this context, character strengths emerge as crucial elements, offering insights into how individuals navigate challenges, foster resilience, and achieve overall psychological flourishing. This shift in focus from the physical to the psychological highlights the integral role of character strengths, inspired by positive psychology, which emphasises their centrality to individuals' well-being and fulfilment in life (Seligman & Csikszentmihalyi, 2000). Research on character strengths has been central to the understanding of human functioning and well-being (Wagner & Ruch, 2023). Additionally, it was found to be beneficial to discover an individual's greatest strengths to face life challenges successfully, achieve personal goals and feel more fulfilled on a personal and professional level (Littman-Ovadia et al., 2021).

Previous studies reported that character strengths are positively correlated with physical and mental well-being (Niemic, 2023; Proyer et al., 2013; Stuntz, 2017). According to Proyer et al. (2013), character strengths influence an adult's compliance with health-promoting activities, which then, in consequence, has an indirect impact on health. Character strengths are related to preferred health practices and might operate as a moderator between health behaviours and physical activity (Proyer et al., 2013). Moreover, this was confirmed by Stuntz (2017), who argued that there is a beneficial correlation between individuals' gym participation and their character qualities in the way that engaging in sports is linked to the development or enhancement of positive character strengths. Besides the positive impact on physical well-being, a study by Azañedo et al. (2021) has shown that character strengths serve as a predictor of mental well-being. Character strengths represent positive attributes inherent in individuals and play a crucial role in shaping their psychological well-being, with strength-based interventions harnessing these strengths to promote optimism, positive mood, and life satisfaction (Drozd et al., 2014; Duan et al., 2013).

### **Virtue of Transcendence**

The character strengths of individuals can be measured and classified through the *VIA Inventory of Strengths (VIA-IS)* which comprises 24 distinct character strengths divided into six virtues: courage, wisdom and knowledge, humanity, justice, temperance, and transcendence (Peterson & Seligman, 2004). Within the rich tapestry of human virtues, the concept of

transcendence takes centre stage due to its profound impact on psychological well-being (Gillham et al., 2011). As elucidated by the VIA-IS (Peterson & Seligman, 2004), transcendence refers to a unique facet of character strengths, encompassing the strengths of appreciation of beauty and excellence, gratitude, hope, humour, and spirituality. Appreciation of beauty and excellence involves recognising and valuing the beauty and excellence in the world around, whether in nature, art, or human achievements while gratitude entails acknowledging the positive aspects of life and expressing thankfulness for kindness received. Hope is the belief in the possibility of positive outcomes in the future, even in challenging circumstances, and the motivation to work towards those outcomes. Furthermore, humour is the ability to find amusement and joy in everyday situations, to laugh at oneself, and to use humour as a coping mechanism during difficult times. Spirituality encompasses a sense of connection to something greater than oneself, whether through religious beliefs, a connection to nature, or a deeper understanding of the universe and one's place within it. The decision to emphasise the virtue of transcendence in this study is grounded in its profound potential to influence and augment the relationship between diverse sports and mental well-being outcomes (Guo et al., 2023; Bethlemy & Corraliza, 2019; Gillham et al., 2011).

### **Transcendence and Mental Well-Being**

The research is consistent with findings that indicate a positive correlation between hope, a key component of transcendence, and cardiorespiratory fitness, highlighting the physical health benefits linked to these character strengths (Proyer et al., 2013). In addition, it was ascertained that athletes with higher levels of gratitude and hope experience greater life and sport satisfaction and suffer less from burnout (Gabana, 2019). A study by Park et al. (2004) identified appreciation of beauty and excellence as one of the strengths least related to life satisfaction, while other studies found all strengths belonging to transcendence to be the greatest indicators of being satisfied with life (Shoshani & Slone, 2013; Weber et al., 2013). The study by Park et al. (2004) may have found appreciation of beauty and excellence to be less related to life satisfaction due to its more passive nature compared to other character strengths. While appreciation of beauty and excellence involves recognizing and admiring the beauty in the world, it may not directly contribute to personal fulfilment or satisfaction in the same way that other strengths, such as perseverance or kindness, do. Two other crucial components of transcendence, humour and spirituality, constitute significant factors for improving well-being. Humour has been disclosed for its ability to reduce stress, foster a positive outlook on life, and contribute to psychological resilience and overall happiness (Fritz et al., 2017; Xing, 2023). Spirituality, encompassing a sense of connection to something greater than oneself, has been

associated with an increased level of life satisfaction by providing individuals with a framework for meaning, purpose and understanding amidst life's challenges (Lomas & Van der Weele, 2021).

### Research Gap and Objective

Despite its potential significance, transcendence is frequently disregarded in traditional sports psychology studies, and notably, there has been limited research conducted on its role within the realm of any kind of sport (Whitley et al., 2022). While previous research has identified the positive influence of transcendence on various aspects of well-being, little is known about how these strengths might moderate and shape the psychological benefits derived from gym participation. This gap in the research highlights the need for a more nuanced investigation, prompting the present study to investigate the moderating impact of transcendence in the relationship between gym engagement and mental well-being.

Therefore, four hypotheses (*H*) were formulated and visualised (Figure 1).

**H1:** Gym participation is positively correlated with mental well-being among adult gym participants.

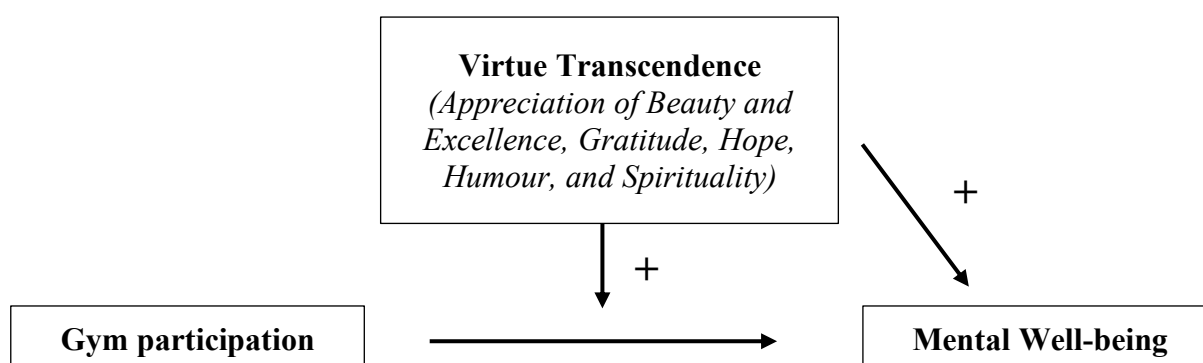
**H2:** The virtue of transcendence is positively correlated with mental well-being among adult gym participants.

**H3:** The virtue of transcendence moderates the relationship between gym participation and mental well-being positively among adult gym participants.

**H4:** The character strengths of appreciation of beauty and excellence, gratitude, hope, humour, and spirituality moderate the relationship between gym participation and mental well-being positively among adult gym participants.

### Figure 1

*Graphical representation of the expected relationship between gym participation, the virtue transcendence and mental well-being.*



## **Methods**

### **Study Design**

This study has been conducted in cooperation with a total of four researchers. Each had their character virtue to focus on and in pairs, they focused on either individual or team sport. While also including questions about the virtue courage and resilience as part of another research, this study specifically centred on individual sports, namely gym participation, the character virtue transcendence and mental health, thereby resembling a correlational study.

