Positive Health in Students: Are Character Strengths Related to an Active Lifestyle?

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Abstract

Background: Recent findings in positive psychology underline the value of character strengths for human flourishing by fostering experiences of positive emotions, life satisfaction, personal and professional achievements, and more. The proposal for the concept of positive health shifts the research among strengths into the field of physical activity. It is already known that physical activity has beneficial outcomes for psychological- and physical well-being, yet, its association with character strengths shows a deficiency in scientific validation. Therefore, this research aims to explore the relationship between the embodiment of character strengths, and virtues in students, and their respective levels of day-to-day physical activity.

Methods: 139 university students with mainly German origin participated in this study. Two questionnaires were administered in a cross-sectional survey design to measure the character strengths (VIA-72) and physical activity levels (IPAQ). Correlation analyses in SPSS were applied accordingly. Lastly, PROCESS macro was used to assess the moderation effect of gender on the relationship between character strengths and physical activity.

Results: Students with a stronger embodiment of character strengths showed slightly more physical activity [$r(139)=.15$, $p=.04$]. In particular, the strengths leadership, self-regulation, and zest were associated with high levels of physical activity, and the physical activity sub-categories domestic- and garden and leisure-time physical activity were related to character strengths. There was no effect of gender on the proposed relationship [$b= -6980.69$, 95% C.I. (-16922.34, 2960.97), $p<.1$]. Overall, no negative relationship was found.

Conclusion: The present study gives evidence for a positive relationship between character strengths and physical activity. The results further contribute to a new approach in studying character strengths and physical activity, by taking day-to-day physical activites into account. Future research may wish to investigate the causality for the proposed association to support the use of character strengths in enhancing physical activity, and thus well-being.

Keywords: positive psychology; character strengths; physical activity; positive health.

Introduction

With the growing popularity of positive psychology during the 21st century, a new approach to psychological practice became more firmly established (Park, Peterson, Seligman, & Steen, 2005). Positive psychology is the scientific study that focuses on the positive aspects of human experiences. According to Seligman and Csikszentmihalyi (2000), the concept emphasizes the "positive human functioning and flourishing on multiple levels that include the biological, personal, relational, institutional, cultural and global dimensions of life". The definition implies that positive psychology portrays a counterpart to other leading domains of psychology, like psychoanalysis or behaviorism, that chiefly accentuate mental illness, maladaptive behavior, and negative thinking. One integral part of positive psychology is the use of signature strengths to maintain a well-lived and fulfilling life (Seligman, 2002b).

Focusing on character strengths, rather than on the weaknesses, is receiving more and more appreciation in today's psychology. Character strengths are said to be a set of internal, positive traits, which are observable in one's thoughts, feelings, and behaviors and ultimately define broader virtues in a person (Park et al., 2004). Concrete examples of character strengths are creativity, fairness, or love of learning (Peterson & Seligman, 2004). Virtues are defined as "any psychological process that enables a person to think and act to benefit him- or herself and society" (McCullough & Snyder, 2000, p. 1). Wisdom, courage, or humanity, for example, are considered as virtues (Peterson & Seligman, 2004). According to Park & Peterson (2009), all individuals have character strengths to a certain degree and whereas they are not permanently displayed, people can reflect on their character strengths and talk about them with others. To illustrate these positive traits, a classification system of character strengths and virtues was developed, namely the Values In Action Inventory (VIA). The VIA lists a total of 24 character strengths, which are organized into six broader categories of virtues. The VIA is used in research settings as a self-report measure to assess specific character strengths as well as the extent to which an individual embodies these characteristics (Peterson & Seligman, 2004).

The value of character strengths for positive psychology derives from the insight that strength-congruent behavior contributes positively to human flourishing due to the experience of positive emotions, personal as well as professional achievements, constructive relationships, meaning in life and engagement (Gander, Proyer, Ruch, & Wyss, 2013; Ghielen, van Woerkom, Meyers, 2017; Peterson & Seligman, 2004; Seligman, 2011;). In the terminology of Seligman (2002a, p. 161) this state of flourishing is called the psychological "good life". Literature provides further evidence for a positive relationship between character strengths and well-being, meaning that the stronger a character strength is expressed, the more life

satisfaction is reported by an individual (Peterson & Seligman, 2004). More precisely, Peterson and Seligman (2004) show that levels of zest were most strongly associated with life satisfaction, followed by the strengths of love, gratitude, and hope. Aside from this, promising results have been found for the applicability of character strengths in other areas of life. Recent findings in positive psychology testify that character strengths also positively affect academic success as well as students' well-being at school. In distinct student samples, it was possible to account for the meaningfulness of character strengths as a resource for well-being. Again, the relationship was most strongly reinforced by the manifestation of zest and hope in an individual (Lounsbury, Fisher, Levy, & Welsh, 2009; Weber, Wagner & Ruch, 2016).

Nowadays, first indications for the effectiveness of signature strengths use as a tool in creating a "good life" (Proyer, Ruch and Buschor, 2013) stimulated the development of a new approach in positive psychology: strengths-based interventions. They are defined as "treatment methods or intentional activities aimed to cultivate positive feelings, positive behaviors, or positive cognitions" to enhance the subjective well-being of individuals (Sin & Lyubomirsky, 2009, p. 468). Literature gave evidence that life satisfaction increased in experimental groups after training character strengths that are most strongly correlated with life satisfaction (e.g. zest, hope, gratitude, curiosity, and humor) (Proyer et al., 2013). Studies, that focused on character strengths and well-being in student populations, agreed on this positive association (Duan, Ho, Tang, Li, & Zhang, 2014; Koydemir, & Sun-Selışık, 2016; Proctor et al., 2011). Further, the results showed universality across context: strengths-based interventions appear to enhance well-being in individuals from a different cultural and socio-economical background (Duan, Ho, Tang, Li, & Zhang, 2014; Proctor et al., 2011). The result was also independent of the duration of the implementation (Duan, Ho, Tang, Li, & Zhang, 2014; Koydemir, & Sun-Selışık, 2016; Proctor et al., 2011) and the form of administration used, e.g. physical classes, including the use of booklets, tutors, teaching and practicing sessions (Duan, Ho, Tang, Li, & Zhang, 2014; Proctor et al., 2011) or electronic devices (Koydemir & Sun-Selışık, 2016).

As demonstrated, the majority of the current studies in the field of positive psychology explore character strengths concerning mental health or psychological well-being. While there are indications that character strengths knowledge and use may affect individuals positively in several life situations, not a great amount of research has been done in different areas. Some related examples of positive outcomes are accepting oneself, competence, efficacy, healthy communities, and families as well as mental and physical health (Park, 2004; Peterson & Seligman, 2004). The latter has formed part in a proposal by Seligman (2008), where he addressed the gap among current research on character strengths in relation to physical well-

being, concluding with the demand for more in-depth investigations in this field. Seligman (2008) introduced his concept of positive health as a new field related to positive psychology, however with greater emphasis on the physical rationals of well-being, targeting cardiovascular systems, fitness and energy levels, and thus, physical activity.

