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The Relationship Between Physical Activity and Life Satisfaction: The Mediating Role of Social-Physique Anxiety and Self-Esteem

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ABSTRACT

The primary aim of the study was to investigate the relationship between physical activity, life satisfaction, and the mediating effects of social-physique anxiety and self-esteem. Furthermore, this study assessed the measurement invariance of research models according to gender and age. A total of 334 participants (29.43 ± 8.17 years) completed the measures. Path analysis was utilized to appraise the research models. The research models exhibited excellent fit based on the data fit index values. The findings of the study showed a positive relationship between physical activity and both self-esteem and life satisfaction. In contrast, a negative relationship was observed between social-physique anxiety and physical activity. Social-physique anxiety was negatively related to self-esteem and life satisfaction. Furthermore, social-physique anxiety played a mediating role in the correlation between physical activity and life satisfaction. Additionally, self-esteem was a mediator in the relationship between social-physique anxiety and life satisfaction. Physical activity directly and indirectly positively impacted life satisfaction, mediated by social-physique anxiety and self-esteem. Eventually, the finding highlights physical activity's significance in mitigating social-physique anxiety and promoting self-esteem and life satisfaction. Hence, promoting physical activity can yield positive outcomes for both physical and psychological well-being, contributing to an overall improvement in quality of life. Encouraging regular physical activity can be incorporated into public health campaigns and wellness programs, as well as in individualized health plans.

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INTRODUCTION

Physical activity has gained significant attention as a crucial contributor to psychological and physiological health, supported by burgeoning research (Maher et al., 2015; O'Brien et al., 2020). Extensive evidence demonstrates the effectiveness of physical activity in preventing and treating several diseases, including stress, depression, and obesity-related disorders, leading to widespread recommendations by healthcare professionals (WHO, 1997). Moreover, attendance in physical activity is linked to improved general well-being (Brown, 1992). Considering the significant influence of physical activity on health, further research is warranted to delve into the multifaceted aspects of this intricate matter.

Within this context, the primary goal of this study is to reveal the relationship between physical activity and life satisfaction. Physical activity any kind of activity that causes an individual to expend energy in the musculoskeletal system, such as walking, working in the garden, or exercising (Caspersen et al., 1985). Life satisfaction evaluates an individual's general happiness, satisfaction, and subjective well-being (Diener et al., 1985; 1999). Past studies have proven a positive correlation between physical activity and life satisfaction (Elavsky & McAuley, 2005; Maher et al., 2015; Zayed et al., 2018). The mechanisms that connect physical activity and life satisfaction are thought to involve the release of hormones such as endorphins, which play a crucial role in overall bodily health (Dishman & O'Connor, 2009), reduction in depression symptoms (Craft & Perna, 2004; Schuch et al., 2018), promotion of cognitive development (Hillman et al., 2008), positive emotions (Reed & Buck, 2009), and overall well-being (Steptoe & Butler, 1996). However, the precise mechanisms underlying this relationship require further investigation. Therefore, researchers are exploring various potential mediators, such as loneliness (Santino et al., 2022), self-control (Zhou et al., 2023), well-being (Randall et al., 2021), and weight perception (Meyer et al., 2021), to explore the relation between physical activity and life satisfaction. In the context of these explanations, it is essential to recognize that the relationship between physical activity and life satisfaction is complex and can be influenced by many different variables. In this study, it was thought that social-physique anxiety and self-esteem may also be important mediators in this relationship.