### **Participants**

The study employed non-probability sampling methods, primarily convenience and snowball sampling. A sample size of 100 participants was striven for the study. The inclusion criteria were adults aged from 18 who engage in physical exercise in the gym and at least once a week. Respondents were excluded if they were below 18, practised a sport other than exercising in the fitness centre or went to the gym less than once a week.

### **Materials**

By using the Qualtrics software, an online questionnaire was designed (see Appendix A). The questionnaire could be filled in with any technical device that was available to the participants. As mentioned above, the participants in this study were gym-goers and the survey that they filled in consisted of 35 items in total.

### ***Gym Participation***

To get an overview of the participants' gym participation, several questions were formulated. First, participants were asked to indicate if they participated in the sports type soccer or the gym, with this study targeting participants who indicated gym participation. Next, they needed to specify how many years they have been practising their sport, ranging from zero to 30 years. Additionally, the survey included an item enquiring at how many days the participants practise their sport during the week and how many hours per week they are involved in it. In the case of the number of days, they were able to answer on a scale from zero to seven days, whereas the item about the hours per week spent doing their sport was answered on a scale ranging from zero to 40. According to the guidelines of the World Health Organization, all adults should perform 150-300 minutes of physical activity per week to profit from the health benefits (Bull et al., 2020). Therefore, the results were compared to the WHO's recommendation to assess whether participants' gym participation aligned with the established health guidelines.



### ***Character Strengths***

For assessing the participants' character strengths, the Global Assessment of Strengths (GACS-24; McGrath, 2019) was used. It is a 24-item questionnaire adapted from the ViA-IS and encompasses a comprehensive set of 24 distinct character strengths organised into the six virtues (Courage, Wisdom, Humanity, Justice, Temperance, and Transcendence). Participants were given a definition of each strength and then asked to indicate their agreement on a scale from 1-7. Here, one coded for 'very strongly disagree' and seven for 'very strongly agree'. In this study, the participants' scores on the virtue of Transcendence were covered. The strength 'hope', for instance, was measured with the item, 'You are optimistic and expect the best'. The strength of humour was measured with the item 'I approach life playfully, making others laugh, and finding humour in difficult and stressful times.' In the context of the Likert scale used, higher scores reflect a greater alignment with these character strengths, indicating a higher level of possession or expression of those strengths.

Overall, the 24-item scale shows good internal reliability with a Cronbach's Alpha of .78. The Cronbach's Alpha for the individual strengths of the eight items is good ( $\geq .70$ ). There is also a moderate correlation ( $r = .61$ ) between the GACS-24 and a revised version of the ViA-IS, which indicates good validity (McGrath, 2019).

### ***Mental Health***

The Mental Health Continuum Short Form (MHC-SF; Lamers et al., 2010) was used to investigate the participant's mental health. It is an adaptation from the long form of the Mental Health Continuum (MHC-LF), with 14 items in their entirety. The MHC-SF includes three emotional well-being items, six psychological well-being items, and five social well-being items. Every item starts with 'In the past month, how often did you feel...' and ends, for instance, with 'satisfied with life?' or 'that you had warm and trusting relationships with others?' All items were scored on a standardised six-point Likert scale ranging from 0-5, where zero coded for 'never' and five for 'every day'. The given answers are summed and divided by the total number of 14 elements to arrive at an overall score, which can reach up to six. Higher scores are indicative of better mental health (Lamers et al., 2010). High internal consistency ( $\alpha = .89$ ) and questionable test-retest reliability ( $r = .68$ ) have been demonstrated by the MHC-SF (Lamers et al., 2010).

### **Procedure**

Prior to commencing data collection, the project was granted approval by the University of Twente's BMS ethics committee. The survey was uploaded to the University of Twente's BMS faculty Sona-System test subject pool, where students were able to earn 0.25 Sona credit

points for participating in the study. Hence, participants were recruited via online platforms (e.g., SONA Systems, WhatsApp groups, Instagram) and some were approached personally in various fitness centres and buildings of the University of Twente by hanging out papers with QR codes in these buildings. Once deciding to participate in the study, participants were referred to the Qualtrics questionnaire, which they could fill in with any technical device (e.g., mobile phone, tablet, laptop). After reading through the study information, students needed to give their informed consent (see Appendix A). They were also informed about their right to quit the study at any point in time without the need to justify their decision. When having agreed to participate, the first set of questions asked the participant to indicate their demographics (Age, Gender, Nationality). Afterwards, the participants had to state if they engaged in gym, soccer, or a different sport, where the latter led to the exclusion of the participant. Subsequently, the items from the gym participation, the GACS-24, the BRS, and the MHC-SF were presented separately. The survey required about ten minutes to complete, and the respondents were assured that their answers would be kept confidential, and everything was anonymised. Lastly, they were thanked for their participation. Participants who entered the survey via SONA were additionally rewarded with the respective credits.

### **Data Analysis**

Analyses were performed utilising R-Studio software (Version 4.2.3), involving several steps to ensure data integrity and comprehensiveness. During the analyses, the following packages were used: dplyr, tidyr, psych, car, lmttest, ggplot2, summarytools, corplot, moderndive, interactionTest. Initially, the dataset underwent thorough cleaning, including the removal of missing data and the exclusion of participants with insufficient engagement (progress of < 100) or low variance (<0.10) on survey subscales to guarantee the seriousness of questionnaire responses. Moreover, the data was screened with the aid of the inclusion and exclusion criteria. Consequently, participants under 18 who chose another sports type than the gym or went to the gym less than once a week were excluded. To prepare for the moderation analyses, the particular assumptions of linearity, homoscedasticity, normality, and non-multicollinearity were checked, and zero violations were reported (see Appendix B1, B2, B3, and B4). Another preparation included inspecting whether the sample size was sufficiently large. According to the G\*Power software (Faul et al., 2009), the sample had to include at least 32 participants to achieve a large effect size ( $f^2 = .35$ ) with a power of .8. Descriptive analyses were then conducted to provide a comprehensive overview of the dataset. Accordingly, a correlation analysis was employed to explore the potential positive correlation between gym participation and mental well-being, with the Pearson correlation coefficient elucidating the

strength and direction of this relationship. The correlation coefficient is considered significant when the associated  $p$ -value is less than 0.05 ( $p < 0.05$ ).

Hypothesis testing was subsequently utilised to assess the significance of the correlation coefficient, with a statistically significant positive correlation lending support to the first hypothesis ( $H1$ ) proposing a positive association between gym engagement and mental well-being and the second hypothesis ( $H2$ ) advocating a positive correlation between the virtue transcendence and mental well-being. Consequently, a moderation analysis was undertaken to investigate the potential moderating role of the virtue of transcendence in the relationship between gym participation and mental well-being. Interaction terms were initially generated between gym participation and transcendence variables, and regression models were then fitted with mental well-being as the dependent variable and gym participation, transcendence, and their interaction term as independent variables. Subsequent assessment of the significance of the interaction term aimed to clarify whether the relationship between gym participation and mental well-being is contingent upon levels of transcendence, with a statistically significant interaction effect supporting the corresponding hypothesis ( $H3$ ). Additionally, separate moderation analyses were conducted for the specific character strengths of the virtue transcendence, including appreciation of beauty and excellence, gratitude, hope, humour and spirituality to explore their potential moderating effects on the relationship between gym participation and mental well-being ( $H4$ ).