The relevance of physical activity in the field of positive psychology is derived from its association with several positive psychological health outcomes (Edwards, Ngcobo, Edwards, & Palavar, 2005; Roychowdhury, 2020). For research purposes, physical activity is defined as "any bodily movement produced by skeletal muscles that require energy expenditure – including activities undertaken while working, playing, carrying out household chores, traveling, and engaging in recreational pursuits" (WHO, 2018, para.1). Essentially, vigorous physical activity triggers neurophysiological processes, e.g. the production of endorphins which eventually leads to enhanced states of well-being (Morgan, 1985). Further beneficial outcomes of physical activity reflect central elements of the "good life", namely perceived self-esteem, positive experiences of life, health behaviors, and overall well-being, but also self-acceptance, increased experiences of autonomy, personal growth, and purpose in life (Edwards et al., 2005). The value of physical activity for positive mental health outcomes supports the implementation of interventions based on promoting an active lifestyle (Edwards et al., 2005).

Another relevant finding that underlines the importance of physical activity for positive psychological outcomes, is the connection between frequent exercise and stress management. Especially the nature of our fast-moving society and its related demands, make psychological distress a common consequence, in particular for young adults (Saheera & Manikandan, 2015). However, under the premise that an individual engages in regular physical activity, it shows to positively affect the moderation of stress, anxiety, and depression (Roychowdhury, 2020). One example is the academic context in which physical activity and proactive stress coping were linked. Students that exercise frequently, meaning at "60-70% of maximal heart rate, for 30-40 minutes, twice to five times a week" (Scully, Kremer, Meade, Graham & Dudgeon, 1998, p.113), strengthen their mental health, enhance their mood and cope more effectively with the requirements of their institution (Welford & O'Brien, 2019). Equal results were obtained in the working context, in which physical activity not only improved work performance but also work quantity and quality (Marques, Balle & Curado, 2018; Pronk et al., 2004). In conclusion, the reviewed literature offers support for the causation between engaging in an active lifestyle and positive mental health outcomes in individuals.

On the contrary, recent statistics for physical activity levels affirm a serious deficiency on a global scale. In 2016, a quarter of all adults worldwide showed insufficient levels of

physical activity and thus, do not only put themselves at risk to evolve physical illnesses but also to threaten their psychological health (Stevens, Riley, & Bull, 2018). Considering this issue, Seligman's proposal (2008) for studying positive health, with an emphasis on physical well-being, may gain significance. Looking at the recent development in the field, it can be assumed that Seligman's paper (2008) holds a stake in first examinations of character strengths and physical activity. One of these pioneer studies focused on the association between health-oriented behaviors, physical fitness, and subjective health (Proyer, Gander, Wellenzohn, & Ruch, 2013). High levels of character strengths were generally found to be associated with frequent engagement in health-oriented behaviors, and more specifically, the strengths curiosity, zest, leadership, and hope indicated significant correlations with self-assessed physical fitness (Proyer et al., 2013). Stuntz (2018) refers to these results by pointing out that high scores across the full range of character strengths generally encourage increased exercise behavior. In particular, the strengths cluster of wisdom, especially perspective, are supposed to predict increased physical activity in individuals as well as feelings of competence during exercising (Stuntz, 2018). Similar results were measured in the workplace context among a set of call center agents, where regular physical activity was correlated with the virtues wisdom and temperance (Moradi, Nima, Ricciardi, Archer, & Garcia, 2014). Workers who showed greater performance in their workplace were more likely to innate combinations of related character strengths, as well as that they, engaged in frequent physical activity. Contrary to this view, Proyer et al. (2013) and Stuntz (2018) reach agreement on the result that the character strengths religiousness and modesty are not correlated with physical activity.

While the few pioneer studies assessed the relationship between character strengths and physical activity in different settings, none of them yet controlled for gender differences. Prior research in the field of positive psychology highlights that men and women vary in their expression of specific character strengths. Studies agree on the finding that women generally obtain higher total scores, as well as they, score higher on character strengths like love, kindness, appreciation of excellence and beauty, and gratitude (Ferragut, Blanca, & Ortiz-Tallo, 2014; Heintz, Kramm & Ruch, 2019; Karris & Craighead, 2012). On the other hand, men were found to report more were found to embody more bravery, creativity, and humor (Avia, & Sánchez-Bernardos, 2015; Shimai, Otake, Park, Peterson, & Seligman, 2006). Overall, the present findings on character strengths in the field of physical health offer a first promising base to further explore the applicability of character strengths as a predictor for physical activity beyond the mere concept of mental health.

The primary aim of this study was to examine the extent to which character strengths are related to levels of physical activity. Although previous work gives a first empirical basis for investigations in the field, research is still in its infancy (Proyer, Gander, Wellenzohn, & Ruch, 2013; Seligman, 2008; Stuntz, 2018). As far as known, the present study is the first to assess correlations between character strengths and physical activity among students as well as the first study to include gender as a moderator variable in this framework. Students from higher education have been chosen because of their convenience to the researcher, concerning their availability, flexibility, proximity as well as their cost-benefit. Moreover, students endure a respective amount of stress (Reddy, Rajan Menon, & Thattil, 2018), which makes them a suitable target group in the scientific exploration of stress-related mental health outcomes. The obtained results serve the aim to contribute to the existing knowledge on how to foster physical activity and, thus enhance well-being on an individual level.

Based on the approaches reviewed in recent literature, the following study purposes, as well as respective hypotheses, have been established:

Research Question 1 To what extent are character strengths and physical activity-related? *H1:* People that score higher across a range of character strengths also score higher on physical activity.

Research Question 2 Which character strengths and virtues are related to high levels of physical activity? *H2:* character strengths in the cluster of wisdom (e.g. perspective, creativity, etc.) and temperance (e.g. self-regulation, prudence, etc.), as well as zest, leadership, and hope, are related to increased levels of physical activity.

Research Question 3 What gender differences exist in the embodiment of character strengths? *H4:* Females score higher on total character strengths, specifically on love, kindness, appreciation of excellence and beauty, and gratitude. Men report more bravery, creativity, and humor.

Research Question 4 To what extent has gender a moderating effect on the proposed relationship between character strengths and physical activity? *H5:* Gender moderates the relationship between character strengths embodiment and physical activity levels (Figure 1).

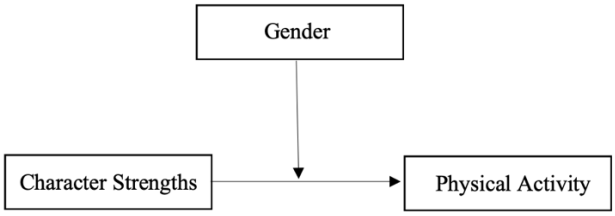

Figure 1. Moderation model for association between character strengths and physical activity

Methods

Design

A cross-sectional quantitative survey design has been used to investigate the association between character strengths and levels of physical activity among students in higher education. The ethical approval for conducting research was obtained by the Faculty of Behavioural Sciences Ethics Committee of the University of Twente in the Netherlands with the respective registration number 200307.

Participants

The current research was conducted with a sample of students in higher education. English was used as administration language since it offered the opportunity to make the study accessible to a more diverse sample of students. For the recruitment of participants, convenience sampling was applied, using the University of Twente's psychology student participant pool and social media. Firstly, the survey was uploaded on Sona Systems, the test subject platform of the University of Twente. Its credit system served as a mean to motivate students of the Faculty of Behavioural Management and Social Sciences (BMS) to join. Secondly, additional means for recruitment were public postings on social media, that forwarded the researchers' acquaintances to the survey. The central criterion for participation was enrollment in higher education. Further, a minimum age of 18 years was requested.