Social-physique anxiety can be defined as the unease or apprehension individuals feel concerning how their bodies appear in social settings. This often results in body comparisons and a fear of being negatively judged by others (Hart et al., 1989). Notably, evidence suggests a significant relationship between social-physique anxiety and physical activity (Brunet & Sabiston, 2009). This relationship may arise from the inherent evaluation of body shape in

environments where physical activities are undertaken (Sabiston et al., 2014). However, it is essential to note that the existing literature presents conflicting findings regarding the relationship between physical activity and social-physique anxiety. Some studies report a negative relationship (Brunet & Sabiston, 2009; Herring et al., 2021; Kowalski et al., 2001), while others indicate a positive relationship (Aşçı et al., 2006; Bowden et al., 2005), and some studies find no significant relationship (Niven et al., 2009; Portman et al., 2018). These divergent findings underscore the need for further research to understand the relationship between physical activity and social-physique anxiety. Furthermore, it is also explained that life satisfaction, which is defined by concepts such as happiness and well-being (Diener et al., 1985; 1999), has a negative relationship with social-physique anxiety (Erçevik, 2021; Ürün & Öztürk, 2020). The literature has also reported that social-physique anxiety negatively affects variables such as well-being (Berger et al., 2021; Brown, 1992). All these findings suggest that the level of physical activity can be influenced by social-physique anxiety, which can affect life satisfaction. In other words, social-physique anxiety could mediate between physical activity and life satisfaction.

Another crucial mediating variable examined within this study is self-esteem. Self-esteem is essential in human existence, as it represents an individual's optimistic or pessimistic evaluation of themselves (Rosenberg et al., 1995). Social-physique anxiety might be related to self-esteem, including self-assessments (Hart et al., 1989). Some studies indicate that individuals with low self-esteem might experience more anxiety about being negatively evaluated by others (Brunet et al., 2010; Hagger & Stevenson, 2010). Additionally, it is reported that individuals who experience anxiety about their appearance might experience a decrease in self-esteem and an increase in negative emotions (Brunet et al., 2010; Davison & McCabe, 2006). Low self-esteem can lead to decreased life satisfaction due to increased negative emotions (Diener & Diener, 1995; McPhie & Rawana, 2012; Ürün & Öztürk, 2020) because self-esteem is an important predictor of life satisfaction (Maher et al., 2015). All these findings together suggest that self-esteem might be a mediating variable in the relationship between social-physique anxiety and life satisfaction.

To summarize, recent research findings have provided compelling evidence that engaging in physical activity yields positive outcomes in terms of life satisfaction (Elavsky & McAuley, 2005; Maher et al., 2015; Zayed et al., 2018), social-physique anxiety (Brunet & Sabiston, 2009; Herring et al., 2021; Kowalski et al., 2001), and self-esteem (Legrand et al., 2020). Furthermore, existing literature has documented a negative relationship between social-physique anxiety and self-esteem (Brunet et al., 2010; Hagger & Stevenson, 2010), as well as

between social-physique anxiety and life satisfaction (Erçevik, 2021; Ürün & Öztürk, 2020), while conversely revealing positive links between self-esteem and life satisfaction (Bozoğlan et al., 2013; Chen et al., 2006; Diener & Diener, 2009). However, it is worth noting that comprehensive research examining the correlation between physical activity and life satisfaction, with due consideration to social-physique anxiety and self-esteem as potential mediating variables, remains limited. Exploring the intricate relationships among these concepts within a unified framework can contribute significantly to the existing body of literature. Additionally, it is crucial to emphasize that much of the prevailing research on social-physique anxiety and self-esteem primarily focuses on adolescents and women (Sabiston et al., 2014). Therefore, investigating these correlations among adults can yield further advancements in the field. In light of these considerations, the principal aim of this study was to investigate the relationship between physical activity and life satisfaction. At the same time, delve into the potential mediating influences of social-physique anxiety and self-esteem.

The findings of this study will significantly contribute to the current body of literature by offering a comprehensive insight into the interconnections among variables of the research. Identifying mediating variables would provide valuable information about the mechanisms behind the efficacy of physical activity on life satisfaction. Thus, with a deeper understanding of the factors affecting life satisfaction, it becomes possible to make positive changes that can increase the general life satisfaction of individuals. Additionally, examining measurement invariance would enhance the applicability of the findings, offering valuable insights for future research and interventions aimed at various subgroups.