## Results

### Participants

The participant data was analysed to assess the hypotheses. In total, the survey was filled in by 71 participants. Five respondents had to be removed because of missing values and one participant's answers had to be excluded since the age was below 18. Hence, the final number of respondents was 65 which exceeds the minimum requirement of 32 participants according to the G\*Power analysis (Faul et al., 2009). The sample ranged in age from 18 to 50, with a mean age of 22.77 years ( $SD = 5.63$ ). Of the participants in this sample, 65.71% ( $n = 46$ ) were female, 31.43% ( $n = 22$ ) were male and 2.86% ( $n = 2$ ) identified with another gender. Furthermore, 88.41% ( $n = 61$ ) of the respondents were German, 7.25% ( $n = 5$ ) were Dutch, and 4.35% ( $n = 3$ ) were of other nationalities.

### Gym Participation

Participants engaged in gym activities for an average of slightly above 6 hours per week ( $M = 6.46$ ,  $SD = 2.97$ ). This suggests a higher level of physical activity among the participants compared to the recommended 5 hours per week by the WHO, with a considerable spread

around the mean, indicating variability in how much participants engage in the fitness centre. The range of gym participation hours was from 1 to 15 hours per week. This wide range indicates a diverse set of behaviours regarding physical activity, from very low to quite high levels of engagement. The mean aligns closely with the median ( $Mdn = 6$ ), suggesting a symmetric distribution of data around the central value.

### **Transcendence**

Participants scored moderately on the virtue transcendence, with an average score slightly above the middle value of the range ( $M = 21.05$ ,  $SD = 4.56$ ). This level of transcendence demonstrates that participants generally experience a moderate degree of purpose, meaning, and connectedness in their lives, with a reasonable spread of scores around the mean. The most common scores are around the median ( $Mdn = 21$ ), which is also close to the mean, suggesting a symmetric distribution around this central value. Scores of 21 are the most frequent, representing about 16.39% of the participants, followed by scores of 22 and 20, which suggest that a notable portion of the group reports moderate to slightly above-average levels of transcendence. Lower scores (e.g., 6, 11) and higher scores (e.g., 28) are less frequent, each constituting smaller percentages of the total (around 1.64% to 6.56%). This indicates that fewer participants experience very low or very high levels of transcendence.

### **Mental Health Continuum Short Form**

The median score of the MHC-SF is around 55, indicating that half of the participants have a score below 55 and the other half above it, and since the highest possible MHC-SF score is 84, this median reflects a generally high level of mental well-being. The mean score is approximately 54.34, which is close to the median, signifying a relatively symmetric distribution of scores. The range of scores extends from a minimum of 26 to a maximum of 78, showing a wide variability in mental health conditions among participants. The interquartile range (IQR) spans from 46 to 64. This implies that the middle 50% of scores are concentrated within this range, providing a sense of the typical score spread.

### **Correlation Analysis**

The correlation analysis revealed a weak negative correlation between gym participation and mental well-being ( $r = -0.08$ ,  $p = 0.55$ ). This result does not provide strong support for  $H1$ , suggesting that the relationship between gym participation and mental well-being might not be as robust as anticipated and is not significant. The correlation coefficient indicates a weak negative correlation between gym participation hours and mental well-being. This proposes that as gym participation increases, there is a slight tendency for mental well-being scores to decrease. As a result,  $H1$  is rejected. However, the virtue of transcendence showed a significant

positive correlation with mental well-being ( $r = 0.61, p = .001$ ). Therefore, hypothesis *H2* can be accepted, and this indicates that higher levels of transcendence are associated with better mental well-being among the participants.

### **Moderation Analysis**

The results of the moderation analysis displayed that transcendence significantly enhances the positive impact of gym participation on mental well-being. The interaction effect between gym engagement, mental well-being and transcendence was found to be statistically significant ( $\beta = 0.43, SE = 0.20, p = .03$ ). Thus, hypothesis *H3* is confirmed which implies that individuals who possess higher levels of transcendence experience greater mental well-being benefits from engaging in gym activities compared to those with lower levels of transcendence.

Consequently, the moderating effects of appreciation of beauty and excellence, gratitude, hope, humour, and spirituality on the relationship between gym participation and mental well-being were examined. It was found that the interaction effect for appreciation of beauty and excellence ( $\beta = -0.16, SE = 0.30, p = .61$ ) is not statistically significant (Table 1). This shows that appreciation of beauty and excellence does not moderate the relationship between gym participation and mental well-being. In contrast, gratitude demonstrates a statistically significant but negative interaction effect ( $\beta = -0.53, SE = 0.25, p = .03$ ) which suggests that higher levels of gratitude may reduce the positive impact of gym involvement on mental well-being. Similarly, hope displays a significant negative moderation effect ( $\beta = -0.67, SE = 0.22, p = .01$ ) indicating that higher levels of hope may decrease the positive effects of gym participation on mental well-being. Humour ( $\beta = 0.61, SE = 0.29, p = .04$ ) and spirituality ( $\beta = 0.56, SE = 0.26, p = .03$ ) denote a statistically significant positive moderation effect each which illustrates that both character strengths may indeed enhance the relationship between gym participation and mental well-being separately. To conclude, the above results support the hypothesis (*H4*) partially. Higher levels of humour and spirituality enhance the positive effects of gym participation on mental well-being but regarding the three other character strengths the hypothesis is rejected.

**Table 1**

*Results of the moderation analyses*

	<b>Interaction Coefficient (<math>\beta</math>)</b>	<b>Standard Error (SE)</b>	<b>P-value (<math>p</math>)</b>
<b>Appreciation of Beauty and Excellence</b>	-0.16	0.30	0.61

	<b>Interaction Coefficient (<math>\beta</math>)</b>	<b>Standard Error (SE)</b>	<b>P-value (<math>p</math>)</b>
<b>Gratitude</b>	-0.53	0.25	0.03
<b>Hope</b>	-0.67	0.22	0.01
<b>Humour</b>	0.61	0.29	0.04
<b>Spirituality</b>	0.56	0.26	0.03

### Discussion

The purpose of this study was to gain insights into the relationship between going to the gym and mental health, with a focus on the moderating influences associated with individuals' character strengths. It was proposed that going to the gym would positively correlate with mental health and that the link would be moderated by the virtue transcendence consisting of the character strengths of gratitude, hope, humour, and spirituality. Contrary to the expectations, the results revealed a weak negative correlation between gym participation and mental well-being, suggesting the relationship is not as straightforward as previously thought. Additionally, the study found that transcendence positively moderated this relationship, while gratitude and hope had negative moderating effects and humour and spirituality had positive moderating effects.

The first main finding is that contrary to the initial conventional assumption of a positive relationship between physical activity and psychological health, the study evidenced a non-significant weak negative correlation between gym participation and mental well-being. The non-significance of this result argues that the relationship may not be as robust or direct as previously thought. Moreover, this outcome highlights the need for a more thorough understanding of this association, potentially influenced by various factors beyond mere engagement in the fitness centre. One possible explanation is the nature of individual sports, which may lack the social contact and support typically linked with team sports and the absence of social interaction could negate some of the mental health benefits usually attributed to gym participation (Reardon & Hitchcock, 2024). According to a study by Teh and Krishnan-Vasanthi (2022), individual sports might be more stressful for some participants, potentially leading to a negative impact on mental well-being for two reasons. Firstly, on account of personal accountability since in the gym, individuals are liable for their progress and if they fail to meet their fitness goals it is only their responsibility which can cause elevated stress, secondly, because of performance pressure gym participants often face significant pressure to perform well, whether this shows in lifting heavier weights or achieving specific body image

goals (Crocker, 2019; Teh & Krishnan-Vasanthi, 2022). This is in line with the study by Harada et al. (2019) which found that exercising together with one or more people in the gym positively influenced the mental state whereas training alone did not affect mental well-being. This finding is crucial as it suggests that the social context within the gym setting plays a pivotal role if individuals exercising in the gym want to profit from enhanced mental well-being.