After following the exclusion procedure, 139 participants remained for further analysis. The age ranged from a minimum of 18 years to a maximum of 32 years, with an mean (sd) of 21.8 years (2.2). Further information about the demographics is stated in Table 1.

Table 1

Demographic Charactertistics of Participants (*N*=139)

	***N*(%)**

Gender	
Female	93(67)
Male	45(32)
Other	1(1)
Nationality	
Germany	117(84)
Other	14(10)
Dutch	8(6)

Notes: Other nationalities represented were Bulgaria (*N*=1), England (*N*=1), India (*N*=2), Ireland (*N*=1), Italy (*N*=2), Latvia (*N*=1), Lithuanian (*N*=1), Mexico (*N*=1), Sweden (*N*=1), Syria (*N*=1), USA (*N*=1), and Vietnam (*N*=1)

Materials

Character Strengths. The expression of all 24 character strengths of the participants was assessed by using the self-report questionnaire Values In Action Inventory 72 (VIA-72) Classification of Strengths (Peterson & Seligman, 2004). The VIA-72 is a short version of the character strengths assessment, originating from the more comprehensive VIA-IS. Character strengths are measured by a total of 72 items, three per strengths, which are answered and scored on a 5-point Likert scale (1= "Very Much Unlike Me" to 5= "Very Much Like Me"). Total scores of the VIA-72 range from 3 to 15 per strength and from 72 to 360 in total. Higher scores indicate a stronger embodiment of the respective strengths. Examples of these items are "I am an extremely grateful person" (Gratitude) and "Despite challenges, I always remain hopeful about the future (Hope) (Appendix A). All items are positively framed.

The overall psychometric properties of the VIA-72 are found to be slightly lower than those of the more comprehensive VIA-120 as well as the VIA-IS (VIA Institute of Character, 2017). On average, the internal consistency reliability is .75, while the validity coefficients show values between .36 to .48 (Peterson & Seligman, 2004). In this study, the internal consistency of the 24 scales on the VIA-72 was found to be good (α=.89).

Physical Activity. Data for the assessment of physical activity levels were collected by administrating the Internation Physical Activity Questionnaire (IPAQ). After extensive testing, the IPAQ is now a widely used self-assessment tool for physical activity (Craig et. al., 2003). It comprises a total of four questionnaires related to physical activity itself (job-related physical activity, transportation physical activity, physical activity during housework and family caring as well as recreation, sport, and leisure-time physical activity) and one for the assessment of

sedentary behavior. Each domain contains questions regarding the frequency and duration of the physical activity executed in either moderate and vigorous activities during the last seven days. Participants have to report their answers in days, hours, and minutes. Some examples of these items are “How much time did you usually spend on one of those days to bicycle from place to place” (transportation physical activity) or “During the last 7 days, how much time did you usually spend sitting on a weekday?” (time spent sitting) (Appendix B). The IPAQ can be scored either in categories (from low- to high activity levels) or as continuous variable (MET minutes a week). According to the scoring protocol, 3.3 METs, 4.0 METs, and 8.0 METs are assigned to walking, moderate, and vigorous-intensity activity, respectively. These resemble the weights for the different activity levels and are used for multiplication with the number of minutes engaging in a certain activity. To estimate the total MET scores of the major domains (e.g. leisure-time physical activity, etc.), one adds up the MET’s per activity belonging to the respective sub-category (Wolin, Heil, Askew, Matthews & Bennett, 2008). People are labeled as low-physically active in case they do not reach a total physical activity score of at least 600 MET-minutes/week and they are labeled as highly-physically active when they indicate a minimum of 3000 MET-minutes/week (Wolin et al., 2008).

Overall, literature reaches agreement on the finding that the IPAQ questionnaire shows acceptable measurement properties, comparable to most other established self-reports (Craig et. al., 2003; Hagstromer, Oja & Sjostrom, 2006). The test-retest reliability for the IPAQ was excellent with a value of .8, while the criterion validity had a value of .3 (Craig et al., 2003). Finally, Craig et al. (2003) testifies the use of the IPAQ for research purposes and shows that it is reliable across a diverse sample of participants. Validation studies report a Cronbach's’ alpha value ranging from .32 to .88 (Craig et. al., 2003; Moghaddam et al., 2012), while total physical activity scores show a significant association with pedometer step counts (Gauthier, Lariviere & Young, 2009). In the present study, the internal consistency of the sub-scales contributing to the total MET score on the IPAQ was acceptable (α=.79).

Procedure. From 14.03.2020 to 15.04.2020 the online survey was available on Qualtrics. Via the invitation link, participants were forwarded to the landing page, which included a description of the research, purpose, duration, and informed consent (Appendix C). Participation happened voluntarily, meaning that students received information about their rights to refuse the invitation or drop out at any time of the research. To proceed, participants had to agree with the informed consent. After controlling for the eligibility criteria, the participants were presented with some questions about their demographics (gender, age, and

nationality). In the following, the participants were asked to complete the VIA-72 to assess character strengths expression. All items were given in a randomized sequence. Subsequently, the students were requested to answer the questions of the IPAQ. The survey ended with an acknowledgment for their time and effort, accompanied by the contact mail of the researcher.

Data analysis. Prior to the analysis, the exclusion procedure was performed. Data from participants that did not conform with the eligibility criteria and non-completers of the questionnaires were removed (N=106). The greatest portion of these non-completers was excluded for the reason that they did not indicate a current enrollment in higher education. Further, participants who filled in improbable responses, for example, "8 days in one week", were excluded from the final data set. Participants' answers were adjusted (N=14) when it was reasonable to assume that they made a mistake in choosing the correct response field, reporting 60 hours instead of 60 minutes in one day. Finally, outliers were detected by calculating the absolute z-scores for the total scores on the IPAQ as well as the VIA-72.

Statistical analyses were executed using the software Statistical Package for the Social Sciences (SPSS version 24.0). The assumption of normality for both questionnaires was tested by visually inspecting the histograms and the normality curve. The skewness statistics were assessed using Bulmers' rule of thumb so that a skewness greater than +1 or -1 was labeled as a deviation from the normal (Bulmer, 1979). The outcomes of this procedure further served as a means to decide on subsequent methods for analysis, e.g. to evaluate the strength of the relationship using Pearson correlation coefficient in case of a normal distribution or using Spearman's correlation coefficient for a non-normal distribution, and to compare the means using an independent samples t-test in case of a normal distribution or a Mann-Whitney U test for a non-normal distribution.

Internal consistency was assessed by calculating Cronbach's alpha for the reliability and internal consistency of the VIA-72 and the IPAQ. Scale values of >.9, >.8 and >.7 equal excellent, good, and acceptable internal consistency, respectively. Values of >.6, >.5 and <.5 were labelled questionable, poor and unacceptable, accordingly (George & Mallery, 2003).

Correlation coefficients were interpreted as follows: correlations of .10 indicate a small positive/negative linear relationship. A correlation coefficient of .30 is considered as a moderate positive/negative relationship and values at level p=.50 represent a strong positive/negative relationship between the variables of interest (Cohen, 1988). P-values of <.05 were considered significant for this study.

Descriptive statistics (e.g. age, nationality, and gender) including the mean, standard deviation, minimum and maximum including mean, median, were visualized in frequency tables in an initial examination. Group-level results for the VIA and IPAQ were visualized in the form of the mean (SD) and range. For further analysis, the total scores of the VIA-72 and IPAQ were calculated, including the scores for each of the 24 character strengths and the respective sub-categories of the IPAQ (work-, active transport-, domestic- and leisure time MET scores).