Measurement Invariance

It is crucial to consider subgroups, such as gender and age, in modeling studies and examine their consistency (Vandenberg & Lance, 2000). aIt is important to assess measurement invariance to determine whether the model retains the similar structure among subgroups (Cheung & Rensvold, 2002). About physical activity, life satisfaction, social-physique anxiety, and self-esteem, it is essential to examine literature findings related to gender and age variables within the model of this research.

> Some studies have reported that physical activity levels differ by age and gender (Azevedo et al., 2007; Bauman et al., 2009; Troiano et al., 2008). In these studies, it was reported that the physical activity levels of men were higher than women, and the physical activity levels of the individuals decreased as they aged.

Regarding life satisfaction, there are conflicting findings about gender differences. Some studies claim that men have higher life satisfaction (Pinquart & Sörensen, 2001), while others indicate no gender difference (Diener et al., 1999; Stone et al., 2010). Age and life satisfaction often exhibit a U-shaped trend, characterized by lower levels in middle adulthood followed by an upturn in later adulthood (Blanchflower & Oswald, 2008).

Social-physique anxiety varies according to gender and age, with higher levels of social-physique anxiety in women as age increases (Hagger & Stevenson, 2010; Zartaloudi et al., 2023). However, measurement invariance of social-physique anxiety has yielded conflicting results, with some studies indicating no distinction according to age and gender (Abdollahi et al., 2023; Pacewicz et al., 2023; Tiggemann, 2004).

The findings concerning gender discrepancy in self-esteem are inconsistent. Certain studies propose that men exhibit superior self-esteem than women (Bleidorn et al., 2016; Kling et al., 1999), while others indicate no significant difference (Trzesniewski et al., 2003). Moreover, the relationship between age and self-esteem can differ across various stages of adulthood. Higher self-esteem is commonly reported in early adulthood, followed by a decline during middle adulthood and a subsequent increase in older adulthood (Orth et al., 2012; Robins et al., 2002).

It is crucial to recognize that these findings may not hold for every individual and can be impacted by various variables, including financial, health status, and personal circumstances (Diener et al., 1999; Orth et al., 2012). Given the contradictory findings reported in previous studies and individual variations, it is imperative to analyze the measurement invariance of variables, including gender and age, in the current study. An analysis of the measurement invariance of variables such as physical activity, life satisfaction, social-physique anxiety, and self-esteem across various subgroups can be attained more thoroughly comprehend the relationship between these factors. Therefore, a secondary aim of this study was to assess whether the research models exhibit measurement invariance across various gender and age groups.

METHODS

Research design

The study utilized a correlational research approach to investigate the relationships between variables. The convenience sampling method was employed in the study. Structural

equation modeling was utilized to assess the validity of the model constructed for exploring these relationships.

Study Group

Determining the appropriate size of a research group can be challenging, and different methods have been proposed for this purpose. Comrey and Lee (1992) introduced a classification for sample size, indicating that a group of 300 is considered good. The research group comprised 174 women and 160 men, with 334 participants. Participants were among the ages of 18-45 (mean 29.43, years ± 8.17). Participants, 58.1% (194 people) fell within the 18-29 age range, while 41.9% (140 people) were in the 30-45 age range.

Data Collection Tools

Personal characteristics, an information form with three open-ended questions and the Sports Awareness Scale (SAS) developed by Uyar and Sunay (2020) were used to collect research data. In the personal information form in the first part of the data collection tool, there are eleven personal information items and three open-ended questions to determine the gender, age, marital status, educational status, professional experience, job title, unit of employment, monthly income, province of residence, relationship with sports, and reason for choosing the profession.

Data Collection Process

Physical Activity Scale-2 (PAS-2) assessed physical activity and sedentary behavior in adults. PAS-2 was initially developed by Pedersen et al. (2018) and later adapted by Gür (2021). PAS-2 includes nine items that assess sedentary behavior during work, transportation, and leisure time, as well as physical activity levels of different intensities. Calculating the metabolic equivalent (MET) equivalents of each item on the scale makes it possible to estimate an individual's daily and weekly physical activity levels. In addition, the test-retest reliability coefficient in Gür's (2021) scale version was 0.81.

