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Research Article

The relationship between physical activity and mental health: Is more always better?

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ABSTRACT

The current study was designed to examine the relationship between physical activity and mental health. We investigated whether individuals who perceive themselves as physically inactive, recreationists, or active athletes differ in positive (positive affect, subjective well-being, unconditional self-acceptance) and negative mental health outcomes (depression, anxiety, stress, negative affect, conditional self-acceptance). Furthermore, we investigated whether the total level of leisure-time physical activity predicted different mental health indicators. Analysis revealed that physically active respondents (recreationists and active athletes) seem to have better overall mental health status than physically inactive ones. Precisely, physically inactive individuals scored higher on all measures of negative mental health indicators, and lower on all measures of positive mental health indicators, compared with the participants from the two other groups. At the same time, there were no significant differences in these measures between recreationists and active athletes. Besides, a positive association was found between the weekly frequency of leisure-time activity and only two positive indicators of mental health (positive affect and subjective well-being)of all tested. The obtained results suggest that it is often more relevant for mental health whether someone is physically active or not, in general, than how frequently they exercise.

Keywords: physical activity, leisure-time activity, mental health, positive affect, negative affect

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Introduction

In professional sports and psychological literature, the benefits of physical exercise on mental health have become a common research topic, with numerous studies confirming this relationship (e.g., Lubans et al., 2016; Schuch & Vancampfort, 2021). In most of these studies, physical activity is defined as "any bodily movement produced by skeletal muscles that result in energy expenditure" (Caspersen et al., 1985, p. 126), whereas the definition of physical exercise is "a specific type of physical activity that is planned, structured and repeatedly done to improve or maintain physical fitness" (Caspersen et al., 1985, p. 126). Although these terms are often explored interchangeably, physical exercise is a narrower term. Considering that, in this paper will be used a broader term, i.e., physical activity, in order to assess the way in which any physical activity, not only planned, structured and repeated, is related to mental health.

When it comes to mental health, it also seems that more precise terminology should be used when the study results regarding physical activity and mental health are communicated to a broader audience. By stating that doing sports is "good for our mental health" we neither imply only the absence of pathology nor that this relationship is unequivocal and straightforward as it seems. Namely, the construct of mental health is not equated with the absence of psychological problems and/or symptoms, but its definition also includes the presence of positive indicators of psychological functioning (Jahoda, 1958; Seligman & Csikszentmihalyi, 2000). Huppert and Whittington (2003) agree with this, suggesting that positive mental states are not the same as the absence of psychological symptomatology. In line with this conclusion are also the findings that positive and negative affect are related but separate dimensions of affectivity (e.g., Clark & Watson, 1991; Diener et al., 1985). Contemporary definitions of mental health include numerous aspects of a person's functioning, such as overcoming stress, achieving the desired productivity and, realizing one's potential, making a positive contribution to the social community (WHO, 2020). For that reason,

researchers typically pose the question of whether being physically active to some extent can, on one hand, foster its positive indicators (e.g., psychological well-being [Buecker et al., 2021; Jenkins et al., 2021; Lawton et al., 2017], positive affect [Maher et al., 2021], self-efficacy [Craft & Perna, 2004], self-esteem [Schmalz et al., 2007; Zamani Sani et al., 2016]) and, on the other hand, diminish negative ones (e.g., anxiety [Batallio et al., 2020; Stubbs et al., 2017] and depression [Batallio et al., 2020; Morres et al., 2019]). However, this is rarely done within the same study.