Research Question 1. One-tailed Spearman's rho correlation coefficient was calculated to examine the extent to which physical activity levels and character strengths are related. Total scores on the VIA-72 and IPAQ were correlated. Confidence intervals (CI, 95% bias-corrected, and accelerated confidence intervals) were calculated.

Research Question 2. To explore the character strengths that are related to increased levels of physical activity, mean values were calculated for all character strengths, including for the respective virtues. Again, Spearman's rho correlation coefficient was applied to examine the relationship between each character's strength and total scores on the IPAQ. Besides total scores, the results of the four sub-categories of the IPAQ were correlated with each character's strength.

A linear regression analysis was conducted, with physical activity scores as the dependent variable. The character strengths that correlated significantly with physical activity total scores, were used as independent variables. Beforehand, standardized residuals were plotted against the standardized predicted values to account for linearity, homoscedasticity, and independence. The assumption of normality was checked by visually inspecting the histograms of residuals for physical activity and character strengths.

Research Question 3 and 4. To assess the extent to which males and females differ in their expression of character strengths and levels of physical activity, a Mann-Whitney U test was applied. The outcomes for character strengths and physical activity levels between the two gender groups were compared to account for an influence of gender on the relationship. Subsequently, the SPSS extension PROCESS macro (Hayes, 2013) was used to determine if gender moderated the relationship between character strengths, measured by total scores on the VIA, and physical activity levels, assessed by total scores on the IPAQ scores. An interaction was termed significant when the respective 95% confidence interval (CI) does not include zero

(Hayes, 2018). The category "other" was excluded from analysis since a single participant was not representative.

Results

Following the exclusion criteria, a total of 43% (N=109) of the initial data (N=252) had to be expelled prior to analysis. These cases can be divided into participants who did not conform with the eligibility criteria (N=63), non-completers (N=44), participants who gave unprobable responses (N=2), and one extreme outlier (zabs≥2.58) due to unusual pattern of responses. Thus, 139 respondents were used for data analysis.

The sample showed a score for all character strengths (M=264.84, SD=22.50), with total scores ranging from a minimum of 193 to a maximum of 326 (Table 2). Character strengths total scores were normally distributed with a skewness of .08 (SE=.21) and kurtosis of .29 (SE=.41). Physical activity total scores were non-normally distributed, with skewness of 3.08 (SE=.21) and kurtosis 11 (SE=.41). Taking the total of 24 character strengths into account, participants reported an average of 3.69 (SD=.31) on a 5-point Likert scale. The highest mean score was observed for the character strength honesty and the lowest mean score was calculated for spirituality (cf. Table 4). The distributions of the 24 character strengths were approximately normal, except for fairness with a skewness of -1.09 (SE=.2) and kurtosis of 2.12 (SE=.4).

Total scores on the IPAQ were non-normally distributed with a median score of 4638.00 METs' (SD=9317.51), ranging from a minimum of 324 MET's to a maximum of 58986 MET's. According to the scoring protocol (Wolin et al., 2008), 69.8% of the present sample can be categorized as highly-physically active and only 2.2% of participants are labeled as low-physically active. Total scores for the sub-scales on the IPAQ ranged from a minimum of 0 METs' to a maximum of 57600, with leisure time being the category with the highest physical activity levels (cf. Table 2).

Table 2

Descriptive statistics for Character Strengths, Physical Activity and Sub-Categories

	Min	Max	*M*	*Med*	*SD*
CS Total	2.68	4.53	3.69	3.52	.31
PA Total	324	58986	7453.1	4638.00	9317.51
Work Place	.00	39330	1873.42	.00	5793.9
Domestic/Garden	.00	29160	1652.72	720.00	3431.7

Leisure Time	.00	57600	2405.84	1257.00	5261.11
Transportation	.00	37170	1521.11	37170.00	3398.64

Note. CS Total = Character Strengths Total. PA Total = Physical Activity Total

Research Question 1

Correlations between Total Scores. The first investigation was aimed at determining the extent to which character strengths and physical activity are related. Results of the one-tailed Spearman correlation indicated a significant small positive correlation between total scores of character strengths and total scores of physical activity per week, [r(139)=.15, p=.04]. Concerning distinct character strengths, small positive correlations were found between leadership [r(139)=.15, p=.04], self-regulation [r(139)=.16, p=.03], zest [r(139)=.16, p=.03] and physical activity total scores. Lastly, a small positive correlation was found between physical activity total scores and the character strengths virtue justice [r(139)=.14, p=.05]. Remaining strengths and virtues did not show any significant correlations.

Total scores of character strengths and the respective sub-categories of physical activity revealed two small positive correlations, namely the domain of domestic- and garden physical activity [r(139)=.18, p=.01] and leisure time physical activity [r(139)=.15, p=.04]. The most relevant correlations between total scores of physical activity and character strengths, including significant correlations between the respective total scores and sub-categories of the two scales, can be found in Table 3. The remaining non-significant correlations with physical activity total score can be found in Appendix D.

Table 3

Spearmans' Correlations for Total Scores of Character Strengths and Physical Activity

	Active Transport		Domestic/ Garden		Leisure Time		Work Place		PA Total	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
CS Total	.09	.16	.18*	.02	.16*	.06	.08	.16	.15*	.04
Leadership	-.00	.48	.15*	.03	.17*	.02	.13	.06	.15*	.04
Self-Regulation	-.00	.49	-.09	.15	.09	.12	.12	.08	.16*	.03
Zest	.08	.19	.07	.2	.31*	.00	.05	.28	.16*	.03

Note. **The correlation is significant at the level of .01 (1-tailed). *The correlation is significant at the level of .05 (1-tailed). CS Total = Character Strengths Total. PA Total = Physical Activity Total.

Correlations between Sub-Categories of Physical Activity and Character Strengths. Investigating the relationships between the sub-categories of physical activity and each character strength, Spearman correlation revealed statistically significant associations for every sub-category apart from the work place domain. The smallest association was found for the domain of active transportation and curiosity [$r(139)=.19$, $p=.05$] and the greatest was detected between leisure time and zest [$r(139)=.3$, $p=.00$]. No significant negative correlations were assessed. An extensive overview of all significant correlations can be found in Table 4 and the remaining non-significant correlations are summarized in Appendix E.

Most strikingly, in the sub-category of domestic- and garden physical activity a total of eight significant correlations were detected. Relationships between strengths and domestic- and garden physical activity solely indicated small positive correlations, beginning with the weakest association with physical activity and social intelligence [$r(139)=.17$, $p=.03$], and ending with the strongest correlation between domestic- and garden physical activity and spirituality [$r(139)=.2$, $p=.00$]. Besides spirituality, the correlation with gratitude also had a p-value close to .00 [$r(139)=.2$, $p=.01$]. Again, no significant negative correlations were found. All remaining correlations can be found in Table 4.