Another remarkable finding is that the virtue of transcendence has emerged to have a strong positive correlation with mental health which illustrates that psychological results are significantly shaped by an individual's character strengths. It appears that transcendence is essential for fostering mental health and individuals with higher levels of it may experience greater mental well-being benefits from engaging in the fitness centre. This could be due to their ability to find deeper meaning and purpose in their activities, promoting a sense of connectedness and fulfilment (Ray et al., 2024). The positive impact of transcendence on mental well-being highlights the potential for interventions aimed at developing these character strengths. Programs that focus on enhancing transcendence could be particularly effective in promoting mental health among gym participants. This approach aligns with positive psychology principles, which emphasize the cultivation of strengths and virtues to improve overall well-being (Carr et al., 2021; Lomas & Ivtzan, 2015).

Lastly, the study uncovered that certain character strengths had significant moderating effects on the relationship between gym participation and mental well-being. Gratitude and hope had significant negative moderating effects, reducing the positive impact of the gym on mental well-being. This finding connotes that individuals with high levels of gratitude and hope might have different expectations or coping mechanisms that influence their mental health outcomes. For example, they might rely more on internal sources of well-being rather than external activities like sports, leading to a diminished impact of gym participation on their mental health (Roesch et al., 2010; Tachon et al., 2021). Contrary, humour and spirituality significantly moderated the relationship between the gym and mental well-being positively. Humour can help individuals cope with stress and adversity, making gym participation more beneficial for mental health (Crawford & Caltabiano, 2011). By incorporating humour into gym routines, individuals might reduce their pressure and personal accountability and can enhance their overall gym experience and profit from the mental health benefits. Similarly, spirituality can provide a sense of connectedness and purpose, strengthening the positive effects of the gym on well-being by assisting individuals in approaching their gym activities with a sense of mindfulness and intention and hence transform their experience into a practice that nurtures their body and soul (Roychowdhury, 2019). In addition to that, due to spiritual practices

incorporated into gym routines such as meditation, a deeper connection with oneself and a greater sense of fulfilment from physical activity can be established (Butler et al., 2019). The character strength appreciation of beauty and excellence did not significantly moderate the gym-mental well-being relationship. This reflects that while appreciation of beauty and excellence is a valuable trait, it may not directly influence the mental health benefits derived from gym involvement. Respectively, an individual with a high level of appreciation of beauty and excellence might find joy in the aesthetics of a well-designed gym or well-performed exercises, but opposing to character strengths such as spirituality, which highlights one's deeper meaning and purpose in exercising, appreciation of beauty and excellence may be more about aesthetic enjoyment rather than psychological benefits.

The findings of this study underline the importance of considering individual differences and character strengths when figuring out how physical activity may impact psychological outcomes among adults. By highlighting the role of character strengths, particularly transcendence, the study contributes to the growing body of literature in positive psychology and sports psychology. The research elucidates how transcendence and other character strengths moderate the relationship between gym participation and mental well-being. These insights offer valuable guidance for designing interventions and programs aimed at fostering overall well-being, such as encompassing mindfulness practices or reflective exercises seeking to promote spirituality among gym participants to maximise the mental health benefits of physical exercise.

### **Limitations**

The study has several limitations that should be considered when interpreting the findings. First, non-probability sampling methods, including convenience and snowball sampling, were used, which can lead to sampling bias since they do not ensure that every member of the population has an equal chance of being included in the sample (Fulop & Avvisati, 2022). As a result, the sample may not be representative of the general population, particularly due to publishing the study on SONA Systems, approaching individuals personally and hanging out papers with QR codes in the buildings of the University of Twente, it can be assumed that the sample consisted mainly of university students who go to the gym. These individuals may already possess certain traits or behaviours that could impact their mental well-being differently from the broader population. Factors like higher levels of motivation, self-discipline, or social support networks among university students could positively influence their mental health outcomes (Xiang et al., 2024). Conversely, they may also face unique stressors associated with academic demands or social pressures, which could negatively affect their



mental well-being (Slimmen et al., 2022). Hence, these differences could have influenced how individuals responded to the study measures and ultimately affected the observed relationships between gym participation and mental well-being. Therefore, the sample's lack of representativeness may have led to biased estimates and conclusions that do not accurately reflect the characteristics or behaviours of the entire population.

Secondly, since the study was cross-sectional, it captured data at a single point in time. This limitation means that whilst the associations between gym participation, character strengths, and mental well-being were confirmed, it cannot be ascertained whether changes in one variable directly cause changes in another. As Wood et al. (2011) noted, longitudinal studies are essential for understanding the dynamic nature of these relationships over time to figure out the direction of causality. This allows determining, for example, whether increased participation in the gym leads to an improvement in mental well-being, or whether people with a higher level of mental well-being tend to exercise more in the gym. Additionally, longitudinal data on consistent gym participation would assist in analysing whether there are sustainable improvements or adverse effects over time.

The final limiting factor of the study is that it did not consider whether participants went to the gym alone or in groups and which kind of activities, such as strength or cardio exercises, they performed there. A lack of consideration of these factors could have led to biased or incomplete results. As an example, individuals who go to the gym alone could have different levels of mental stress than those who exercise in groups, which could lead to different results (Yorks et al., 2017). Similarly, the various activities in the gym could have diverse effects on mental health, which could have resulted in an incorrect interpretation of the results if not adequately assessed.

### **Recommendations for Future Research**

Future studies should endeavour to use probability sampling methods to ensure that the sample is representative of the general population hence contributing to a minimisation of sampling error and providing more accurate estimates of the relationships between gym participation and mental well-being. Withal long-term studies are advised to track changes in the variables over time and to gain a more thorough understanding of the direction of these relationships. Furthermore, it is recommended to consider factors such as whether participants go to the gym alone or in groups to check for the social influence in this regard as this can for instance impact the motivation and the amount of mental health benefits. The type of activities they participate in (e.g., strength training, and endurance exercise) should be also examined since they can provide various psychological advantages (Zatsiorsky et al., 2020). Researchers

may acquire a deeper knowledge of how various gym environments and activities impact mental well-being by taking into consideration these aspects. It would also be interesting to include people who do not exercise in the questionnaire to have a comparison group and to identify the effects of sport even more precisely. Finally, qualitative research methods such as focus groups and interviews could have the potential to gain deeper, more extensive insights into people's experiences with mental health and gym participation. This method could assist in capturing the subtleties of individual experiences and the subjective dimensions of well-being that are sometimes overlooked in quantitative studies.

### **Implications**

As of current knowledge, this was the first study that examined the moderating effect of transcendence on the connection between exercising at the gym and mental health. The given results add further insights to previously established studies on sport and mental health by demonstrating that the benefits of physical activity might vary depending on the kind of activity and individual differences. Nonetheless, the identification of the character strengths of humour and spirituality as significant moderators between gym participation and mental well-being contributes to the growing body of literature on positive psychology by illustrating how individual characteristics can determine the effect of physical activity on psychological well-being. The finding that gratitude and hope negatively influence the relationship between gym-goers and mental well-being challenges existing research that generally views these strengths as beneficial (Shoshani & Slone, 2013; Weber et al., 2013). This supports the notion that the role of character strengths in influencing psychological outcomes may be more context-dependent than hitherto assumed.

