The relation between physical activity and flourishing in everyday life

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Abstract

According to prior research, moderate to vigorous physical activity levels can promote emotional, social and psychological well-being and high levels of these concepts result in the highest level of mental well-being, namely, flourishing. This study examines different levels of physical activity in relation to emotional, social and psychological well-being and to flourishers versus non-flourishers. Therefore, a cross-sectional study was conducted which resulted in a sample of 153 German speakers. Significant correlations showed that physically active participants were also likely to have high emotional and social well-being but not psychological well-being. Moreover, respondents who flourished were also more likely to be physically active and especially to engage in vigorous levels of activity. These findings are only in part consistent with prior studies. Further research should therefore use a longitudinal design to focus not only on the relation but also on the causality between physical activity and flourishing. Additionally, different self-care behaviours might explain an increase in flourishing and physical activity and should therefore be considered in future studies. Lastly, age might have an effect on the relation between physical activity and flourishing and should therefore be further examined.

Keywords: flourishing, well-being, physical activity

The relation between physical activity and flourishing in everyday life

Physical activity is widely known to be beneficial for physical health. It can prevent negative health outcomes like obesity or cardiovascular diseases and increase overall well-being (Biddle et al., 2003; Kokkinos, 2012). An increase in physical activity reduces the risk for illnesses (Kokkinos, 2012), while a reduction of physical activity is a risk factor for poor health (Warburton et al., 2006). Sedentary behaviour for example is shown to decrease perceived life satisfaction and health status, while physical activity increases it (Pengpid & Peltzer, 2019). However, in spite of its positive effects, the World Health Organization (WHO) reported in 2018, that only 48% of the people living in Germany engage in physical activity (WHO, 2018). A lack of regular physical activity, in contrast to its multiple health benefits, is associated with premature death and chronic disease (Kokkinos, 2012; Saxena et al., 2005; VanKim & Nelson, 2013). Some subgroups, like females and elderly people, are overall less active than others (Paluska & Schwenk, 2000). Therefore, their mental as well as physical health outcomes may be worse than those of more active subgroups such as males and young adults (VanKim & Nelson, 2013).

Regarding the frequency and intensity of physical activity, the WHO provides guidelines for different age groups. For adults between 18 and 64 years of age, it is recommended to engage in at least 150-300 minutes of moderate-intensity physical activity or alternatively 75-150 minutes of vigorous-intensity physical activity per week (WHO, 2020). The best opportunity to engage in at least moderate-intensity physical activity is at leisure-time (Paluska, & Schwenk, 2000). Furthermore, physical activity also refers to any type of movement during work and to physical activity as a consequence of transportation to and from places (WHO, 2020). Moderate-intensity physical activity includes activities like dancing, domestic chores, or walking an animal and is defined by the WHO as “a moderate amount of effort and [it] noticeably accelerates the heart rate” (WHO, 2021-a, p.1). Therefore, physical

activity already starts at regular everyday activities. Vigorous physical activity, on the other hand, is defined by the WHO as "a large amount of effort and [it] causes rapid breathing and a substantial increase in heart rate" (WHO, 2021-a, p.1). Therefore, if regular physical activity is integrated in everyday life, it can be benefitting in many ways.

Moreover, physical activity does not only improve physical health, but was also found to reduce perceived stress levels and even to lower the risk of depression and anxiety in adults (Saxena et al., 2005; Schuch et al., 2018). At the same time, physical activity can enhance self-esteem and result in a better mood (Kandola et al., 2019; Paluska & Schwenk, 2003; VanKim & Nelson, 2013). Through engagement in physical activity, it is also possible to enhance one's creativity and to improve social functioning and academic achievement (Paluska, & Schwenk, 2000; Tamminen et al., 2020). Additionally, Keyes and Simoes (2012) found that people are more likely to experience high mental well-being when they are physically active. This suggests that physical activity is beneficial for promoting mental well-being. In addition, there is some evidence that meeting the recommended physical activity level for moderate activity can lead to higher levels of flourishing and simultaneously, to lower levels of symptoms of mental illness (Keyes & Simoes, 2012).