The Social-Physique Anxiety Scale (SPAS) was originally developed by Hart et al. (1989) as an evaluation of individuals' levels of social-physique anxiety. SPAS was later adapted to the Turkish context by Mülazımoğlu-Ballı and Aşçı (2006), and its cross-cultural validity was further investigated by Hagger et al. (2007). Based on their findings, Hagger et al. (2007) recommended using seven items from the scale and confirmed its one-dimensional structure in Turkish culture. The SPAS is a five-point Likert-type. SPAS was evaluated with a total score, the lowest possible score was seven and the highest was 35. It shows that as the

score obtained from the SPAS increases, the level of anxiety about the person's appearance also increases. In this study, the Cronbach alpha reliability coefficient of the scale was 0.86.

The Global Self-Esteem Scale, originally developed by Rosenberg (1965), is widely used to assess self-esteem. The questionnaire was adapted to the Turkish context by Çuhadaroğlu (1986) to ensure its relevance and applicability to the target population. The scale comprises ten items that designed to measure a single construct. Participants respond on a four-point Likert type. A score between 0 and 6 can be obtained from the scale. In the Turkish adaptation, scores between 0 and 1 indicate low self-esteem, scores between 2 and 4 indicate medium self-esteem, and between 5 and 6 indicate high self-esteem. An increase in the score obtained from the scale suggests an increase in self-esteem. The Cronbach's alpha coefficient of the scale was found to be 0.75 in this study.

The Satisfaction with Life Scale, developed by Diener et al. (1985), was adapted to Turkish by Dağlı and Baysal (2016) to assess individuals' satisfaction with their lives. The scale comprises five items, each rated on a 5-point Likert type. It was a unidimensional scale, scored from 1 to 5, and the total score was obtained by calculating the average of the responses. An increase in the Satisfaction with Life Scale score indicated an increase in life satisfaction. The Cronbach's alpha coefficient of the scale was 0.89 for this study.

Procedure

The study received ethical approval from the Ethics Committee of Pamukkale University (30/03/2021-07) and adhered to the principles outlined in the Declaration of Helsinki. Participation in the study was voluntary, and participants received written and oral explanations regarding their participation and the importance of providing accurate information. Research data were collected face-to-face and online. Face-to-face forms (197 people) were filled out by the participants in places such as cafes, workplaces, and sports fields near the researchers. Online forms were applied to the participants (137 people) through the social media accounts of the researcher and their relatives. No specific list of names was created for the participants, and data collection tools were randomly sent and collected from their social media accounts. Necessary explanations were written on the data collection tools for the target participants. No identifying information, such as their names, was requested, ensuring that their identities remained confidential. To increase the return, the data was shared twice. There was no time limit for filling out the forms. Participants were also assured that their privacy and confidentiality would be maintained throughout the study.

Data Analysis

Descriptive statistics and structural equation model (SEM) analyses were implemented to investigate the relationships between research variants. The data analyses were performed using SPSS version 21.0 (IBM Corp., Armonk, NY) and AMOS version 23.0 (IBM Corp., Wexford, PA) software. The first stage of data analysis involved conducting descriptive statistics, assessing the data's normality, evaluating measures' reliability, and handling missing values. For the normality analysis, the ±2 interval suggested by George and Mallery (2012) was used for skewness and kurtosis values. The reliability evaluation was based on the value of 0.70 recommended by Nunnally and Bernstein (1978). In the second step, the correlation coefficients between the variables were calculated. In the third stage, path analysis, a component of the structural equation model, was employed to evaluate the adequacy of the research model. While evaluating the path analysis, acceptable limits were set according to Marsh et al., (2004), including the ratio of chi-square to degrees of freedom (x^2/df) was smaller than three, comparative fit index (CFI), Tucker–Lewis index (TLI) more significant than 0.90, and standardized root mean square residual (SRMR), root-mean-square error of approximation (RMSEA) < .08/.10. Perfect fit limits were also considered, including x2/df < 2.00, CFI, TLI > 0.95, and SRMR, RMSEA < 0.05. In the fourth stage, to ensure measurement invariance was conducted by including gender and age variables and evaluating configural, metric, scalar, and strict invariances. The criteria suggested by Chen (2007) and Cheung and Rensvold (2002) were used to assess the degree of invariance, with ΔCFI (change in CFI) and ΔRMSEA (change in RMSEA) values compared between the nested models. The significance of the chi-square difference ($\Delta\chi 2$) for measurement invariance should also be reported.