### **Conclusion**

The present study investigated the relationship between gym attendance, character strengths and mental well-being among adults. It found a non-significant, weak negative correlation between gym activity and mental health, indicative of a more complex relationship. Transcendence was identified to positively impact mental well-being and reinforced the positive effects of gym attendance. The findings can be applied to develop mental health intervention programmes that incorporate physical activity and character strengths. Health facilities such as gyms or rehabilitation centres can modify their training schedules to include both social and individual training. Furthermore, the results offer significant direction for psychologists and therapists in creating customised strategies to enhance psychological health.

Given the emerging importance of mental health in society nowadays, it is critical that future research and interventions take these findings into account. This could aid in the

development of tailored programmes that not only promote physical fitness but also mental well-being, thus meeting the current needs of an increasing prevalence of mental health problems.

### Reference List

- Antunes, R., Frontini, R., Amaro, N., Salvador, R., Matos, R., Morouço, P., & Rebelo-Gonçalves, R. (2020). Exploring lifestyle habits, physical activity, anxiety and basic psychological needs in a sample of Portuguese adults during COVID-19. *International journal of environmental research and public health*, 17(12), 4360. <https://doi.org/10.3390/ijerph17124360>
- Arnett, J. J., Žukauskienė, R., & Sugimura, K. (2014). The new life stage of emerging adulthood at ages 18–29 years: implications for mental health. *The Lancet Psychiatry*, 1(7), 569-576. [https://doi.org/10.1016/s2215-0366\(14\)00080-7](https://doi.org/10.1016/s2215-0366(14)00080-7)
- Arsović, N., Đurović, R., & Rakočević, R. (2020). Influence of physical and sports activity on mental health. *Facta Universitatis, Series: Physical Education and Sport*, 559-568.
- Azañedo, C. M., Artola, T., Sastre, S., & Alvarado, J. M. (2021). Character Strengths Predict Subjective Well-Being, Psychological Well-Being, and Psychopathological Symptoms, Over and Above Functional Social Support. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.661278>
- Belcher, B. R., Zink, J., Azad, A., Campbell, C. E., Chakravarti, S. P., & Herting, M. M. (2021). The roles of physical activity, exercise, and fitness in promoting resilience during adolescence: effects on mental well-being and brain development. *Biological psychiatry: Cognitive neuroscience and neuroimaging*, 6(2), 225-237. <https://doi.org/10.1016/j.bpsc.2020.08.005>
- Bethelmy, L. C., & Corraliza, J. A. (2019). Transcendence and Sublime Experience in Nature: Awe and Inspiring Energy. *Frontiers in Psychology*, 10. <https://doi.org/10.3389/fpsyg.2019.00509>
- Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., ... Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, 54(24), 1451-1462. <https://doi.org/10.1136/bjsports-2020-102955>
- Butler, L. D., Mercer, K. A., McClain-Meeder, K., Horne, D. M., & Dudley, M. (2019). Six domains of self-care: Attending to the whole person. *Journal of Human Behavior in the Social Environment*, 29(1), 107-124.
- Carr, A., Cullen, K., Keeney, C., Canning, C., Mooney, O., Chinseallaigh, E., & O'Dowd, A. (2021). Effectiveness of positive psychology interventions: a systematic review and

- meta-analysis. *The Journal of Positive Psychology*, 16(6), 749-769. <https://doi-org.ezproxy2.utwente.nl/10.1080/17439760.2020.1818807>
- Chekroud, S. R., Gueorguieva, R., Zheutlin, A. B., Paulus, M., Krumholz, H. M., Krystal, J. H., & Chekroud, A. M. (2018). Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: a cross-sectional study. *The lancet psychiatry*, 5(9), 739-746. [https://doi.org/10.1016/S2215-0366\(18\)30227-X](https://doi.org/10.1016/S2215-0366(18)30227-X)
- Crawford, S. A., & Caltabiano, N. J. (2011). Promoting emotional well-being through the use of humour. *The Journal of Positive Psychology*, 6(3), 237-252. <https://doi.org/10.1080/17439760.2011.577087>
- Crocker, B. (2019). *A qualitative exploration of collegiate student-athletes constructions of health, fitness, and body image*. McGill University (Canada).
- Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian psychology/Psychologie canadienne*, 49(1), 14. <https://doi/10.1037/0708-5591.49.1.14>
- Drozd, F., Mork, L., Nielsen, B., Raeder, S., & Bjørkli, C. A. (2014). Better Days—A randomized controlled trial of an internet-based positive psychology intervention. *The Journal of Positive Psychology*, 9(5), 377-388. <https://doi.org/10.1080/17439760.2014.910822>
- Duan, W., Ho, S. M. Y., Tang, X., Li, T., & Zhang, Y. (2013). Character Strength-Based Intervention to Promote Satisfaction with Life in the Chinese University Context. *Journal of Happiness Studies*, 15(6), 1347-1361. <https://doi.org/10.1007/s10902-013-9479-y>
- Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A systematic review of the psychological and social benefits of participation in sport for children and adolescents: informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity*, 10(1), 98. <https://doi.org/10.1186/1479-5868-10-98>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149-1160. <https://doi.org/10.3758/brm.41.4.1149>
- Fritz, H. L., Russek, L. N., & Dillon, M. M. (2017). Humor use moderates the relation of stressful life events with psychological distress. *Personality and social psychology bulletin*, 43(6), 845-859. <https://doi.org/10.1177/0146167217699583>

- Fulop, G., & Avvisati, F. (2022). The analytical value of non-probability samples in the context of TALIS: A review of current practices in the use of non-probability samples in comparative, cross-national research. <https://doi.org/10.1787/19939019>
- Gabana, N. T. (2019). Gratitude in sport: Positive psychology for athletes and implications for mental health, well-being, and performance. *Theoretical approaches to multi-cultural positive psychological interventions*, 345-370. [https://doi.org/10.1007/978-3-030-20583-6\\_15](https://doi.org/10.1007/978-3-030-20583-6_15)
- Gillham, J., Adams-Deutsch, Z., Werner, J., Reivich, K., Coulter-Heindl, V., Linkins, M., Winder, B., Peterson, C., Park, N., Abenavoli, R., Contero, A., & Seligman, M. E. (2011). Character strengths predict subjective well-being during adolescence. *The Journal of Positive Psychology*, 6(1), 31-44. <https://doi.org/10.1080/17439760.2010.536773>
- Guo, K., Wang, Z., Zhang, L., & Li, C. (2023). Self-Transcendence Values Influence Meaningful Sports Consumption Behavior: The Chain Mediator of Team Identification and Eudaimonic Motivation. *Sustainability*, 15(14), 10938. <https://doi.org/10.3390/su151410938>
- Harada, K., Masumoto, K., & Kondo, N. (2019). Exercising Alone or Exercising With Others and Mental Health Among Middle-Aged and Older Adults: Longitudinal Analysis of Cross-Lagged and Simultaneous Effects. *Journal of Physical Activity and Health*, 16(7), 556-564. <https://doi.org/10.1123/jpah.2018-0366>
- Lamers, S. M. A., Bolier, L., Westerhof, G. J., Smit, F., & Bohlmeijer, E. T. (2012). The impact of emotional well-being on long-term recovery and survival in physical illness: A meta-analysis. *Journal of Behavioral Medicine*, 35(5), 538–547. <https://doi.org.ezproxy2.utwente.nl/https://doi.org/10.1007/s10865-011-9379-8>
- Lamers, S. M., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. (2010). Evaluating the psychometric properties of the mental health Continuum-Short Form (MHC-SF). *Journal of Clinical Psychology*, 67(1), 99-110. <https://doi.org/10.1002/jclp.20741>
- Lichtenstein, M. B., Griffiths, M. D., Hemmingsen, S. D., & Støving, R. K. (2018). Exercise addiction in adolescents and emerging adults – Validation of a youth version of the Exercise Addiction Inventory. *Journal of Behavioral Addictions*, 7(1), 117-125. <https://doi.org/10.1556/2006.7.2018.01>