Table 4

Significant Spearmans' Correlations for Sub-categories of Physical Activity and Strengths

	M	*SD*	Active Transportation		Domestic/ Garden		Leisure Time	
			r	*p*	*r*	*p*	*r*	*p*
Creativity	3.55	.67	.14*	.05	.02	.43	.06	.25
Curiosity	3.66	.62	.19*	.01	.02	.43	.25**	.00
Gratitude	3.93	.53	-.03	.37	.2**	.01	-.01	.48
Hope	3.93	.96	.09	.14	. 19*	.01	.03	.37
Humour	3.92	.76	.02	.4	. 17*	.02	-.01	.47
Leadership	3.80	.64	-.00	.48	.16*	.04	.17*	.02
Love	3.94	.70	-.06	.26	.08	.16	.15*	.04
Perseverance	3.56	.74	-.03	.35	. 18*	.02	.15*	.04
Social Intelligence	4.02	.99	.09	.15	.17*	.03	.10	.12
Spirituality	2.59	.96	-.00	.48	.2**	.01	-.04	.31
Teamwork	3.82	.61	-.03	.38	.17*	.03	-.07	.21

Zest	3.32	.65	.08	.19	.07	.2	.31**	.00

Note. **The correlation is significant at the level of .01 (1-tailed). *The correlation is significant at the level of .05 (1-tailed).

Correlations between Physical Activity Sub-Categories and Virtues. Moreover, the sub-categories of physical activity and character strengths virtues were correlated. Results of the one-tailed Spearman correlation indicated a significant small positive correlation between domestic- and garden physical activity scores and the strength of courage [r(139)=.17, p=.02], justice [r(139)=.16, p=.03] and transcendence [r(139)=.21, p=.01]. Similary, a small positive correlation was found for total scores of leisure time activity and courage [r(139)=.18, p=.02]. Humanity, temperance and wisdom do not show any correlation with physical activity scores (cf. Table 5). The results revealed that several virtues are not directly correlated with physical activity total scores, but with the respective sub-categories.

Table 5

Spearmans' Correlations for Total Scores of Character Strengths and Physical Activity

	M	*SD*	Active Transport		Domestic/ Garden		Leisure Time		Work Place		Total	
			r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Courage	3.27	.4	.01	.47	.17*	.02	.18*	.02	.05	.29	.13	.07
Humanity	4.04	.55	.05	.27	.12	.09	.13	.06	.05	.29	.1	.15
Justice	3.93	.44	.01	.48	.16*	.03	.09	.14	.12	.08	.14*	.05
Temperance	3.28	.43	.03	.34	.1	.13	.05	.29	.11	.1	.11	.1
Transcendence	3.64	.49	.1	.13	.21*	.01	.02	.41	-.06	.25	.07	.2
Wisdom	3.59	.47	.14	.05	-.00	.5	.13	.06	.01	.45	.08	.19

Note. **The correlation is significant at the level of .01 (1-tailed). *The correlation is significant at the level of .05 (1-tailed). PA Total = Physical Activity Total.

Research Question 2

To assess which character strengths and virtues are related to high levels of physical activity, total scores for physical activity and character strengths were assessed using simple linear regression. Besides this, all character strengths that showed significant correlations with scores of physical activity sub-categories were examined through multiple regression. Firstly, the linear regression to predict physical activity total scores based on character strengths total scores did not show a significant relation [F(1, 137)=1.02, *p*=.31]. The model for domestic-

and garden physical activity with the respective predictors gratitude, hope, humour, leadership, perseverance, social intelligence, spirituality and teamwork, could not account for a significant relationship [F(8, 130)=1.31, *p*=.26]. In addition, the calculated regression model for leisure time physical activity showed that the coefficients curiosity, leadership, love, perseverance and zest did not significantly predicted the respective total scores [F(5, 133)=0.61, *p*=.7]. On the contrary, the multiple linear regression used to predict scores of physical in the active transportation domain on basis of the character strengths creativity and curiosity showed a significant effect [F(2, 136)=4.35, *p*=.02] with an R^2 of .06.

Finally, the linear regressions for virtues and physical activity scores did not give any significant results. Neither physical activity total scores [F(1, 137)=2.2, *p*=.14], nor scores on the sub-categories leisure time physical activity [F(1, 137)=.19, *p*=.66] or physical activity in the domestic and garden domain [F(3, 135)=1.23, *p*=.34] were predicted by the embodiment of the respective virtues in a student. In conclusion, apart from the strengths of creativity and curiosity in the active transportation domain of physical, no strength nor virtue were found to have predictive power over physical activity levels.

Research Question 3 and 4

A oneway ANOVA was performed in order to examine the influence of gender on the relationship between physical activity scores and character strengths. The respective results showed no significant difference for males and females in character strengths expression [*F*(2, 136)=.48, *p*=.62] nor on physical activity total scores [*F*(2, 136) =.12, *p*=.89].

To investigate the effect of gender on the proposed relationship, a simple moderation analysis was performed using total scores of physical activity as outcome variable, character strengths total scores as predictor variable and gender as moderator variable. The interaction did not show significance [b= −6980.69, 95% C.I. (−16922.34, 2960.97), p<.1], suggesting that gender has no moderating effect on the proposed relationship.

Discussion

The present study aimed to explore the association between the embodiment of character strengths, including distinct strengths and virtues, and physical activity levels in various areas in students' lives. Motivated by Seligmans' proposal (2008) to expand the current research on positive health, the present results provide further justification for his demand and contribute to this new field in positive psychology. According to the present results, character strengths and physical activity levels indicate a small positive relationship. Character strengths

associated with high physical activity scores were leadership, self-regulation, and zest. Sub-categories that were associated with a stronger embodiment of character strengths in total were domestic- and garden and leisure-time physical activity. No negative relationship was assessed between character strengths and physical activity. Lastly, the expected moderation of gender on the respective relationship had to be rejected.

By demonstrating that students with more character strengths also indicate more physical activity in other domains (physical activity in leisure time, workplace, etc.), the present results align with those of the pioneer studies in the field of the character strengths and physical activity context (Moradi et al., 2014; Proyer et al., 2013; Stuntz, 2018). Conforming with the work by Proyer et al. (2013), leadership and zest were both positively related to physical activity of various intensity. Expanding upon these results, heightened physical activity was measured in students with the strength self-regulation. While Proyer et al. (2013) further underline the relevance of curiosity and hope for the respective relationship, support could not be provided in the present research. This may be justified by some methodological differences between the studies, especially the application of the Multiple Health Behavior Questionnaire (MHB-39) used by Proyer et al. (2013) to measure physical activity in participants. Generally, Proyer et al. (2013), defined physical activity by basic motor abilities (cardiorespiratory fitness, flexibility, coordination, and strength). Besides this, the MHB-39 conceptualizes physical activity in terms of "living an active sociable life" or "getting fresh air" (Wiesmann, Timm, & Hannich, 2013), which is rather different from the items that are used in the IPAQ.

Other possible explanations arise when looking at the mean age of the samples as well as the context in which the studies were conducted. Firstly, Proyer et al. (2013) used an adult sample with an average age of over 27 years. Studies have found a moderating effect of age on character strengths embodiment, with curiosity being one of the strengths with the greatest positive association with age (Linley et al., 2007). And secondly, according to the VIA Institute of Character (2020a, Become aware of your strength, para.3), hope is reflected in optimistic thinking and focusing on good outcomes. However, the present study was conducted during the global pandemic COVID-19, which may have flawed the expression of these behaviors in the participants. During challenging times such as a global crisis, it appears logical that states like hopelessness may be strengthened due to circumstances such as self-isolation, negative media coverage, loss of employment, and similar (Shaw, 2020).