During the acute COVID-19 world crisis, physical exercise was recommended as part of mental health protection strategies (Jacob et al., 2020; Marconcin et al., 2022), and it turned out to be an adaptive strategy in overcoming stress caused by this crisis (Popov et al., 2021). Also, it was found that physical exercise is positively associated with stress reduction in the student population (Moeller et al., 2020). The way a person perceives their value is also one of the indicators of mental health that is often tested in relationship with physical exercise (e.g., Zamani Sani et al., 2016). For example, one study claims that aerobic exercise increases self-esteem (Mousavi Gilani & Dashipour, 2017). According to some authors, physical exercise has a preventive function (Chekroud et al., 2018) or is used as an additional activity (i.e., intervention) in treating disordered states (Rosenbaum et al., 2014; Zschucke et al., 2013). One gets the impression that physical exercise is a "vaccine" that protects mental health, but this does not mean that all physical activities are equally beneficial, nor that people who exercise more (e.g., athletes) are necessarily mentally healthier than those who exercise less (Rice et al., 2016). For instance, there are study results that are suggestive of the harmful effects that overtraining and staleness have on mental health (e.g., Peluso & Guerra de Andrade, 2005; Tobar, 2005). White and colleagues (White et al., 2017) conducted a meta-analysis that revealed that the effects that physical activity has on mental health depend on the life domain in which physical activity occurs. According to their study, leisure-time physical activity produces the clearest and most consistent positive effects on mental health (unlike household physical activity, transport-related physical activity, and physical education).

Given that there are, to some extent, inconsistent findings regarding the effects that physical activity produces, researchers should focus on different specificities of physical activity (e.g., type, frequency, duration, intensity) that could potentially lead to divergent mental health outcomes. In this regard, the current study aims to investigate whether different levels and frequencies of physical activity could enrich positive mental health in different ways.

What is the right dose of physical activity to preserve mental health?

Is all physical activity beneficial for mental health? Does a higher intensity, duration or frequency of physical activity necessarily mean better mental health? Research on the connection between cognitive functioning and physical exercise mainly emphasizes the benefit of recreational exercise, which differs in specificities of physical activity from the rigorous training of elite and professional athletes (e.g., Moore et al., 2012; Pennington & Hanna, 2013). Many studies find that moderate intensity of physical exercise is the most effective regarding psychological well-being (e.g., Netz et al., 2005; Wicker & Frick, 2015). However, research that investigated the relationship between physical exercise and mental health is inconsistent in its results. For example, according to some studies, vigorous physical exercise achieves the best benefit for the well-being of adolescents (Costigan et al., 2019), as well as a lower state of anxiety compared to light and moderate activity (Frontini et al., 2021). This may be because the types of sports and activities the respondents practiced (e.g., running and shooting) are not distinguished, but also because researchers frequently do not make a distinction between those who play sports recreationally and those who play sports professionally (Sokić et al., 2021). Similarly, earlier studies differ in terms of the mental health criteria they use, which makes study findings difficult to compare, but it also possibly leads to inconsistent results. One study shows that semi-professional athletes use more constructive emotional regulation strategies than

amateurs (Shirvani et al., 2015). On the other hand, given the greater possibility of injury, overtraining, and stressors that come from performance demands, it can be assumed that elite and professional athletes are more susceptible to psychopathology compared to the general recreational population (Reardon & Factor, 2010). Some authors (Peluso & Andrade, 2005) speculate that the positive effects of physical exercise on mental health that are widely discussed are experienced by respondents who engage in recreational sports, compared to a sedentary lifestyle, while this is not necessarily the case when it comes to elite and professional athletes (due to the abovementioned risks of this profession).

The current study aims to examine the relationship between physical activity and mental health. More specifically, we want to examine whether individuals who perceive themselves as physically inactive, recreationists, or active athletes differ in mental health outcomes (both positive and negative). Also, we are interested in whether total level of leisure-time physical activity (that includes light, moderate, and strenuous exercise) predict different mental health indicators. Given that age may affect the total level of weekly physical activity (Suryadinata et al., 2020; Varma et al., 2017), as well as mental health variables (Carstensen et al., 2020; Han et al., 2019; Lorem et al., 2017; Sun & Sauter, 2021), we will use it as a control variable.

Method

Participants and Procedure

The total sample in the research consisted of 939 respondents from the general population in Serbia (67.1% female), 18–75 years old (M = 26.57, SD = 10.18). Despite the large age range, young people predominated in the sample (Mode = 20; a histogram with age distribution among praticipants is given in Appendix A). The data was collected online between March and May 2022 using the Google form platform. Since we collected data online, the pool of potential study participants was restricted to social networks sites users (i.e., Facebook).The survey link was administered with the help of students who were rewarded with additional points during the exam period. All individuals ≥ 18 years

old were eligible to participate in the study.Before filling out the survey, participants consented to participate in this research study.