Flourishing is the highest level of mental well-being and it includes positive functioning in life as well as positive feelings (Huppert & So, 2013; Keyes, 2002). More specifically, flourishing is the result of high levels of its three components, namely, emotional, social and psychological well-being. Emotional well-being is characterized by positive affect and overall perceived satisfaction, which leads to positive feelings towards, and in life. It also includes personal growth and autonomy (Penninx et al., 1998). Social well-being refers to the mastery of social life and includes contribution to social life and acceptance by the social surroundings (Keyes, 1998). Finally, psychological well-being is defined by characteristics such as having a purpose in life and positive relations with others (Ryff, 1989). People who

flourish in life can master everyday activities and also work more effectively than people who do not flourish (Keyes, 2005). Additionally, flourishers report better physical health and therefore, a better life expectancy (Keyes & Simoes, 2012). They also built meaningful social relationships and contribute to the community more than non-flourishers (Huppert & So, 2009). However, in Germany, only about 20% of the German adult population is flourishing in life (Huppert & So, 2013).

Past research found that physical activity and mental well-being are positively related (Downward & Dawson, 2016; Keyes & Simoes, 2012; O'Rourke et al., 2021). It is even suggested that physical activity can promote emotional, social and psychological well-being (Keyes & Simoes, 2012). However, previous studies about this topic primarily focus only on single traits and aspects of well-being like self-esteem, mood or social functioning (Kandola et al., 2019; Paluska & Schwenk, 2000; VanKim & Nelson, 2013, Schuch et al., 2018, Tamminen et al., 2020). Only few studies focus specifically on the relationship between physical activity and flourishing and on the characteristics of flourishers in general, but it can be suggested from these previous studies that there is a positive relation between these two concepts (Keyes and Simoes, 2012; O'Rourke et al., 2021; Schotanus-Dijkstra et al., 2016). However, these prior studies did not investigate the different levels of physical activity in relation to emotional, social and psychological well-being and to flourishers versus non-flourishers. They also did not examine specifically the relationship between physical activity and flourishing in a German speaking sample including different groups of people.

Therefore, this study investigates different dimensions of physical activity and well-being as well as flourishing. The aim of the current study is to examine the relation between flourishing and physical activity in German speaking adults. It is hypothesized that (H1) people who engage in moderate to vigorous levels of physical activity (e.g. dancing, walking) are related to higher levels of emotional, social and psychological well-being, and to flourishing.

Furthermore, it is also hypothesized that (H2) flourishers engage in at least 250 minutes of moderate-intensity physical activity or at least 60 minutes of vigorous-intensity physical activity per week compared to non-flourishers.

Methods

Design

A cross-sectional design was used for this study. The correlation between the dependent variable flourishing and the independent variable physical activity were measured at one time-point (April 2021). The ethics committee of the Faculty of Behavioural, Management and Social sciences (BMS) of the University of Twente approved the study (No. 210168). Furthermore, participants gave online informed consent before the start of the survey. This included general information about the purpose and the time expenditure of the study. Regarding the ethical standard of confidentiality, information was given about the use and storage of the participants' data, which was treated anonymously.

Participants and procedure

German speaking adults of 18 years and older were recruited by a group of 11 Bachelor students from the University of Twente. A convenience sample was recruited from the students' close environment. More specifically, German adults were asked by the Bachelor students to sign up for the study through WhatsApp messages and Instagram polls. In total, 241 people signed up for the study. After excluding participants who did not complete the survey, the final dataset consisted of 153 participants. First, participants were asked for their name and email address to receive a link, providing more information about the study and to register. Secondly, participants were given online informed consent before they could complete the survey within one week. The survey was part of a more extensive study, of which two questionnaires about physical activity and mental well-being were used in the current study. The overall time expenditure for completing these two questionnaires was approximately 10 minutes.

Measures

Physical activity

The level and frequency of physical activity was measured by the 7-item international physical activity questionnaire short form (IPAQ-SF) by Booth (2000), translated in German by Hagströmer (2016). The IPAQ-SF asked participants about the time they spend being physically active within the last seven days. Participants were asked to think of moderate and vigorous physical activities they engaged in at work, at home, during leisure time and for transportation. Examples were given for vigorous physical activity (e.g. "Heavy lifting, digging, aerobics, or fast bicycling") and for moderate physical activity (e.g. "Carrying light loads, bicycling at a regular pace"). Next, participants indicated how many hours and minutes they engaged in these activities. A higher number of minutes engaged in moderate or vigorous activities per week indicated a higher physical activity level. Lastly, participants stated how many minutes and hours they spent walking and sitting. Participants also had the choice to answer, "don't know/not sure" and if they claimed that they did not engage in moderate or vigorous physical activity, the questions about the frequency of these behaviours were skipped.