- Littman-Ovadia, H., Dubreuil, P., Meyers, M. C., & Freidlin, P. (2021). Editorial: VIA Character Strengths: Theory, Research and Practice. *Frontiers in Psychology, 12*.  
<https://doi.org/10.3389/fpsyg.2021.653941>
- Lomas, T., & Ivtzan, I. (2015). Second Wave Positive Psychology: Exploring the Positive–Negative Dialectics of Wellbeing. *Journal of Happiness Studies, 17*(4), 1753-1768.  
<https://doi.org/10.1007/s10902-015-9668-y>
- Lomas, T., & VanderWeele, T. J. (2023). The complex creation of happiness: Multidimensional conditionality in the drivers of happy people and societies. *The Journal of Positive Psychology, 18*(1), 15-33.  
<https://doi.org/10.1080/17439760.2021.1991453>
- Martín-Rodríguez, A., Gostian-Ropotin, L. A., Beltrán-Velasco, A. I., Belando-Pedreño, N., Simón, J. A., López-Mora, C., ... & Clemente-Suárez, V. J. (2024). Sporting Mind: The Interplay of Physical Activity and Psychological Health. *Sports, 12*(1), 37.  
<https://doi.org/10.3390/sports12010037>
- McGrath, J. J., Al-Hamzawi, A., Alonso, J., Altwaijri, Y., Andrade, L. H., Bromet, E. J., ... & Zaslavsky, A. M. (2023). Age of onset and cumulative risk of mental disorders: a cross-national analysis of population surveys from 29 countries. *The Lancet Psychiatry, 10*(9), 668-681. [https://doi.org/10.1016/S2215-0366\(23\)00193-1](https://doi.org/10.1016/S2215-0366(23)00193-1)
- McGrath, R. E. (2019). The VIA Assessment Suite for Adults: Development and initial evaluation, revised edition. *Cincinnati, OH: VIA Institute on Character*.
- Mikkelsen, K., Stojanovska, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas, 106*, 48-56.  
<https://doi.org/10.1016/j.maturitas.2017.09.003>
- Niemiec, R. M. (2023). Mental health and character strengths: the dual role of boosting well-being and reducing suffering. *Mental Health and Social Inclusion*.  
<https://doi.org/10.1108/MHSI-01-2023-0012>
- Pahlavani, H. A. (2023). Possible role of exercise therapy on depression: Effector neurotransmitters as key players. *Behavioural Brain Research, 114791*.  
<https://doi.org/10.1016/j.bbr.2023.114791>
- Park, N., Peterson, C., & Seligman, M. E. P. (2004). Strengths of Character and Well-Being. *Journal of Social and Clinical Psychology, 23*(5), 603-619.  
<https://doi.org/10.1521/jscp.23.5.603.50748>
- Peterson, C. (2006). *A primer in positive psychology*. Oxford university press.

- Peterson, C., & Seligman, M. E. (2004). *Character strengths and virtues: A handbook and classification* (Vol. 1). Oxford University Press.
- Proyer, R. T., Gander, F., Wellenzohn, S., & Ruch, W. (2013). What good are character strengths beyond subjective well-being? The contribution of the good character on self-reported health-oriented behavior, physical fitness, and the subjective health status. *The Journal of Positive Psychology*, 8(3), 222-232.  
<https://doi.org/10.1080/17439760.2013.777767>
- Ray, D., Lunz, A., Amiah, A. & Olaoye, G. (2024). The Concept of Transcendence in Spiritual Nursing Care Theory.
- Reardon, C. L., & Hitchcock, M. (2024). Mental health in individual versus team sports. *International Review of Psychiatry*, 1-12.  
<https://doi.org/10.1080/09540261.2024.2349079>
- Roesch, S. C., Duangado, K. M., Vaughn, A. A., Aldridge, A. A., & Villodas, F. (2010). Dispositional hope and the propensity to cope: A daily diary assessment of minority adolescents. *Cultural Diversity and Ethnic Minority Psychology*, 16(2), 191-198.  
<https://doi.org/10.1037/a0016114>
- Roychowdhury, D. (2019). Spiritual Well-Being in Sport and Exercise Psychology. *SAGE Open*, 9(1), 215824401983746. <https://doi.org/10.1177/2158244019837460>
- Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, 55(1), 5-14. <https://doi.org/10.1037/0003-066x.55.1.5>
- Shimai, S., & Urata, Y. (2023). Development and validation of the Character Strengths Test 24 (CST24): a brief measure of 24 character strengths. *BMC Psychology*, 11(1).  
<https://doi.org/10.1186/s40359-023-01280-6>
- Shoshani, A., & Slone, M. (2013). Middle school transition from the strengths perspective: Young adolescents' character strengths, subjective well-being, and school adjustment. *Journal of happiness studies*, 14, 1163-1181.  
<https://doi.org/10.1007/s10902-012-9374-y>
- Slimmen, S., Timmermans, O., Mikolajczak-Degrauwe, K., & Oenema, A. (2022). How stress-related factors affect mental wellbeing of university students A cross-sectional study to explore the associations between stressors, perceived stress, and mental wellbeing. *PLOS ONE*, 17(11), e0275925.  
<https://doi.org/10.1371/journal.pone.0275925>



- Stuntz, C. P. (2017). Linking positive psychology and the transtheoretical model: How character strengths and processes of change relate to each other and to exercise. *Journal of Positive Psychology and Wellbeing*, 1(2), 85-108.
- Tachon, G., Shankland, R., Marteau-Chasserieau, F., Morgan, B., Leys, C., & Kotsou, I. (2021). Gratitude Moderates the Relation between Daily Hassles and Satisfaction with Life in University Students. *International Journal of Environmental Research and Public Health*, 18(24), 13005. <https://doi.org/10.3390/ijerph182413005>
- Teh, R., & Krishnan-Vasanthi, R. (2022). The effects of individual vs. team sports on perceived stress, sports anxiety and sports motivation among competitive youth athletes. *Journal of Sport & Health Research*, 14(3).  
<https://doi.org/10.58727/jshr.96641>
- Trott, M., Jackson, S. E., Firth, J., Jacob, L., Grabovac, I., Mistry, A., Stubbs, B., & Smith, L. (2020). A comparative meta-analysis of the prevalence of exercise addiction in adults with and without indicated eating disorders. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 26(1), 37-46. <https://doi.org/10.1007/s40519-019-00842-1>
- Varma, P., Junge, M., Meaklim, H., & Jackson, M. L. (2021). Younger people are more vulnerable to stress, anxiety and depression during COVID-19 pandemic: A global cross-sectional survey. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 109, 110236. <https://doi.org/10.1016/j.pnpbp.2020.110236>
- Vella, S. A., Aidman, E., Teychenne, M., Smith, J. J., Swann, C., Rosenbaum, S., White, R. L., & Lubans, D. R. (2023). Optimising the effects of physical activity on mental health and wellbeing: A joint consensus statement from Sports Medicine Australia and the Australian Psychological Society. *Journal of Science and Medicine in Sport*, 26(2), 132-139. <https://doi.org/10.1016/j.jsams.2023.01.001>
- Wagner, L., & Ruch, W. (2023). Displaying character strengths in behavior is related to well-being and achievement at school: Evidence from between-and within-person analyses. *The Journal of Positive Psychology*, 18(3), 460-480.  
<https://doi.org/10.1080/17439760.2022.2109196>
- Waters, L., Algoe, S. B., Dutton, J., Emmons, R., Fredrickson, B. L., Heaphy, E., ... & Steger, M. (2022). Positive psychology in a pandemic: Buffering, bolstering, and building mental health. *The Journal of Positive Psychology*, 17(3), 303-323.  
<https://doi.org/10.1080/17439760.2021.1871945>