RESULTS

Upon examining the mean values, it was thought that the scores for social-physique anxiety fell within the moderate range, while the scores for self-esteem and life satisfaction were slightly above average. The normality assumption was confirmed as the skewness and kurtosis values for the variables fell within the recommended range of ±2, indicating that the data followed a normal distribution. The Cronbach's alpha coefficients of the scales ranged from 0.75 to 0.89. Additionally, composite reliability values ranged from 0.86 to 0.90, further confirming the reliability of the scales. These values indicated acceptable internal consistency coefficients. Table 1 reports the descriptive statistics.

Table 1
Descriptive, Reliability and Correlation of the Research Variables

Variables	*M* ±*SD*	Skewness	Kurtosis	α	*CR*	1	2	3	4
1. Physical activity	2364.571 ±352.269	.776	1.772	-	-	-			
2. Social-physique anxiety	18.03 ±6.75	.541	-.556	.86	.86	-.226**	-		
3. Self-esteem	5.22 ±4.02	1.057	.170	.75	.90	.082	-.296**	-	
4. Life satisfaction	3.24 ±.96	-.287	.565	.89	.90	.226**	-.392**	.233**	-

**p < .01, * p < .05
Note. α = cronbach alpha, CR = composite reliability

According to the correlation coefficients reported in Table 1, positive relationships were observed between physical activity and both life satisfaction and self-esteem. Conversely, social-physique anxiety negatively affected physical activity, self-esteem, and life satisfaction. Apart from physical activity and self-esteem, all the correlation coefficients reached statistical significance at the p < .01 level.

Research models

The research model (Figure 1) was developed to depict the relationships among physical activity, social-physique anxiety, self-esteem, and life satisfaction. According to the model, the level of physical activity influences life satisfaction by impacting both social-physique anxiety and self-esteem. Additionally, social-physique anxiety directly influences life satisfaction through its effect on self-esteem.

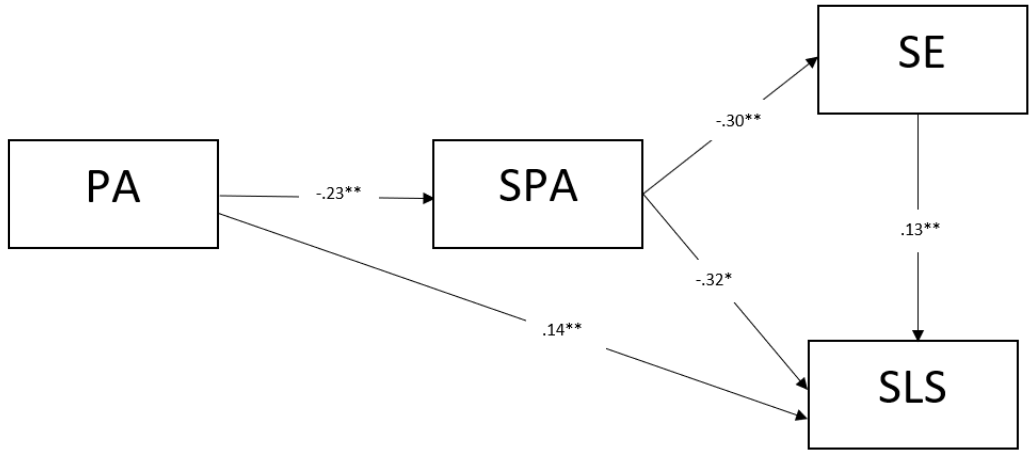
The results of the path analysis indicated that the research model provided a perfect fit for the datum (Table 2). The x2/df < 3, the RMSEA and SRMR values were less than 0.05. Additionally, the values of CFI, TLI, and IFI exceeded 0.95, as indicated in Table 3. The standardized coefficients indicated that physical activity positively influenced life satisfaction (β = .14, p < .01), and self-esteem positively influenced life satisfaction (β = .13, p < .01). Conversely, the relationships between physical activity and social-physique anxiety (β = -.23, p < .001), social-physique anxiety and self-esteem (β = -.30, p < .001), and social-physique anxiety and life satisfaction (β = -.32, p < .001) were negative. The path coefficients were shown in Figure 1. In addition, the research model was repeated for men and women, 18-29 years old and 30-45 years old. Similar results were obtained with the research model in the models made according to gender and age (Table 2).