A person was considered to engage in moderate levels of physical activity if he or she engaged in at least "3 or more days of vigorous activity of at least 20 minutes per day OR 5 or more days of moderate-intensity activity of at least 30 minutes per day" (IPAQ Research Committee, 2005). Walking and sitting were not considered as moderate activity and therefore, a new variable was created, combining the two activities, labelled as *low to no activity* respectively. Therefore, a cut-off score for being active was calculated and participants were labelled as *active* (1) if they engaged in a minimum of 250 minutes of moderate physical activity or 60 minutes of vigorous physical activity, and *inactive* (0) if they did not meeting these criteria. Overall, measurement properties of the IPAQ-SF proved to be acceptable throughout

multiple countries in prior research (Craig et al., 2003). The Cronbach's alpha of the IPAQ-SF of the current study was .63.

Mental well-being

To measure mental well-being, the 14-item Mental Health Continuum-Short Form (MHC-SF) by Keyes (2009) was used. This questionnaire consisted of three scales with three items each, about emotional (e.g. "During the past month, how often did you feel happy?"), social (e.g. "During the past month, how often did you feel that people are basically good?") and psychological well-being (e.g. "During the past month, how often did you feel that your life has a sense of direction or meaning to it?"). Participants rated on a 6-point Likert scale how often they experienced different feelings of well-being within the last month (0 = *never* to 5 = *every day*). A higher mean score (0-5) indicated higher levels of mental well-being. Besides the continuous score, a cut-off score for flourishing was also calculated. An individual could be labelled as *flourishing* (1) if he or she scored 4 ("almost every day") or 5 ("every day") on at least one item measuring emotional well-being and on at least six items measuring social and psychological well-being. Individuals who did not fulfil these criteria were labelled as *not flourishing* (0).

The questionnaire showed previously high internal reliability and a moderate test-retest reliability, indicating that its outcomes are stable over time and sensitive to change (Lamers et al., 2011). Convergent validity and discriminant validity proved to be good as well, which made the MHC-SF a valid measure for mental well-being (Lamers et al., 2011). The Cronbach's alpha for the MHC-SF in the current study was .86.

Data analysis

Data was analysed using SPSS (version 23), a software package designed for statistical data analysis. The data was tested for normality and dummy variables were created for *flourishing* (1) and *not flourishing* (0) and for *physically active* (1) and ph*ysically inactive* (0).

Additionally, descriptive statistics were calculated for all variables and for characteristics of respondents.

To test whether people who engaged in moderate to vigorous levels of physical activity (1 = yes, 0 = no) were related to higher levels of emotional, social and psychological well-being, bivariate Pearson Correlation coefficients were calculated with all variables. A correlation below 0.3 was considered weak, while a correlation coefficient between 0.3 and 0.7 was considered moderate and a correlation coefficient above 0.7 was good (Cohen, 1998). Moreover, to test whether *flourishers* (1) engaged in at least 250 minutes of moderate-intensity activity or in at least 60 minutes of vigorous-intensity physical activity per week, compared to *non-flourishers* (0), Chi-Square tests were conducted. The effect size of the Chi-Square tests were measured using Phi. A value between 0.1 and 0.3 was considered as a small effect, while a value between 0.3 and 0.5 was considered a medium effect and 0.5 or higher was considered a large effect (Cohen, 1998).

Results

The final sample consisted of 62.7% females with a mean age of 33 years (SD_{age} = 16) and the age of the participants ranged from 18 to 83 years. In total, 45% of the participants were flourishers and 43% of the participants were labelled as active. The data was normally distributed (*ps* > .05). Moreover, no significant differences were found between flourishing and not flourishing for gender, with 42% males and 47% females labelled as flourishers $X^2(1, N = 153) = 0.16$, $p > .05$. Additionally, no significant correlation was found between different age groups on the level of flourishing ($r = -.02$, $N = 153$, $p = .803$). However, a significant difference was found between males and females in physical activity levels with 56% males compared to 35% females labelled as physically active $X^2(1, N = 153) = 5.45$, $p < .05$.

Bivariate correlations

Table 1 shows the bivariate correlations between physical activity levels and mental well-being. The more participants engaged in physical activity, the more likely they had higher levels of emotional well-being (r = .25, N = 153, p = .002) and social well-being (r = .20, N = 153, p = .014) but not psychological well-being (r = .14, N = 153, p = .076). However, the significant correlations were weak.

Furthermore, Pearson Correlation analyses were conducted between flourishing and different physical activity levels. It was found that participants who flourished were also more physically active (r = 0.19, N = 153, p = .017). Again, the significant correlation was weak. Additionally, as can be seen in Table 1, another Pearson correlation analysis was conducted between the variables *flourishing or not* and *vigorous activity*, *moderate activity* and *low to no activity*. People who flourish were more likely to engage in vigorous levels of activity (r = .23, N = 103, p = .021), but not in moderate levels of activity (r = .18, N = 110, p = .055). The significant correlations between flourishing and vigorous levels of physical activity were weak as well. Lastly, respondents who flourished were not likely to engage in low to no physical activity (r = .04, N = 153, p = .617).