- Weber, M., Ruch, W., Littman-Ovadia, H., Lavy, S., & Gai, O. (2013). Relationships among higher-order strengths factors, subjective well-being, and general self-efficacy—The case of Israeli adolescents. *Personality and Individual Differences*, 55(3), 322-327. <https://doi.org/10.1016/j.paid.2013.03.006>
- Whitley, M. A., Collison-Randall, H., Wright, P. M., Darnell, S. C., Schlenker, N., Knee, E., ... & Richards, J. (2022). Moving beyond disciplinary silos: The potential for transdisciplinary research in Sport for Development. *Journal of sport for development*.
- Wood, A. M., & Joseph, S. (2010). The absence of positive psychological (eudemonic) well-being as a risk factor for depression: A ten year cohort study. *Journal of Affective Disorders*, 122(3), 213–217. <https://doi-org.ezproxy2.utwente.nl/https://doi.org/10.1016/j.jad.2009.06.032>
- Wood, A. M., Linley, P. A., Maltby, J., Kashdan, T. B., & Hurling, R. (2011). Using personal and psychological strengths leads to increases in well-being over time: A longitudinal study and the development of the strengths use questionnaire. *Personality and Individual Differences*, 50(1), 15-19. <https://doi.org/10.1016/j.paid.2010.08.004>
- World Health Organization. (2004). *Promoting mental health: Concepts, emerging evidence, practice: Summary report*. World Health Organization.
- World Health Organization. (2022). *World mental health report: transforming mental health for all*.
- Xiang, Y., Shuai, C., Zhang, Y., & Li, Y. (2024). The mental health of college students and the level of academic achievement: knowledge about psychological well-being, self-control, and college learning. *Československá psychologie*, 68(1), 80-95. <https://doi.org/10.51561/cpsych.68.1.80>
- Xing, R. (2023). Understanding the role of humour in the relationship between emotional intelligence and psychological well-being among university students: A mixed methods study. <https://doi.org/10.5525/gla.thesis.83870>
- Yorks, D. M., Frothingham, C. A., & Schuenke, M. D. (2017). Effects of group fitness classes on stress and quality of life of medical students. *Journal of Osteopathic Medicine*, 117(11), e17-e25. <https://doi.org/10.7556/jaoa.2017.140>
- Zatsiorsky, V. M., Kraemer, W. J., & Fry, A. C. (2020). *Science and practice of strength training*. Human Kinetics.

**Artificial Intelligence Statement**

During the preparation of this work, the author used Grammarly.com for spell-checking reasons, DeepL.com for translating words and sentences from German to English and ChatGPT.com for the Data Analysis part to aid in generating R Studio Codes and finding a solution for errors displayed in R Studio. After using these tools/services, the author reviewed and edited the content as needed and takes full responsibility for the content of the work.

## Appendix A

### The Qualtrics Questionnaire

▼ Informed Consent

Introduction ...

Investigating the Moderating Role of Character Strengths on the Relationship Between Sports and Mental Well-Being

Dear participant,

In this study, we are interested in how character strengths affect the relationship between sports participation and several aspects of mental health by analysing the level of sports participation, the possession of specific character strengths, and various aspects of mental well-being. All personal data will be removed and anonymised so that nothing can be traced back to you. With each answer you help us to obtain the most accurate information which helps us to make precise conclusions from the data. Filling in this questionnaire will take about 10-15 minutes.

Researchers  
 Contact details:  
 Tobias Book (t.book@student.utwente.nl)  
 Dana Demuth (d.demuth@student.utwente.nl)  
 Lynn Niederwemmer (l.niederwemmer@student.utwente.nl)  
 Jule Wagner (j.a.wagner@student.utwente.nl)

Supervisors:  
 Nienke Peeters (n.j.peeters@utwente.nl)  
 Lean Kramer (l.l.kramer@utwente.nl)

If you have questions about your rights as a research participant or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by [ethicscommittee-hss@utwente.nl](mailto:ethicscommittee-hss@utwente.nl)

----- Page Break -----

Q22

Before the start of the survey, please fill in the following informed consent.

IC\_1 \*

▼ Skip to

End of Survey if No Is Selected

I have read and understood the study information.

Yes

No

IC\_2 \*

▼ Skip to

End of Survey if No Is Selected

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

Yes

No

IC\_3 ★

▼ Skip to  
End of Survey if No Is Selected

I understand that taking part in the survey involves a survey questionnaire.

Yes  
 No

IC\_4 ★

▼ Skip to  
End of Survey if No Is Selected

I understand that information I provide will be used for research.

Yes  
 No

IC\_5 ★

▼ Skip to  
End of Survey if No Is Selected

I understand that all personal information that will be collected about me that could identify me, will not be shared beyond the study team.

Yes  
 No

IC\_6 ★

▼ Skip to  
End of Survey if No Is Selected

I give permission for the survey data that I provide to be archived anonymously in OneDrive.

Yes  
 No

Add Block

Demographics

Q23

Now, please answer these questions about your demographics:

age ★

How old are you (in years)?

gender \*

What gender do you identify with?

Female

Male

Other

nationality \*

What is your nationality?

German

Dutch

Other, namely:

[Import from library](#) [+ Add new question](#)

Add Block

▼ Sport Participation

Q24

Next, you will be asked a few questions about your sport:

sport\_type \*

▼ Skip to

End of Survey if Other, namely: Is Selected

What is your specific type of sport?

Please be aware that this study focuses only on people who play soccer or go to the gym.

Soccer

Gym

Other, namely:

sport\_start \*

How long have you been practising your sport (Gym or Soccer)?

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

Please indicate in years:

sport\_week\_gym ★

Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Gym Is Selected

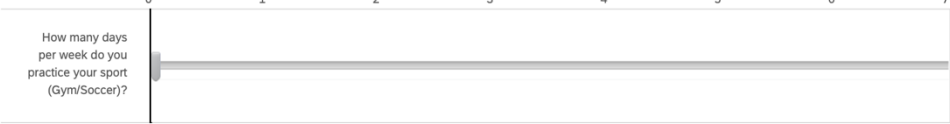
Skip to

End of Survey if How many days per week do y... Is Less Than 1

Please indicate ...

0 1 2 3 4 5 6 7

How many days per week do you practice your sport (Gym/Soccer)?



sport\_week\_soccer ★

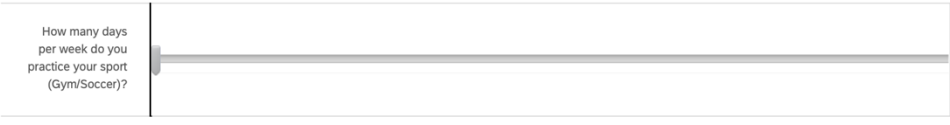
Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Soccer Is Selected

Please indicate ...

0 1 2 3 4 5 6 7

How many days per week do you practice your sport (Gym/Soccer)?



sport\_hours\_soccer ★

Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Soccer Is Selected


Skip to

End of Survey if How many hours per week do ... Is Less Than 1

Please indicate...

0 4 8 12 16 20 24 28 32 36 40

How many hours per week do you practice your sport (Gym/Soccer)?



sport\_hours\_gym ★


Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Gym Is Selected

Please indicate...