Lastly, the motivation that guided the research should be taken into account. While the present research assessed physical activity, in particular, Proyer et al. (2013) looked at general health-oriented behaviors. Nonetheless, it may be assumed that not all forms of activity are

executed to maintain a good level of health. Workplace physical activity is a comprehensible example, as a person might engage in frequent physical activity due to a certain type of career (e.g. nurse, construction worker), without the intention to use this necessary physical activity for beneficial health outcomes. In consideration of this, it can be questioned what types of underlying motives exist, to understand how high or low scores for physical activity emerge in interaction with character strengths.

In addition to single character strengths, this study also aimed to examine the association between levels of physical activity and virtues. As only a small association was detected for the virtue of justice and overall physical activity, the results contradict the expectations based on previous research: neither the virtue of wisdom nor temperance was in particular found to be related to levels of physical activity (Moardi et al., 2014; Stuntz, 2018). Only one strength, drawn from the cluster temperance, i.e. self-regulation, showed a small association with physical activity in students. Even though self-regulation was not discussed extensively in earlier studies, there is scientific justification for a relationship between physical activity and self-regulation. In line with the VIA Institute of Character (2020b, Become aware of your strength, para.3), self-regulation is defined as a character strength that "has to do with controlling your appetites and emotions and regulating what you do". Since physical activity is a complex behavior that requires strength to firstly intent an action, and then to monitor and adjust the respective process without getting distracted (Mullen & Hall, 2015), the need for self-regulation in this framework appears plausible. Literature approves the positive effect of self-regulation on ones' engagement in physical activity (Castonguay, Miquelon & Boudreau, 2018; Matthews, & Moran, 2011; Stadler, Oettingen, & Gollwitzer, 2008). On top of that, the benefit of adopting self-regulation techniques to increase physical activity among a sample of adolescents and women was highlighted (Matthews, & Moran, 2011; Stadler, Oettingen, & Gollwitzer, 2008). The resemblance between the population in earlier research and the present participant pool ultimately substantiates to analyze and compare these results for interpretation.

Surprisingly, the only virtue which showed a positive association with overall physical activity in university students was justice. According to the VIA Institute of Character (2020c, Become aware of your strength, para.3), the virtue of justice is the base for an individual to attach to a community or any group-related situation. The reviewed studies did not highlight any significant relation with the virtue of justice, so that the population of the present research may bear an explanation for this finding. The literature on justice among the younger generation shows increased attention for the subject value in a variety of contexts (Guleryuz-Turkel, & Altinbasak-Farina, 2017; Schneider, 2004; Walton-Fisette, & Sutherland, 2018).

Firstly, justice plays an important role in the educational system of the 21st century (Schneider, 2004). A core of the related educational goal is thus, to transfer "social responsibility and civic engagement" and to strengthen democracy (Schneider, 2004, pp. 8-9). This consideration is further reflected in research on the importance of values for one's life in a population of working Generation Y'ers, meaning people born before approximately 2000. The study by Guleryuz-Turkel and Altinbasak-Farina (2017) indicates that justice is the most important value for the younger generation at hand. Thus, it may be assumed that heightened awareness for justice may partially explain the association between physical activity total scores and justice in the present research. As total scores for physical activity were exceptionally high regardless of gender, age or other demographics, and students further showed increased averages on the virtue justice, but also for its related strengths (e.g. fairness, leadership, and teamwork), the relationship encountered may partially be a product of a strengthened sense for justice that has developed over the past decades. Future research may assess the degree to which the embodiment of character strengths and virtues differ between generations and how changes are reflected over time and context.

The most explorative part of this study was dedicated to the relation between character strengths and distinct domains of physical activity in daily life (e.g. domestic- and garden-, workplace physical activity, etc.). While some findings in previous research in the field may indicate possible directions, the results for the IPAQ sub-categories used are rather unique. Firstly, it showed that increased levels of physical activity in the domain of domestic- and garden as well as leisure time are related to a stronger embodiment of character strengths. To the extent that leisure-time physical activity is considered to be equal, or at least very much alike, the concept of exercise, mutual support can be found in the proposal by Stuntz' (2018) for the virtue of wisdom to be a predictor for increased levels of physical activity. Even though the concepts used may not be identical, it can be argued that physical activity measured by Stuntz (2018) resembles leisure-time physical activity since the respective items of the IPAQ are directed at recreation, sport, exercise or leisure (Craig et. al., 2003). In addition, considering the numerous correlations between character strengths and the domestic- and garden physical activity domain, it appears noteworthy that remarkably high levels of physical activity were assessed in this domain. Future research might look closer into the respective relationship to find an explanation for this occurrence and to see if it equally accounts for other populations.

Finally, the investigation among possible gender differences in the association between character strengths and physical activity gave no indication that students differ significantly from each other in the expression of their top strengths, meaning strengths with the strongest

correlation, nor on how the embodiment of distinct strengths has an impact on their levels of physical activity. These results contradict the expectations that were based on several previous studies, underlining that women not only score higher on character strengths in general, but also on some character strengths belonging to the virtue humanity and transcendence, namely appreciation of excellence and beauty, kindness, and love (Ferragut, Blanca, & Ortiz-Tallo, 2014; Heintz, Kramm & Ruch, 2019; Karris & Craighead, 2012). However, looking closely at the assessed deviations in strengths expression in previous studies, it can be seen that the effect of gender is often only small (Heintz, Kramm & Ruch, 2019). Ferragut, Blanca, and Ortiz-Tallo (2014) support that character strengths slightly increase overage. Since the participants of their study had a mean age of 12 years, it may be questioned if differences between gender may outbalance over time. Gander, Hofmann, Proyer, and Ruch (2019) supported this view with the argument that despite the stability of character strengths, there is room for change in some distinct strengths. Consequently, the equality in character strengths embodiment between gender in the present study may not be a stable condition, but a product of naturally occurring change over time.

Strengths and Limitations

The present study shows strengths, particularly in its design and the respective material used to assess the relationship between character strengths and physical activity in university students. To begin with the factorial validation of the IPAQ and VIA-72, it is to stress that both tools have already been applied among several student samples in scientific research. For the reason that both questionnaires indicated good psychometric properties in the present study, its applicability for the purpose of this study is justified and supports the accuracy of the results. Especially, the internal reliability of the VIA-72 in the present study was found to be stronger than in other scientific work. Consequently, one can argue for a well-designed study design, which allows generalizing the present findings within a student population.

Conceivably, the strongest argument for this research is the explorative nature in which, on the one hand, a first approach to study character strengths in the domain of physical activity was established (Moardi et al., 2014; Proyer et al., 2013; Stuntz, 2018), but on the other hand, physical activity was assessed in a more complex sense. The application of the IPAQ offered the possibility to cluster the embodiment of character strengths in distinct categories of physical activity in daily life (e.g. workplace physical activity or leisure-time physical activity). While earlier research used the concepts of physical activity levels and character strengths, in a rather

narrow sense, the methodology in this research enabled the correlation of each sub-category, virtue, and total score with each other to construct a clear picture of the respective association.