Table 1

Pearson correlation coefficients between flourishing with its subscales and activity level with its subscales

	1.	2.	3.	4.	5.	6.	7.	8.
1. Flourishing or not	-							
2. Emotional Well-being	.20*	-						
3. Social Well-being	.20*	.43**	-					
4. Psychological Well-being	.16*	.67**	.56**	-				
5. Active or not	.19*	.25**	.20*	.14	-			
6. Low to no activity	.04	.10	-.04	-.03	-.05	-		
7. Moderate activity	.18	.47**	.01	-.07	.31**	-.04	-	
8. Vigorous activity	.23*	.06	.09	.01	.60**	.10	.47**	-

***. Correlation is significant at the 0.01 level (2-tailed)*

**. Correlation is significant at the 0.05 level (2-tailed)*

Differences between flourishers and non-flourishers

Results of the Chi-Square tests revealed that flourishers were more often physically active compared to non-flourishers $X^2(1, N = 153) = 4.88$, $p < .05$. This significant difference,

however, was small (φ = .19; p = .018). Additionally, flourishers were more likely to engage in at least 60 minutes of vigorous levels of physical activity than non-flourishers $X^2(1, N = 153) = 3.95$, $p < .05$. Again, the significant difference was small (φ = .17; p = .031). No significant differences could be found between flourishers versus non-flourishers for engagement in at least 250 minutes of moderate activity $X^2(1, N = 153) = 0.94$, $p > .05$.

Table 2

Comparison of flourishers and non-flourishers in different activity levels

	Flourishers n (%)	Non-flourishers n (%)	P-value
Physically active	37 (53.6)	29 (46.4)	.037
Moderate levels of activity	7 (63.6)	4 (36.4)	.333
Vigorous levels of activity	34 (55.7)	27 (44.3)	.047

Discussion

The aim of the current study was to examine the relation between flourishing and physical activity levels in German citizens. In particular, it was hypothesized that people who engaged in moderate to vigorous levels of physical activity were related to higher levels of emotional, social and psychological well-being and to flourishing. It was also hypothesized that flourishers engaged in at least 250 minutes of moderate-intensity physical activity or at least in 60 minutes of vigorous-intensity physical activity per week compared to non-flourishers.

Main findings

It was found that respondents who were physically active, were also more likely to be flourishers and to score higher on emotional and social well-being but not on psychological well-being. Prior experimental as well as longitudinal research has found that physical activity can increase emotional and social well-being as well as flourishing (Chen et al., 2021; Lee & Russell, 2003; Lubans et al., 2012). However, prior studies also found that physical activity was positively related to psychological well-being, while this effect was not observed in the current study (Kim et al., 2017; Zhang & Chen, 2019). One potential explanation for this difference might be the study design. Prior studies examining psychological well-being in relation to physical activity used longitudinal designs or reviewed results of multiple experimental and longitudinal studies, while in the current study, a one-time measurement was used. Next, the prior studies mentioned above, focused on only one specific group of people. For example, Lubans et al. (2012) only focused on children and adolescents while Lee and Russel (2003) focused on women in their 70s and Zhang & Chen (2019) included studies with clinical and non-clinical samples in their review. The current study, in contrast, included healthy male and female participants within a wide age range. This difference could have been another explanation for the differences in outcomes and also gives rise to the need of further examining the effect of age on the relation between mental well-being and physical activity.

Additionally, when comparing flourishers versus non-flourishers on different activity levels, flourishers were significantly more active than non-flourishers, which seemed mainly explained by their higher engagement in vigorous levels of physical activity, because flourishers engaged significantly more in vigorous than in moderate levels of physical activity. However, prior studies found that also moderate levels of physical activity were associated with higher levels of well-being and flourishing (O'Rourke et al., 2021; Paluska & Schwenk, 2000; Schuch et al., 2018). A possible explanation for this difference could be that participants might

have overestimated the frequency and duration of physical activity, which might have led to wrong estimates of activity level. This effect of overestimation was found in prior research by Vandelanotte et al. (2011). This could also be the reason why the IPAQ-SF only had a questionable Chronbach's alpha. Instead of asking participants about their physical activity levels retrospectively, a longitudinal study design should be used which measures physical activity at multiple time points. This might have led to more reliable results. Further, prior studies mainly focused on the relation between psychopathology (e.g. depressive symptoms) and physical activity, while the current study focused on the relation between flourishing and physical activity (Joshi et al., 2016; Rius-Ottenheim et al., 2012; Ströhle et al., 2007; Ten Have et al., 2011). Additionally, most prior studies focused on only one age group, while the respondents in the current study had a wide age range (Joshi et al., 2016; Rius-Ottenheim et al., 2012; Ströhle et al., 2007). Therefore, in contrast to prior research, the current study added the concept of flourishing in relation to physical activity and included participants of a wide age range instead of focusing on one age group.