0 4 8 12 16 20 24 28 32 36 40

How many hours per week do you practice your sport (Gym/Soccer)?



Add Block

Global Assessment of Character Strengths

Courage



Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Gym Is Selected

This questionnaire asks you to describe aspects of your personality. Please read through the definitions and indicate the extent to which you agree. Be as honest as you can.

	Very Strongly Disagree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Very Strongly Agree
You face your fears and overcome challenges and adversity; you stand up for what is right; you do not shrink in the face of pain or inner tension or turmoil.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You keep going and going when you have a goal in mind; you attempt to overcome all obstacles; you finish what you start.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You are a person of high integrity and authenticity; you tell the truth, even when it hurts; you present yourself to others in a sincere way; you take responsibility for your actions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You are enthusiastic toward life; you are highly energetic and activated; you use your energy to the fullest degree.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Transcendence



Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Gym Is Selected

This questionnaire asks you to describe aspects of your personality. Please read through the definitions and indicate the extent to which you agree. Be as honest as you can.

	Very Strongly Disagree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Very Strongly Agree
You notice the beauty and excellence around you; you are often awe-struck by beauty, greatness, and/or the moral goodness you witness; you are often filled with wonder.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You regularly experience and express thankfulness; you don't take the good things that happen in your life for granted; you tend to feel blessed in many circumstances.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You are optimistic, expecting the best to happen; you believe in and work toward a positive future; you can think of many pathways to reach your goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You are playful; you love to make people smile and laugh; your sense of humor helps you connect closely to others; you brighten gloomy situations with fun and/or jokes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Justice



Display this question

If What is your specific type of sport? Please be aware that this study focuses only on people who... Soccer Is Selected

This questionnaire asks you to describe aspects of your personality. Please read through the definitions and indicate the extent to which you agree. Be as honest as you can.

	Very Strongly Disagree	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Very Strongly Agree
You are a collaborative and participative member on groups and teams; you are loyal to your group; you feel a strong sense of duty to your group; you always do your share.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You believe strongly in an equal and just opportunity for all; you don't let personal feelings bias your decisions about others; you treat people the way you want to be treated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You positively influence those you lead; you prefer to lead than to follow; you are very good at organizing and taking charge for the collective benefit of the group.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break





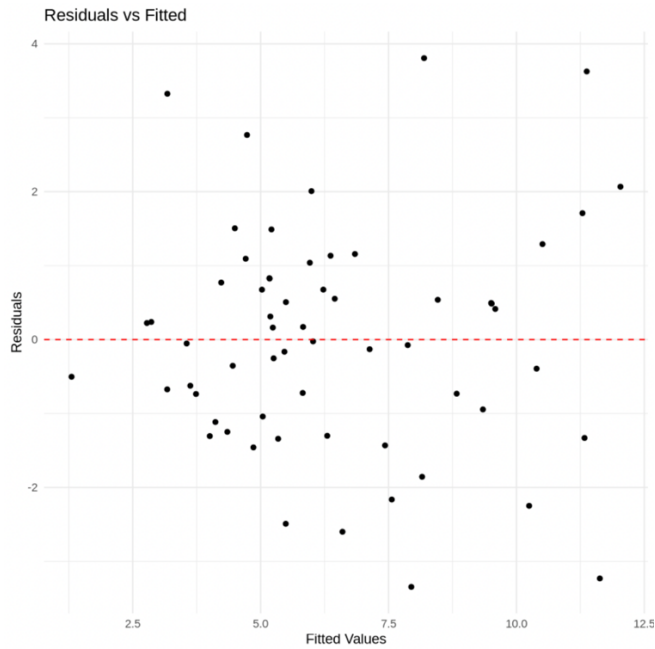
<p>During the past month, how often did you feel that you had experiences that challenged you to grow and become a better person?</p> <p>During the past month, how often did you feel confident to think or express your own ideas and opinions?</p> <p>During the past month, how often did you feel that your life has a sense of direction or meaning to it?</p>	<table border="0"><tr><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr><tr><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr><tr><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td><td><input type="radio"/></td></tr></table>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>														
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>														
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>														
<p>▲ <span style="float: right;"><a href="#">Import from library</a> <a href="#">+ Add new question</a></span></p>																			
<p style="text-align: center;"><a href="#">Add Block</a></p>																			
<p>End of Survey</p> <p style="text-align: center;">We thank you for your time spent taking this survey. Your response has been recorded.</p>																			

## Appendix B

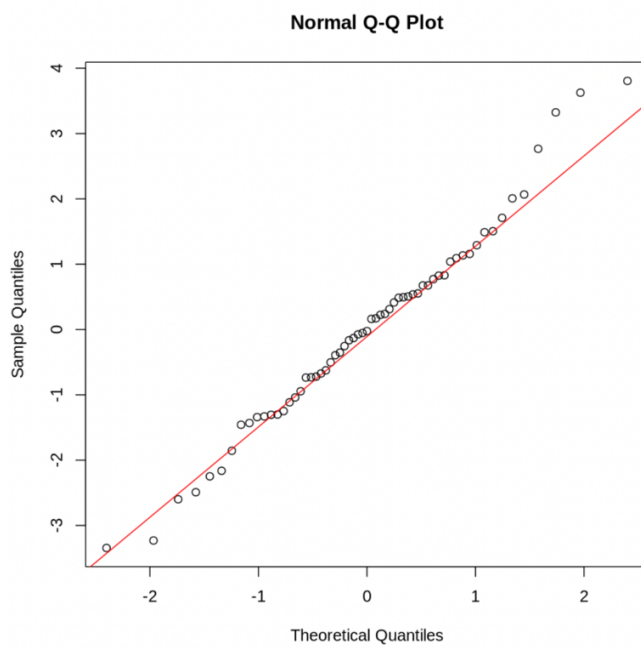
### Assumptions

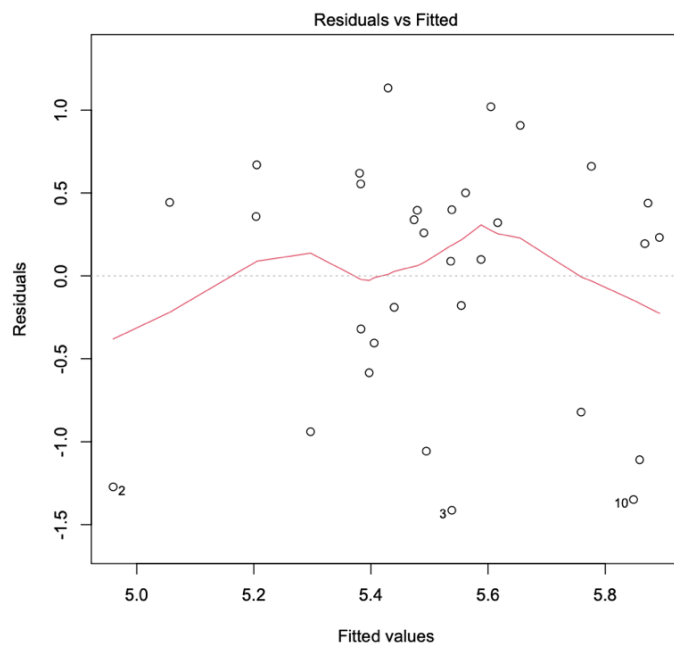
**Figure C1**

*Homoscedasticity Assumption*

**Figure C2**

*Normality of Residuals Assumption*



**Figure C3***Linearity Assumption***Figure C4***Multicollinearity Assumption*