Table 2
Model-Test Findings of Study Variables

Variables	χ^2	*df*	χ^2/df	*p*	*RMSEA*	*SRMR*	*CFI*	*TLI*	*IFI*
Research model	.090	1	.090	.764	.000	.005	1.000	1.000	1.000
Female	003	1	.003	.953	.000	.001	1.000	1.091	1.014
Male	1.448	1	1.448	.229	.053	.029	.991	.945	.992
18-29 years	.197	1	.197	.657	.000	.009	1.000	1.071	1.011
30-45 years	1.155	1	1.155	.212	.063	.031	.987	.923	.988
Perfect fit thresholds			<3	>.05	<.05	<.05	>.95	>.95	>.95

Based on the findings derived from the path analysis of the research model (as illustrated in Figure 1), there exist significant relationships between various factors: physical activity and social-physique anxiety, social-physique anxiety and self-esteem, and self-esteem and life satisfaction. Indirect relationships were also found between physical activity and life satisfaction, mediated by social-physique anxiety, and between social-physique anxiety and life satisfaction, mediated by self-esteem. Findings suggest that an increase in physical activity was related to a decrease in social-physique anxiety, leading to an increase in life satisfaction. Conversely, higher social-physique anxiety was related to lower self-esteem, resulting in decreased life satisfaction.

Figure 1
The Research Model of the Study Variables



Chi-Square = .090, df = 1, P-value = .764, RMSEA = 0.000
standardized coefficient, p < .01*, p < .001**
Note. PA = physical activity, SPA = social-physique anxiety, SE = self-esteem, SLS = satisfaction with life.

The model analysis results, as presented in Table 3, revealed that the strongest effect in the model was observed for the relation between social-physique anxiety and life satisfaction. The effects of social-physique anxiety on self-esteem, physical activity on social-physique anxiety, self-esteem on life satisfaction, and physical activity on self-esteem were observed. These findings suggest that social-physique anxiety significantly influences overall life satisfaction. Additionally, social-physique anxiety impacts self-esteem, physical activity influences social-physique anxiety, self-esteem contributes to life satisfaction, and physical activity affects self-esteem.

Physical activity standardized indirectly affected life satisfaction through social-physique anxiety ($\beta 2$ = .081). Social-physique anxiety indirectly affected life satisfaction through self-esteem ($\beta 2$ = -.037). Physical activity indirectly affected self-esteem through social-physique anxiety ($\beta 2$ = .067). All direct (Table 3) and indirect path coefficients established in the research models were determined to be meaningful.