Strengths and limitations

A strong point of the current study was the sample. It seemed to be a good mix of healthy people, because almost half of the respondents were flourishers, while none of them were languishing. Additionally, 43% of the respondents could be labelled as physically active, which is consistent with the findings from the WHO (2018), which stated that 48% of the German population met the criteria for being physically active. Furthermore, the MHC-SF was used, which makes comparison of results to different studies possible. Moreover, the reliability and validity of the MHC-SF makes it a good measure for assessing different dimensions of mental well-being. Additionally, different dimensions of mental well-being and flourishing were compared with different levels of physical activity. This is different from prior research, which mainly focused on single aspects of mental well-being or on mental illness.

The study also showed some possible limitations. Firstly, the cross-sectional design of the study poses some problems because it is a one-time measurement. Therefore, to avoid biased results, measuring multiple time points would be favourable. Additionally, although the age of participants ranged between 18 and 83 years, most participants were not older than 30 years. Therefore, people with an older age were not sufficiently represented. This could be an explanation why no age differences were found between active and inactive participants. Next, the Chronbach's alpha of the IPAQ-SF was questionable in this study. Therefore, while the reliability of the IPAQ-SF proved to be acceptable in other studies (Craig et al., 2003), the results from this survey in the current study could not be considered reliable. Again, a possible explanation for this could be that people with an older age were not sufficiently represented in this sample. Other limitations might be the effects of the current COVID-19 pandemic. In the current study, almost half of the participants were flourishing. Nevertheless, prior studies showed that the pandemic had a negative effect on mental well-being while the prevalence of negative psychological responses like stress and anxiety increased (Talevi et al., 2020; Usher et al., 2020; Vindegaard & Benros, 2020; WHO, 2021-b). Additionally, physical activity levels were lower during the pandemic because the measures and restrictions due to the pandemic were diminishing the opportunities for different physical activities (Dwyer et al., 2020; Woods et al., 2020). Therefore, the well-being and physical activity level of respondents might have changed by the circumstances in comparison with 1.5 years ago.

Implications for future research

Considering the results and limitations of the current study, implications can be made for future research. Firstly, the current study and prior research suggested an association between physical activity and flourishing, but the causality between the two should be further examined as well (Keyes and Simoes; O'Rourke et al., 2021; Tamminen et al., 2020). Therefore, future research should focus on the question if flourishing causes engagement in

physical activity or if the engagement in physical activity causes flourishing. A longitudinal study design could reveal more about the relation and causality between physical activity and flourishing because of the assessment at multiple time points. It could also rule out possible confounding situational aspects like the current COVID-19 pandemic. Prior studies already used longitudinal designs to investigate the relation between physical activity and different forms of psychological and physical well-being and psychopathology (Chen et al., 2021; Joshi et al., 2016; Lee & Russell, 2003; Lubans et al., 2012; Rius-Ottenheim et al., 2012; Ströhle et al., 2007; Ten Have et al., 2011). However, future research should specifically focus more on the concept of flourishing in relation to physical activity because this relation has not been researched extensively.

Another suggestion for future research is to take different concepts of self-care into account which might have a positive influence on the relation between physical activity and flourishing. For example, Pohlmeier (2017) found in a prior study that positive intentional activities like being optimistic and taking care of one's body had a positive effect on well-being. Physical activity was also one of these self-care activities, next to concepts like nurturing activities and being optimistic (Pohlmeier, 2017). Therefore, other self-care behaviours might be a possible explanation for an increase in physical activity and flourishing.

Additionally, in the current study, no significant differences were found in levels of physical activity for different age groups, although, significant differences were found in other studies (Paluska & Schwenk, 2000; VanKim & Nelson, 2013). While in prior research, physical activity levels were found to be higher in younger age groups, young adults were also found to be likely to flourish (Sallis, 2000; Schotanus-Dijkstra et al., 2016). Therefore, future research should focus on the effect of age on the relation between physical activity and flourishing.