On the contrary, the accuracy of physical activity scores may be a concern due to the use of a self-report measurement. Even though the results on the psychometric properties of the IPAQ defend its reputation as a valid assessment tool for physical activity (Craig et. al., 2003; Hagstromer, Oja & Sjostrom, 2006), it is yet a common concern to accurately assess physical activity through self-report data due to its subjectivity (Demetriou, Uzun Ozer & Essau, 2015). For the scope of this study, it was practical to collect self-report data using the IPAQ. As the IPAQ only asks to recall recent activity, which is supposed to ensure accurate responses due to a better memory capacity (Clarke, Fiebig, & Gerdtham, 2008), responses were expected to be reliable. Nonetheless, results for total physical activity were noticeable high, even compared to other studies using the IPAQ within similar samples. On average, the sample of the present research showed higher total scores than assessed in participants with similar demographics (Mulahasanović, Mujanović, Mujanovic, Atikovic & Maglaj, 2018; Simona, Radu & Vanvu, 2015). For example, the student sample in Simona, Radu, and Vanvu (2015) showed a mean of 5343.92 (SD=2314.02) METs per week. Consequently, this may have influenced the number of positive associations assessed in an inflationary manner. In the future, this may be corrected using an additional assessment tool for physical activity.

Finally, an important consideration is the nature of a cross-sectional study design. As the relationship between the concepts of interest is only measured at one point in time, a causal relationship can not be confirmed, nor a clear prediction can be made about the direction or true causality of the association (Solem, 2015). Lastly, the opportunity for further moderators can not be ruled out based on this data.

Practical Implications

The results of this study may offer some practical implications, especially concerning the physical and psychological well-being of individuals. As previously reviewed, literature gives evidence for the beneficial effects of physical activity on positive mental states such as self-acceptance or feelings of having a purpose in life, but it also shows to reduce stress, anxiety, and symptoms of depression (Edwards et al., 2005; Roychowdhury, 2020). Earlier research substantiates the possibility to build up character strengths in individuals through appropriate forms of training or exercises (Park, Peterson, Seligman, & Steen, 2005; Proctor et al., 2011). Hence, one option may be to evoke a general increase in character strengths through strengths-based interventions and subsequently, observe the impact on physical activity and possibly,

physical and psychological well-being. Since existing knowledge argues for a causal effect of physical activity on character strengths, it seems logical to begin with this direction, however, future research should focus on the validation of this causation.

To make this implication more feasible in case that a causal effect may be validated in future research, one may start with the character strengths that directly interact with physical activity, namely leadership, self-regulation, and zest. As referred to earlier, the VIA Institute suggests engaging in physically rigorous activities (e.g. exercises in the gym, running, bike riding, etc.), which would simultaneously tackle the issue of sedentary behavior. However, there is also the advice to either connect with old friends to reminisce memories or to enhance energy levels by improving ones sleeping routine (e.g. having a regular sleeping schedule, reducing caffeine, etc.) (2020d, Become aware of your strength, para.7). In conjunction, self-regulation may also be strengthened when not only creating a routine for sleeping but the whole day: according to the VIA Institute, setting goals for one's daily tasks (e.g. cleaning, laundry, etc.) and eventually controlling them, can boost self-regulation (2020b, Become aware of your strength, para.7). Lastly, leadership can be strengthened by taking the responsibility to guide small projects, particularly at work. As the present results for physical activity total scores were based on a variety of life situations, there are numerous opportunities to foster these strengths in different settings. Given that future research establishes evidence for a causal effect between those two, the strengths-based interventions described could foster a more active way of life, and thus, enhance physical and psychological well-being.

Future Direction

The strengths and limitations offer a promising opportunity to build upon the present results in future investigations. Beginning with some methodological aspects that can be considered in replicating this study, a first adjustment may be the tool to collect physical activity scores. As highlighted, remarkably high levels of physical activity among students were found, while the general population indicates a deficiency in physical activity levels. Self-report assessments are prone to error (Craig et. al., 2003; Hagstromer, Oja & Sjostrom, 2006), and therefore, the introduction of an accelerometer as an additional tool to measure physical activity could improve the findings (Sylvia, Bernstein, Hubbard, Keating & Anderson, 2014). It could also be thought of something less evasive such as using the mobile phone activity data of participants, as this is already a substantial element of people nowadays, and therefore carried a lot during the day.

Moreover, the cross-sectional design of the study puts a limit on the extent to which the present results can be inferred. Future research may circumvent this problem, by including an experimental- or longitudinal condition. This may be possible by re-designing the research in a way that focuses on the causation of the two variables, e.g. by introducing control groups that are assessed on their physical activity levels over time. One group could receive strengths-based interventions to compare the development in their physical activity levels with a non-treatment condition group.

Finally, some suggestions for future research emerge in consideration of the potential influence of moderators on the relationship between character strengths and physical activity. As the present study only focused on the impact of gender, there is room for exploring different moderators to create a more sophisticated model. Current literature on physical activity and exercising suggests that physical activity is partially a product of an individuals' extrinsic or intrinsic motivation (Vallerand, 2007). Consequently, future research may assess the impact of motivation on the proposed relationship (Figure 2). Further, findings on character strengths knowledge and use imply that the distinction between knowing ones' strengths and using them may lead to different outcomes (Duan, Bu, Zhao, & Guo, 2019). Thereupon, future research may wish to re-evaluate the relation between physical activity and character strengths under the premise that participants use their strengths.

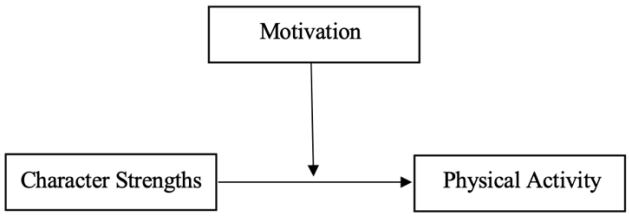

Figure 2. Hypothesized moderation model for future research

Conclusion

In conclusion, this study contributes to the knowledge of the relationship between character strengths and physical activity levels in that it supports a positive association between the two concepts as well as underlines the interaction between the engagement in several day-to-day physical activities and distinct character strengths. It further highlights zest, leadership, and self-regulation as core strengths of the relationship, and therefore emphasizes the accuracy of previous research in the field. Moreover, the present study contributes to a new approach to

physical activity and character strengths, by assessing the different predictors for physical activity in daily life. Hereby, the domain of domestic- and garden physical activity is remarked as a potential field for future investigations. Beyond this, the present study questions earlier findings of gender differences in character strengths as well as previous results on the impact of virtues on physical activity levels. While earlier research, including the present one, supports the view of a positive relation in the framework of positive psychology, character strengths still find little recognition in the context of physical well-being and its promotion. With the current results, the potential use of character strengths knowledge in the enhancement of well-being and the prevention of physical inactivity is supported and further investigations are proposed.

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Appendix A

Via-72: Strength of Character Inventory

Character strengths and items were ordered alphabetically. During the questionnaire, participants were not presented with the titlte of the strengths and the respective items were randomized.

Items were answered on a 5-point Likert scale

1 = Very Much Unlike Me
2 = Unlike Me
3 = Neutral
4 = Like Me
5 = Exactly Like Me

VIA-72 (Park, Peterson, Seligman, 2004)

Appreciation of excellence and beauty

(1) I experience deep emotions when I see beautiful things.
(2) I see beauty that other people pass by without noticing.
(3) I am always aware of the natural beauty in the environment.

Bravery
(1) I have taken frequent stands in the face of strong opposition.
(2) I must stand up for what I believe in.
(3) I always stand up for my beliefs.

Creativity
(1) I am always coming up with new ways to do things.
(2) My friends say that I have lots of new and different ideas.
(3) I am an original thinker.

Curiosity
(1) I am always busy with something interesting.
(2) I am excited by many different activities.
(3) I can find something of interest in any situation.