Instruments and variables

The Godin Leisure-Time Exercise Questionnaire (GLTEQ)

The Godin Leisure-Time Exercise Questionnaire (GLTEQ); Godin, 2011; Serbian adaptation by Popov et al., 2021) refers to a weekly physical activity self-assessment. Physical activity is defined as the weekly frequency of physical activity that lasts at least 15 minutes and refers to the week preceding the examination. Based on the answers, three categories of physical activity can be distinguished: light (e.g., yoga, easy walking, and archery), moderate (e.g., fast walking, easy bicycling, and tennis), and strenuous (e.g., running, squash, and roller skating). The weekly activity frequencies are multiplied by appropriate metabolic equivalents to obtain the total leisure activity score ([Strenuous x 9] + [Moderate x 5] + [Light x3]; Godin, 2011).

Self-assessment of Physical Activity

Along with the GLTEQ, we asked the participants whether they consider themselves physically inactive, recreationists, or active athletes.

The Depression, Anxiety, Stress Scale (DASS-21)

The Depression, Anxiety, Stress Scale (DASS-21; Lovibond & Lovibond, 1995; translation into the Serbian language is available on the official website[1]) is used for measuring mental health indicators: Depression scale assesses the degree of dysphoria, hopelessness, anhedonia, negative self-view and passivity (α = .90, 7 items, e.g. *I felt that life was meaningless*); Anxiety scale refers to the subjective feeling of situational trepidation, muscle tension and autonomic arousal (α = .90, 7 items, e.g. *I felt I was close to panic*); Stress scale measures nervous arousal, relaxing difficulties, easy agitation and irritability (α = .88, 7 items, , e.g. *I found it difficult to relax*). The respondent should choose the answer that

[1] http://www2.psy.unsw.edu.au/dass/Serbian/DASS-SER.pdf

best describes how he/she felt during the previous two weeks using the 4–point Likert scale (0 – *did not apply to me at all*; 3 – *applied to me very much or most of the time*).

Serbian Inventory of Affect based on the Positive and Negative Affect Schedule-X (SIAB-PANAS)

Serbian Inventory of Affect based on the Positive and Negative Affect Schedule-X (SIAB-PANAS; Mihić et al., 2010) is a Serbian adaptation of PANAS-X (Watson & Clark, 1994). We used a short version of the 20-items questionnaire to assess dispositional positive (PA; α = .87, 10 items, *e.g. excited, attentive, enthusiastic*) and negative affectivity (NA; α = .90, 10 items, *e.g. distressed, irritable, afraid*). The responses are collected using the 5–point Liker scale (1 – *almost none or not at all*, 5 – *extremely*).

The Short Subjective Well-Being Scale (SWBS)

The Short Subjective Well-Being Scale (SWBS; Jovanović, 2010) measures participants' subjective well-being (SWB) through 8 items related to the positive evaluation of life and pleasant emotions (α = .93, e.g. *It is wonderful to be alive*). The responses are collected using the 5–point Liker scale (0 –strongly disagree, 5 – strongly agree).

The Unconditional Self-Acceptance Questionnaire-short scale (USAQ)

The Unconditional Self-Acceptance Questionnaire-short scale (USAQ-short scale; Popov & Sokić, 2022) is a Serbian adaptation of USAQ by Chamberlain and Haaga (2001). The USAQ-short scale consists of 10 items that refer to various aspects of unconditional (4 items) and conditional self-acceptance (6 items). We used scores from the two subscales: Conditional self-acceptance (CSA; α =.90, e.g. *When I am criticized or when I fail at something, I feel less worthy as a person*) and Unconditional self-acceptance (USA; α = .80, e.g. *I feel worthwhile even if I am not successful in meeting certain goals that are important to me*). Responses are collected using the 7–point Likert scale (1 –almost always untrue, 7 – almost always true).