Conclusion

Past research about physical activity and flourishing suggested that there is a relation between these two concepts. Therefore, the current study examined the relation between different levels of physical activity and concepts of mental well-being, while comparing flourishers and non-flourishers. Physically active people seemed to have a higher emotional and social well-being and to be more likely to flourish, especially if they engaged in vigorous levels of physical activity. Regarding prior research and the findings and limitations from this study, exploring the relation between physical activity and flourishing further might make the characteristics of flourishing in everyday life more straightforward. Consequently, flourishing and physical activity could be reinforced in the general population, which could improve people's overall physical and mental health.

References

Biddle, S. J., Fox, K., & Boutcher, S. (Eds.). (2003). *Physical activity and psychological well-being*. Routledge. https://cutt.ly/kxTalmj

Booth, M.L. (2000). Assessment of Physical Activity: An International Perspective. *Research Quarterly for Exercise and Sport, 71* (2): s114-20. https://doi.org/10.1080/02701367.2000.11082794

Chen, S., Calderón-Larrañaga, A., Saadeh, M., Dohrn, I. M., & Welmer, A. K. (2021). Correlations of Subjective and Social Well-Being With Sedentary Behavior and Physical Activity in Older Adults—A Population-Based Study. *The Journals of Gerontology: Series A*. https://doi.org/10.1093/gerona/glab065

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences. *Hillsdle*.

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & science in sports & exercise*, *35*(8), 1381-1395. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1043.9481&rep=rep1&type=pdf

Downward, P., & Dawson, P. (2016). Is it pleasure or health from leisure that we benefit from most? An analysis of well-being alternatives and implications for policy. *Social Indicators Research*, *126*(1), 443-465. https://link.springer.com/content/pdf/10.1007/s11205-015-0887-8.pdf

Dwyer, M. J., Pasini, M., De Dominicis, S., & Righi, E. (2020). Physical activity: Benefits and challenges during the COVID-19 pandemic. *Scandinavian journal of medicine &*

science in sports, *30*(7), 1291. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7323175/

Fusar-Poli, P., de Pablo, G. S., De Micheli, A., Nieman, D. H., Correll, C. U., Kessing, L. V., Pfennig, A., Bechdolf, A., Borgwardt, S., Arango, C., & van Amelsvoort, T. (2020). What is good mental health? A scoping review. *European neuropsychopharmacology*, *31*, 33-46. https://doi.org/10.1016/j.euroneuro.2019.12.105

Hone, L. C., Jarden, A., Schofield, G. M., & Duncan, S. (2014). Measuring flourishing: The impact of operational definitions on the prevalence of high levels of wellbeing. *International Journal of Wellbeing*, *4*(1). https://www.internationaljournalofwellbeing.org/index.php/ijow/article/view/286

Huppert, F. A., & So, T. (2009). What percentage of people in Europe are flourishing and what characterises them. In *IX ISQOLS Conference* (pp. 1-7). http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.550.8290&rep=rep1&type=pdf

Huppert, F. A., & So, T. (2013). Flourishing across Europe: Application of a new conceptual framework for defining well-being. *Social indicators research*, *110*(3), 837-861. https://link.springer.com/article/10.1007%252Fs11205-011-9966-7

IPAQ Research Committee. (2005). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ)-short and long forms. *http://www.ipaq.ki.se/scoring.pdf*.

Joshi, S., Mooney, S. J., Kennedy, G. J., Benjamin, E. O., Ompad, D., Rundle, A. G., Beard, J. R., & Cerdá, M. (2016). Beyond METs: types of physical activity and depression among older adults. *Age and ageing*, *45*(1), 103-109.

https://doi.org/10.1093/ageing/afv164

Kandola, A., Ashdown-Franks, G., Hendrikse, J., Sabiston, C. M., & Stubbs, B. (2019). Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. *Neuroscience & Biobehavioral Reviews, 107*, 525-539. https://doi.org/10.1016/j.neubiorev.2019.09.040

Keyes, C. L. M. (1998). Social well-being. *Social psychology quarterly*, 121-140. https://doi.org/10.2307/2787065

Keyes, C. L. M. (2002). The Mental Health Continuum: From Languishing to Flourishing in Life. *Journal of Health and Social Behavior*, *43*(2), 207-222. https://doi.org/10.2307/3090197

Keyes, C. L. M. (2005). Mental Illness and/or Mental Health? Investigating Axioms of the Complete State Model of Health. *Journal of Consulting and Clinical Psychology, 73*(3), 539–548. https://doi.org/10.1037/0022-006X.73.3.539

Keyes, C. L. M. (2009). Atlanta: Brief description of the mental health continuum short form (MHC-SF).