Fairness
(1) Everyone's rights are equally important to me.
(2) I give everyone a chance.
(3) I believe that it is worth listening to everyone's opinions.

Forgiveness
(1) I rarely hold a grudge.
(2) I believe it is best to forgive and forget.
(3) I am usually willing to give someone another chance.

Gratitude
(1) I am an extremely grateful person.
(2) I feel a profound sense of appreciation every day.
(3) I feel thankful for what I have received in life.

Honesty
(1) I always keep my promises.
(2) My promises can be trusted.
(3) I am true to my own values.

Hope
(1) I always look on the bright side.
(2) Despite challenges, I always remain hopeful about the future.
(3) I know that I will succeed with the goals I set for myself.

Humility
(1) I never brag about my accomplishments.
(2) I rarely call attention to myself.
(3) I have been told that modesty is one of my most notable characteristics.

Humour
(1) I try to add some humour to whatever I do.
(2) I am known for my good sense of humour.
(3) I have a great sense of humour.

Kindness
(1) I really enjoy doing small favours for friends.
(2) I go out of my way to cheer up people who appear down.
(3) I enjoy being kind to others.

Judgement
(1) Thinking things through is part of who I am.
(2) I try to have good reasons for my important decisions.
(3) I always weigh the pro's and con's.

Leadership
(1) As a leader, I treat everyone equally well regardless of his or her experience.
(2) One of my strengths is helping a group of people work well together even when they have their differences.
(3) To be an effective leader, I treat everyone the same.

Love
(1) I always feel the presence of love in my life.
(2) I can express love to someone else.
(3) I can accept love from others.

Love of Learning
(1) I am a true life-long learner.
(2) I read all of the time.
(3) I read a huge variety of books.

Perspective
(1) People describe me as "wise beyond my years."
(2) Others consider me to be a wise person.
(3) I have a mature view on life.

Perseverance
(1) I never quit a task before it is done.

(2) I always finish what I start.
(3) I finish things despite obstacles in the way.

Prudence
(1) I think through the consequences every time before I act.
(2) I always make careful choices.
(3) I am a very careful person.

Self-Regulation
(1) I am a highly disciplined person.
(2) Even when candy or cookies are under my nose, I never overeat.
(3) I can always stay on a diet.

Social Intelligence
(1) I know how to handle myself in different social situations.
(2) No matter what the situation, I am able to fit in.
(3) I always know what to say to make people feel good.

Spirituality
(1) I am a spiritual person.
(2) My faith makes me who I am.
(3) I practice my religion.

Teamwork
(1) Without exception, I support my teammates or fellow group members.
(2) It is important to me to respect decisions made by my group.
(3) Even if I disagree with them, I always respect the leaders of my group.

Zest
(1) I awaken with a sense of excitement about the day's possibilities.
(2) I look forward to each new day.
(3) I have lots of energy.

Appendix B

International Physical Activity Questionnaire

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

   ☐ Yes

   ☐ No → ***Skip to PART 2: TRANSPORTATION***

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

   _____ **days per week**

   ☐ No vigorous job-related physical activity → ***Skip to question 4***

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

   _____ **hours per day**
   _____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

   _____ **days per week**

   ☐ No moderate job-related physical activity → ***Skip to question 6***

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

_____ **hours per day**
_____ **minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

_____ **days per week**

☐ No job-related walking → ***Skip to PART 2: TRANSPORTATION***

7. How much time did you usually spend on one of those days **walking** as part of your work?

_____ **hours per day**
_____ **minutes per day**

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

_____ **days per week**

☐ No traveling in a motor vehicle → ***Skip to question 10***

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

_____ **hours per day**
_____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

☐ No bicycling from place to place → ***Skip to question 12***

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

_____ **hours per day**
_____ **minutes per day**

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

☐ No walking from place to place → ***Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY***

13. How much time did you usually spend on one of those days **walking** from place to place?

_____ **hours per day**
_____ **minutes per day**

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?

_____ **days per week**

☐ No vigorous activity in garden or yard → ***Skip to question 16***

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

_____ **hours per day**
_____ **minutes per day**

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

_____ **days per week**

☐ No moderate activity in garden or yard → ***Skip to question 18***

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

_____ **hours per day**
_____ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

_____ **days per week**

☐ No moderate activity inside home → ***Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY***

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ **hours per day**
_____ **minutes per day**

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ **days per week**

☐ No walking in leisure time → ***Skip to question 22***

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ **hours per day**
_____ **minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

_____ **days per week**

☐ No vigorous activity in leisure time → ***Skip to question 24***

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

_____ **hours per day**
_____ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

_____ **days per week**

☐ No moderate activity in leisure time → ***Skip to PART 5: TIME SPENT SITTING***

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

_____ **hours per day**
_____ **minutes per day**

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?

_____ **hours per day**
_____ **minutes per day**

This is the end of the questionnaire, thank you for participating.

Appendix C

Informed consent

When answering the questions, there is no right or wrong. Do not think about the answers for too long, instead choose the first thing that comes to your mind and that you feel comfortable with.

The participation is voluntary at any time, meaning, you can withdraw from the research at any stage of the process.

The responses to this survey will be handled confidential and anonymous. The data will only be used for research purposes.

If you still have further questions, do not hesitate to contact the researcher:

a.sommer@student.utwente.nl

I have read the informed consent and agree to what I have read. I declare that I have been informed about the nature, method, and purpose of the study.

Yes, I consent.
No, I do not consent.

Appendix D

Remaining Correlations Between Character Strengths and Physical Activity Total Score

	Physical Activity Total Score	
	r	*p*
Appreciation of Excellence and Beauty	.05	.27
Bravery	-.00	.49
Creativity	.1	.03
Curiosity	.13	.06
Fairness	.13	.06
Forgiveness	.06	.26
Gratitude	.08	.17
Honesty	.03	.35
Hope	.1	.12
Humility	.09	.16
Humour	-.01	.47
Kindness	.04	.33
Judgement	.03	.35
Love	.06	.25
Love of Learning	-.03	.36
Perspective	.04	.33
Perseverance	.11	.1
Prudence	-.02	.41
Social Intelligence	.14	.05
Spirituality	.04	.3
Teamwork	.04	.33

Note. **The correlation is significant at the level of .01 (1-tailed). *The correlation is significant at the level of .05 (1-tailed).

Appendix E

Remaining Correlations Between Character Strengths and Physical Activity

	Active Transportation		Domestic/ Garden		Leisure Time		Work	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Appreciation	-.06	.24	-.00	.49	.12	.43	-.06	.24
Bravery	-.03	.39	.06	.23	.01	.44	-.03	.37
Fairness	.06	.34	.01	.45	.11	.1	.06	.34
Forgiveness	-.01	.47	.08	.17	.08	.17	-.01	.47
Honesty	-.01	.47	.1	.11	-.02	.4	-.01	.47
Humility	.11	.09	-.01	.44	-.01	.45	.11	.09
Kindness	.08	.16	-.02	.42	.06	.26	.08	.16
Judgement	.09	.14	.00	.5	-.02	.43	.09	.14
Love of Learning	-.02	.43	-.08	.18	.08	.17	-.02	.43
Perspective	-.1	.1	.03	.36	.05	.3	-.10	.11
Prudence	.09	.15	.01	.46	-.1	.12	.09	.15

Note. **The correlation is significant at the level of .01 (1-tailed). *The correlation is significant at the level of .05 (1-tailed). Appreciation = Appreciation of Excellence and Beauty