Results

The data were analyzed using an open-source statistical software JASP (Version 0.16.4; JASP Team, 2022). The descriptive statistics for continuous variables used in the research are shown in Table 1. According to values of skewness and kurtosis, the distribution of scale scores does not significantly deviate from normality(skewness < ±2 and kurtosis < ±7; Hair et al., 2010).

Table 1
Descriptive statistics for continual variables in the study

	Theoretical range	Empirical range	*M*	*SD*	*Skewness*	*Kurtosis*
Leisure Activity(GLTEQ)	0-119	0-119	33.63	26.69	1.13	1.07
Depression (DASS-21)	0-21	0-21	5.46	5.54	0.96	-0.03
Anxiety (DASS-21)	0-21	0-21	5.98	5.85	0.81	-0.42
Stress (DASS-21)	0-21	0-21	9.66	5.78	0.20	-0.88
Positive Affect (SIAB-PANAS)	10-50	13-50	38.14	7.18	-0.47	-0.14
Negative Affect (SIAB-PANAS)	10-50	10-50	22.87	8.83	0.79	-0.05
Subjective Wellbeing (SWBS)	8-40	8-40	33.50	6.39	-1.00	0.60
Conditional Self-Acceptance (USAQ-short)	6-42	6-42	17.67	9.25	0.67	-0.42
Unconditional Self-Acceptance (USAQ-short)	4-28	4-28	21.59	5.29	-0.72	-0.04

Intercorrelations among variables are shown in Table 2. All correlations are in the theoretically expected direction.The DASS-21 subscales (depression, anxiety, and stress) correlate positively and very highly with each other. Positive affect moderately and negatively correlates with all three DASS-21 subscales, while a higher positive correlation exists between NA and DASS-21 subscales. Also, there is a negative but moderate correlation between PA and NA. Subjective well-being achieves a high positive correlation with PA, while the correlations with DASS-21 subscales and NA are moderate and negative. Conditional self-acceptance (CSA) moderately and positively correlates with all

three DASS-21 subscales, and NA negatively correlates with SWB and PA. Unconditional self-acceptance (USA) achieves the opposite tendencies to conditional self-acceptance. The correlations of leisure activity score (GLTEQ) with mental health variables are particularly interesting. The total leisure activity score correlates statistically significantly only with the PA and SWB. These correlations are positively directed but low.

Table 2
Intercorrelations among the variables

		1	2	3	4	5	6	7	8	9
1	Age	-								
2	Depression	-.176**	-							
3	Anxiety	-.174**	.803**	-						
4	Stress	-.156**	.728**	.768**	-					
5	PA	.124**	-.416**	-.296**	-.336**	-				
6	NA	-.136**	.675**	.648**	.657**	-.352**	-			
7	SWB	.053	-.509**	-.392**	-.402**	.706**	-.465**	-		
8	CSA	-.183**	.617**	.532**	.521**	-.422**	.632**	-.406**	-	
9	USA	.181**	-.391**	-.342**	-.294**	.465**	-.394**	.427**	-.510**	-
10	Leisure-time Activity	-.137**	-.053	-.050	-.050	.214**	-.042	.145**	-.043	.045

Note. PA – Positive Affect. NA – Negative Affect. SWB – Subjective Wellbeing. CSA – Conditional Self-Acceptance. USA – Unconditional Self-Acceptance.*p<. 01.**p<. 01.

In order to test the differences in mental health indicators between three categories of respondents according to the level of physical activity (physically inactive, recreational athletes and active athletes), we conducted a one-way analysis of variance. The results revealed small but statistically significant between-groups effects in case of all dependent variables (depression, anxiety, stress, PA, NA, SWB, USA, and CSA; Table 3). Because homogeneity of variances assumption was not met in all models except in those where PA and stress were used as dependent variables, as well as because compared groups were not equal in size, Games-Howell post-hoc test was used (Games & Howell, 1976) and the p values are corrected using Tukey method.