Keyes, C. L., & Simoes, E. J. (2012). To flourish or not: Positive mental health and all-cause mortality. *American journal of public health*, *102*(11), 2164-2172. https://doi.org/10.2105/AJPH.2012.300918

Kim, E. S., Kubzansky, L. D., Soo, J., & Boehm, J. K. (2017). Maintaining healthy behavior: a prospective study of psychological well-being and physical activity. *Annals of Behavioral Medicine, 51*(3), 337-347. https://doi.org/10.1007/s12160-016-9856-y

Kokkinos, P. (2012). Physical activity, health benefits, and mortality risk. *International Scholarly Research Notices*, *2012*. https://downloads.hindawi.com/archive/2012/718789.pdf

Lamers, S. M., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. (2011). 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

Lee, C., & Russell, A. (2003). Effects of physical activity on emotional well-being among older Australian women: cross-sectional and longitudinal analyses. *Journal of psychosomatic research, 54*(2), 155-160. https://doi.org/10.1016/S0022-3999(02)00414-2

Lubans, D. R., Plotnikoff, R. C., & Lubans, N. J. (2012). A systematic review of the impact of physical activity programmes on social and emotional well-being in at-risk youth. *Child and adolescent mental health, 17*(1), 2-13. https://doi.org/10.1111/j.1475-3588.2011.00623.x

O'Rourke, R. H., Doré, I., Sylvester, B. D., & Sabiston, C. M. (2021). Flourishing or physical activity?: Identifying temporal precedence in supporting the transition to university. *Journal of American College Health*, 1-6. https://doi.org/10.1080/07448481.2021.1879815

Paluska, S. A., & Schwenk, T. L. (2000). Physical activity and mental health. *Sports medicine, 29*(3), 167-180. https://link.springer.com/article/10.2165/00007256-200029030-00003

Pengpid, S., & Peltzer, K. (2019). Sedentary behaviour, physical activity and life satisfaction, happiness and perceived health status in university students from 24 countries. *International journal of environmental research and public health, 16*(12), 2084. https://doi.org/10.3390/ijerph16122084

Penninx, B. W., Guralnik, J. M., Simonsick, E. M., Kasper, J. D., Ferrucci, L., & Fried, L. P.

(1998). Emotional vitality among disabled older women: The Women's Health and Aging Study. *Journal of the American Geriatrics Society*, *46*(7), 807-815. https://doi.org/10.1111/j.1532-5415.1998.tb02712.x

Pohlmeyer, A. E. (2017). How design can (not) support human flourishing. In *Positive Psychology Interventions in Practice* (pp. 235-255). Springer, Cham. https://link.springer.com/chapter/10.1007/978-3-319-51787-2_14

Rius-Ottenheim, N., Geleijnse, J. M., Kromhout, D., van der Mast, R. C., Zitman, F. G., & Giltay, E. J. (2013). Physical activity after myocardial infarction: is it related to mental health?. *European journal of preventive cardiology*, *20*(3), 399-408. https://doi.org/10.1177/2047487312438184

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of personality and social psychology*, *57*(6), 1069. https://doi.org/10.1037/0022-3514.57.6.1069

Santini, Z. I., Torres-Sahli, M., Hinrichsen, C., Meilstrup, C., Madsen, K. R., Rayce, S. B., Baker, M. M., Ten Have, M., Schotanus-Dijkstra, M., & Koushede, V. (2020). Measuring positive mental health and flourishing in Denmark: validation of the mental health continuum-short form (MHC-SF) and cross-cultural comparison across three countries. *Health and quality of life outcomes*, *18*(1), 1-15. https://doi.org/10.1186/s12955-020-01546-2

Saxena, S., Van Ommeren, M., Tang, K. C., & Armstrong, T. P. (2005). Mental health benefits of physical activity. *Journal of Mental Health*, *14*(5), 445-451. https://doi.org/10.1080/09638230500270776

Sallis, J. F. (2000). Age-related decline in physical activity: a synthesis of human and animal studies. *Medicine and science in sports and exercise*, *32*(9), 1598-1600.

https://bit.ly/3pRaV0t

Schotanus-Dijkstra, M., Pieterse, M. E., Drossaert, C. H., Westerhof, G. J., De Graaf, R., Ten Have, M., Walburg, J. A., & Bohlmeijer, E. T. (2016). What factors are associated with flourishing? Results from a large representative national sample. *Journal of happiness studies*, *17*(4), 1351-1370. https://doi.org/10.1007/s10902-015-9647-3