Games-Howell test for multiple comparisons found that physically inactive respondents reported significantly higher scores on negative indicators

of mental health compared to recreational athletes; namely, higher anxiety (M_{dif} = 1.81, 95% CI [0.77, 2.85], p < .001), higher depression (M_{dif} = 1.75, 95% CI [0.78, 2.74], p < .001), higher stress (M_{dif} = 1.51, 95% CI [0.50, 2.54], p = .001), higher NA (M_{dif} = 2.26, 95% CI [0.68, 3.83], p = .002), and higher CSA (M_{dif} = 2.79, 95% CI [1.15, 4.44], p < .001). Physically inactive respondents also reported significantly more pronounced symptoms compared to professional athletes: higher anxiety (M_{dif}= 2.43, 95% CI [1.11, 3.75], p < .001), higher depression (M_{dif} = 2.30, 95% CI [1.05, 3.56], p < .001), higher stress (M_{dif} = 1.74, 95% CI [0.37, 3.11], p = .008), higher NA (M_{dif} = 3.43, 95% CI [1.43, 5.42], p < .001), and higher CSA (M_{dif} = 3.81, 95% CI [1.69, 5.93], p = .002). At the same time, recreational athletes and professional athletes did not significantly differ in any of these negative indicators of mental health.

When it comes to positive indicators of mental health, physically inactive individuals had significantly lower PA (M_{dif} = -3.94, 95% CI [-5.17, -2.70], p < .001), lower SWB (M_{dif} = -2.23, 95% CI [-3.32, -1.14], p < .001), and lower USA (M_{dif}= -1.72, 95% CI [-2.65, -0.78], p < .001) compared to recreational athletes. They also scored significantly lower on PA (M_{dif}= -5.64, 95% CI [-7.19, -4.10], p < .001), on SWB (M_{dif} = -3.34, 95% CI [-4.74, -1.94], p < .001) and USA (M_{dif} = -1.33, 95% CI [-2.61, -0.05], p = .039) compared to professional athletes. In addition, comparison of recreational and professional athletes implied that these two groups do not differ in terms of SWB and USA, but that they differ in PA in a way that professional athletes reported higher scores on PA than recreational athletes (M_{dif} = -1.71, 95% CI [-3.09, -0.32], p = .011).[2]

[2] It is worth noting that even when Bonferroni post hoc test is applied (which is more conservative test than Games-Howell test), detected between-groups differences remain the same.

Table 3

The difference in mental health variables due to level of physical activity

Groups: 0:inactive (*n*= 293) 1: recreationists (*n*= 490) 2: active athletes (*n*= 156)		*F* (*df*=2,936; *p*<.001)	ω^2	Games-Howell post-hoc test
	M (SD)			
Depression	0:6.76 (5.90) 1:5.01 (5.33) 2:4.46 (5.08)	12.55	.024	0>1,2
Anxiety	0:7.33 (6.23) 1:5.52 (5.64) 2:4.90 (5.32)	12.27	.023	0>1,2
Stress	0:10.75 (8.09) 1:9.22 (5.51) 2:9.01 (5.76)	7.69	.014	0>1,2
Positive Affect	0: 35.15 (7.27) 1: 39.08 (6.82) 2: 40.79 (6.25)	43.92	.084	2>0,1; 1>0
Negative Affect	0: 24.62 (9.37) 1: 22.36 (8.55) 2: 21.19 (8.08)	9.59	.018	0>1,2
Subjective Wellbeing	0: 31.77 (6.60) 1: 34.01 (6.26) 2: 35.12 (5.66)	17.86	.035	0<1,2
Conditional Self-Acceptance	0: 19.76 (9.79) 1: 16.97 (8.88) 2: 15.96 (8.69)	11.85	.023	0 > 1,2
Unconditional Self-Acceptance	0:20.47 (5.65) 1:22.19 (4.92) 2:21.81 (5.40)	10.00	.019	0<1,2

Note. Values for partial$\omega^2$of value .01 indicate small effect, .06 indicate medium effect, and .14 indicate large effect (Field, 2013).