Schuch, F. B., Vancampfort, D., Firth, J., Rosenbaum, S., Ward, P. B., Silva, E. S., Hallgren, M., Ponce De Leon, A., Dunn, A. L., Deslandes, A. C., Fleck, M. P., Carvalho, A. F., & Stubbs, B. (2018). Physical activity and incident depression: a meta-analysis of prospective cohort studies. *American Journal of Psychiatry*, *175*(7), 631-648. https://doi.org/10.1176/appi.ajp.2018.17111194

Ströhle, A., Hoefler, M., Pfister, H., Müller, A. G., Hoyer, J., Wittchen, H. U., & Lieb, R. (2007). Physical activity and prevalence and incidence of mental disorders in adolescents and young adults. *Psychological medicine*, *37*(11), 1657-1666. https://pubmed.ncbi.nlm.nih.gov/17579930/

Talevi, D., Socci, V., Carai, M., Carnaghi, G., Faleri, S., Trebbi, E., Di Bernado, A., Capelli, F., & Pacitti, F. (2020). Mental health outcomes of the CoViD-19 pandemic. *Rivista di psichiatria*, *55*(3), 137-144. https://www.rivistadipsichiatria.it/archivio/3382/articoli/33569/

Tamminen, N., Reinikainen, J., Appelqvist-Schmidlechner, K., Borodulin, K., Mäki-Opas, T., & Solin, P. (2020). Associations of physical activity with positive mental health: a population-based study. *Mental Health and Physical Activity*, *18*, 100319. https://doi.org/10.1016/j.mhpa.2020.100319

Ten Have, M., de Graaf, R., & Monshouwer, K. (2011). Physical exercise in adults and

mental health status: findings from the Netherlands mental health survey and incidence study (NEMESIS). *Journal of psychosomatic research, 71*(5), 342-348. https://doi.org/10.1016/j.jpsychores.2011.04.001

Usher, K., Durkin, J., & Bhullar, N. (2020). The COVID-19 pandemic and mental health impacts. *International Journal of Mental Health Nursing, 29*(3), 315. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7262128/

Vandelanotte, C., Duncan, M. J., Hanley, C., & Mummery, W. K. (2011). Identifying population subgroups at risk for underestimating weight health risks and overestimating physical activity health benefits. *Journal of health psychology, 16*(5), 760-769. https://doi.org/10.1177/1359105310390543

VanKim, N. A., & Nelson, T. F. (2013). Vigorous physical activity, mental health, perceived stress, and socializing among college students. *American Journal of Health Promotion, 28*(1), 7-15. https://doi.org/10.4278/ajhp.111101-QUAN-395

Vindegaard, N., & Benros, M. E. (2020). COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain, behavior, and immunity, 89*, 531-542. https://doi.org/10.1016/j.bbi.2020.05.048

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Cmaj, 174*(6), 801-809. https://www.cmaj.ca/content/cmaj/174/6/801.full.pdf

WHO. (2018). Germany - Physical activity factsheet (2018). *World Health Organization*. https://www.euro.who.int/en/health-topics/disease-prevention/physical-activity/data-and-statistics/physical-activity-fact-sheets/physical-activity-country-factsheets/germany

WHO. (2020). Physical activity. *World Health Organization.*

https://www.who.int/news-room/fact-sheets/detail/physical-activity

WHO. (2021-a). What is Moderate-intensity and Vigorous-intensity Physical Activity? *World Health Organization.* https://www.who.int/ncds/prevention/physical-activity/intensity/en/

WHO. (2021-b). Mental health and COVID-19. *World Health Organization.* https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/publications-and-technical-guidance/noncommunicable-diseases/mental-health-and-covid-19

Woods, J., Hutchinson, N. T., Powers, S. K., Roberts, W. O., Gomez-Cabrera, M. C., Radak, Z., Berkes, I., Boros, A., Boldogh, I., Leeuwenburgh, C., Coelho-Júnior, H. C., Marzetti, E., Cheng, Y., Liu, J., Durstine, L., Sun, J., & Ji, L. L. (2020). The COVID-19 pandemic and physical activity. https://doi.org/10.1016/j.smhs.2020.05.006

Zhang, Z., & Chen, W. (2019). A systematic review of measures for psychological well-being in physical activity studies and identification of critical issues. *Journal of affective disorders*, *256*, 473-485. https://doi.org/10.1016/j.jad.2019.06.024