For testing how total leisure-time activity predicts mental health outcomes, we conducted two hierarchical regression analysis. Given that total leisure-time activity score correlates only with the SWB and PA, these two positive mental health indicators were used as criterion variables.It

should be noted that these correlations, although significant, were small.In both regression models age was entered in the first step to control for its effects. The total leisure-time activity, after controling for the age of the respondents, positively predicted PA, $F(2, 936)=35.13$, $R^2=.07$, $\beta=.24$, $p<.001$, and the SWB, $F(2, 936)=12.80$, $R^2=.03$, $\beta=.17$, $p<.001$. In the first tested model, age positively predicted PA even after including total leisure-time activity score, $\beta=.16$, $p<.001$. In the second model, age was not a significant predictor of the SWB when entered in the initial step. However, it appeared to be a significant predictor of the SWB after including the total leisure activity score, $\beta=.08$, $p=.022$. Nevertheless, all calculated effects were small, and very small percent of variance of the criteria was explained by independent variables.

Discussion

This study aimed to examine the relationship between the level and frequency of physical activity and different positive and negative mental health indicators in the general population. The level of physical activity was defined through the respondents' self-assessment of whether they perceive themselves as physically inactive, recreationists, or active athletes. The frequency of physical activity was operationalized through a composite score calculated based on the weekly frequency of light, moderate, and strenuous leisure-time physical exercise. Depression, anxiety, stress, NA, and CSA scores were used as negative indicators of mental health, while PA, SWB, and USA were used as positive indicators of mental health.

First, we tested whether there are differences in the abovementioned mental health outcomes between physically inactive, recreationists, and active athletes. In line with the theoretical expectations and the results of some previous studies, physically active respondents seem to have better overall mental health status than physically inactive ones. Precisely, participants from the group of physically inactive individuals scored higher on all measures of negative indicators of mental health (depression, anxiety, stress, NA, and CSA), compared with the participants from the two other groups. At the same time, there were no significant differences in these

measures between recreationists and active athletes. Although the effect size of the obtained differences is small, this result was consistently found in studies conducted before and during the COVID-19 crisis in different countries, including Serbia (e.g., Chekroud et al., 2018; Jacob et al., 2020; Popov et al., 2021). One of the explanations for this finding in earlier studies was that physical activity can be understood as a strategy for overcoming stress (i.e., distress reduction) and thus contributes to better outcomes regarding the mentioned mental health indicators. The cross-sectional nature of the current study limits us in conclusions about whether physical activity serves as a protective factor, a strategy that helps people to reduce distress, or simply individuals with acute disordered states less frequently engage in physical activities. However, some longitudinal studies provide us with evidence that (moderate and strenuous) physical activity preceded decrease in symptoms of anxiety and depresson(Battalio et al., 2020). Nevertheless, the effect size for the obtained differences between the groups is small for all variables except for dispositional positive affectivity, where the effect size is medium. Considering these results, physical activity cannot be unambiguously interpreted as a protective factor regarding negative mental health indicators. The reasons for such a small effect size can be methodological. This research did not consider individual differences and temporal and systemic factors that may influence the relationship between physical activity and mental health. When it comes to individual differences in the impact of physical activity on mental health, what may help one person may not help another (Wilson & Rhodes, 2021). Also, the effects of physical activity on mental health can be short-term and temporary. Exercise may only provide immediate relief, but symptoms may return (Paluska & Schwenk, 2000). Also, we assume that the overall impact of physical activity on mental health depends on other factors essential for the individual's functioning, such as social support or quality of social relationships. Physical activity is only one of the factors that can contribute to a comprehensive approach to reducing negative emotionality. The critical question is the respondent's motivation for physical activity. Is it more focused on maintaining physical health and appearance or improving mental health? People more prone to negative

affectivity, as well as a higher degree of anxiety and depression, may not be motivated to exercise.

When it comes to positive indicators of mental health, physically inactive respondents reported significantly lower SWB, PA, and USA than physically active respondents (both recreationists and active athletes). Although the relationship between physical activity and positive mental health indicators has yet to be investigated, a recent meta-analytic study (Buecker et al., 2021) suggested a significant association between SWB and physical activity (this association was found in crossectional, experimental, and quasi-experimental studies). Buecker and colleagues alsohave found that physical activity is more related to PA (as a subdomain of SWB) than to the cognitive aspect of SWB (Buecker et al., 2021). It is interesting to emphasize that there are no differences between the groups of recreationists and active athletes in any mental health indicator assessed in this study, except in PA. Considering the PA, active athletes reported the highest PA, while physically inactive respondents scored the lowest. This finding is in line with the results presented in earlier studies (e.g., Cameron et al., 2018; Maher et al., 2021; Pasco et al., 2011). For example, Maher and colleagues (Maher et al., 2021) reported that physical activity fostered PA during the COVID-19 curfew. In addition, limited experimental findings suggested that experimentally induced PA"could be a promising strategy to promote the pursuit of physical activity goals" (Cameron et al., 2018, p. 13). Thus, it seems that the relationship between PA and physical activity is bidirectional.However, before assuming that an increase in physical activity is followed by linear growth of PA, one should address the question of whether active athletes practice more intense physical activity than recreationists by default. In addition, given that our sample is comprised of people from the general population, we do not know whether those participants who perceive themselves as active athletes are professional athletes (yet this information would help us to make stronger assumptions regarding the difference in intensity of physical activity between those who consider themselves a recreationist and athletes). Our study findings contradict the study findings of those who reported the existence of

a negative association between practicing more intense and strenuous physical activity and PA (e.g., Hall et al., 2002). This is also visible from the positive association that we found between the weekly frequency of leisure-time activity and PA (knowing that strenuous activity has the highest ponder in the composite score calculated from the GLTEQ).We also have found a positive association between the weekly frequency of leisure-time activity and SWB which is also in line with earlier studies. For example, a recent longitudinal study confirmed that four weeks of regular physical activity in a sample from the general population aged 18–64 contributed to higher overall subjective well-being, regardless of the sample's demographic characteristics (Iwon et al., 2021). However, it is of particular interest that the weekly frequency of leisure-time activity did not correlate with any other indicator of mental health except with PA and SWB. It might be that the frequency of participating in physical activities does not play an essential role in the context of most mental health indicators measured in this study. It appears more important whether one is being physically active or not, in general, regardless of the recurrence of the activities.

The present study also has some limitations, the first of which is the usage of self-report questionnaires. While commonly used in physical activity research, self-report questionnaires are associated with recall bias (Schuch et al., 2018). We collected data on the subjects' physical activity via self-assessment, while more objective measuring instruments (e.g., pedometer, pulsometer) were not used. Ideally, physical activity would be measured by both subjective and objective instruments, to make conclusions about the potential discrepancy between these measures. However, no such data were available in the present study. Another limitation of our study stems from the fact that we did not administer our questionnaires in a randomized order. This seems to be important given that one group of researchers tested whether the order of the questionnaires influenced the results in a way that more physically active respondents tended to report more happiness and SWB (Kaczmarek et al., 2021). Namely, they examined whether there is a focusing illusion if the respondents were asked about physical activity first and then about SWB. They found that respondents with moderate physical activity did

report a higher level of SWB when they were asked about their physical activity first, but not the other way around. The question remains whether a similar illusion occurred in our research, considering the order in which the questionnaires were administered.

The obtained results in our study suggest that there are group differences in terms of CSA and USA. Namely, physically inactive respondents reported higher levels of CSA and lower levels of USA compared with the recreationists and active athletes. These are novel findings if we take into account that, to our knowledge, the concepts of CSA and USA have not been tested previously in the context of physical activity. Nowadays a lot of pressure is put on people because society requires that we invest in self-care in various ways – a healthy diet and physical exerciseare frequently on that list. One possible interpretation of our results could be that physically inactive people feel less worthy and successful if they fail to achieve these social standards. However, to investigate this more thoroughly, we should also ask the respondents how they feel about the fact that they are physically inactive. Another potential understanding of the beforementioned study results can be found in the Exercise and self-esteem model (EXSEM; Sonstroem et al., 1994). According to the EXSEM, being physically active can lead to greater perceived self-efficacy, further contributing to self-esteem. Considering conceptual overlaps between self-esteem, USA, and CSA, it could be that the interplay between physical activity, USA, and CSA can be explained via the same mechanisms. Yet, we need more research to further test this assumptionby including the measure of self-efficacy and asking participants to evaluate their self-worth in the context of physical activity instead of asking them to focus on conditional or unconditional acceptance of themselves as a person in general. Finally, it could be that those who are physically inactive avoid physical exercising because that way they want to avoid receiving feedback about their performance (if receiving negative feedback would make them feel less worthy). Although novel and interesting, it seems our finding regarding the relationship between physical activity, CSA, and USA could be better understood by including additional variables.

Aside from evaluating positive and negative indicators of mental health in the context of physical activity, another strength of the present study comes from using a large sample of adult respondents from the general population. The link between physical activity and mental health indicators is evident, although the impact of physical activity on mental health in this study is small. However, further longitudinal and experimental studies are needed to understand the complexity of this relationship. We can find another valuable aspect of our research in using two different measures of physical activity: one based on the self-assessment of the level of physical activity and the other one that indicates the frequency of practicing different light, moderate, and strenuous exercise. Different patterns of results obtained for these two measures imply the importance of how physical activity is operationalized in studies, suggesting that using divergent instruments across studies can be partly responsible for inconsistent research findings. Moreover, it is debatable how accurate people are when they need to assess to what extent they are being physically active. For instance, some people may consider themselves physically inactive because they do not play any sport, neglecting other daily activities such as walking, cycling, household chores, etc. Finally, more information about the intensity of practiced physical activities is needed, given that even recreational activities can demand great physical effort. In contrast, different sports can require different physical effort (e.g., aerobic consumption), meaning that it is possible that some activities practiced recreationally are more physically challenging compared to some sports people actively play.

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Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

Data files are available upon a reasonable request.

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Appendix A

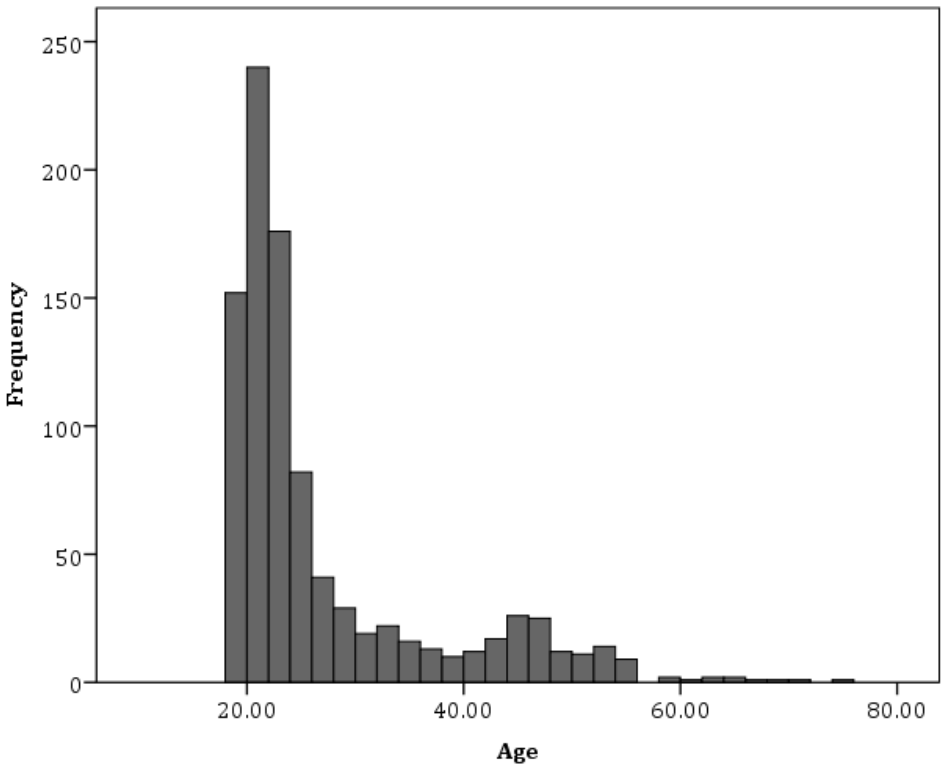

Figure 1. Age distribution among study participants

Note. $M = 26.57$, $SD = 10.18$, $Mode = 20$