Table 3
Direct Paths Analysis of Study Variables with Bootstrap Analysis from the Research Model

Variables			B^1	β^2	*SE*	*CR*	*p*
SPA	<--	PA	-.004	-.226	.001	-4.233	p<.001
SE	<--	SPA	-.059	-.296	.010	-5.654	p<.001
SLS	<--	SE	.091	.126	.037	2.439	p<.01
SLS	<--	SPA	-.046	-.322	.008	-6.083	p<.001
SLS	<--	PA	.000	.142	.000	2.808	p<.01

Note. β^1 = non-standard coefficients, β^2 = standard coefficients, PA = physical activity, SPA = social-physique anxiety, SE = self-esteem, SLS = satisfaction with life

Measurement invariance

Measurement invariance findings from the research model indicated that the data fit indices for gender and age levels met the recommended thresholds for $\chi 2/df$, RMSEA, and SRMR scores, as presented in Table 2. However, upon analyzing the research model, it was found that the gender variable did not demonstrate metric, scalar, and strict invariance (see Table 4). On the other hand, the age variable exhibited structural, metric, scalar, and strict invariance in the research model (see Table 4).

Table 4
The Research Models Short Form Measurement Invariance Results by Gender, Age Level

	Invariance Test	χ2 (df)	Δ χ2 (Δ df)	CFI	Δ CFI	RMSEA	Δ RMSEA	Invariant?
Gender for Short Form	Configural invariance	1.452 (2)	-	1.000	-	.000	-	Yes
	Metric invariance	8.992 (7)	7.540 (5)**	.983	.017	.029	.029	No
	Scalar invariance	14.762 (8)	5.770 (1)	.941	.042	.050	.021	No
	Strict invariance	22.664 (11)	7.902 (3)	.898	.043	.057	.007	No
Age level for Short Form	Configural invariance	1.754 (2)	-	1.000	-	.000	-	Yes
	Metric invariance	5.995 (7)	4.241 (5)**	1.000	.000	.000	.000	Yes
	Scalar invariance	8.105 (8)	2.111 (1)**	.999	.001	.006	.006	Yes
	Strict invariance	9.036 (11)	.931 (3)**	1.000	.001	.000	.006	Yes

DISCUSSION

The findings of this research, which investigated the relationships among physical activity, social-physique anxiety, self-esteem, and life satisfaction, indicate that an increase in physical activity levels results in an enhanced sense of life satisfaction. This relationship is observed through both direct and indirect avenues. Notably, social-physique anxiety and self-esteem act as mediating factors in the indirect relationship. Furthermore, self-esteem serves as a mediator between social-physique anxiety and life satisfaction.

This study offers evidence in support of a positive correlation between physical activity and higher life satisfaction. This finding is consistent with previous research conducted (Elavsky & McAuley, 2005; Maher et al., 2015; Zayed et al., 2018) and further strengthens the validity of the relationship between physical activity and life satisfaction. When reviewing the existing literature, it can be observed that an increase in the level of physical activity supports positive emotions (Ludwig & Rauch, 2018), enhances well-being (Steptoe & Butler, 1996), reduces fatigue, and raises energy levels (Puetz et al., 2006), thus influencing variables that impact life satisfaction. Furthermore, it is observed that physical activity's physiological contributions (Dishman & O'Connor, 2009) and psychological benefits (Craft & Perna, 2004; Reed & Buck, 2009; Steptoe & Butler, 1996) lead to increased life satisfaction. Possibly, the positive psychological and physiological contributions of the increase in the level of physical activity individuals cause individuals to have a more positive outlook on life (O'Brien et al.,

2020; Maher et al., 2015). This also affects life satisfaction. However, research also indicates that life satisfaction can be approached as a broad term and can be influenced positively or negatively by various variables (Elavsky & McAuley, 2005; Maher et al., 2015; Zayed et al., 2018). Both the existing literature and the findings of this study show that mediating variables significantly affect the relationship between physical activity level and life satisfaction.

Based on the findings of this study, it can be said that social-physique anxiety functions as a mediator between physical activity and life satisfaction. The study observed that a high physical activity level is linked to a low level of social physique anxiety, positively influencing life satisfaction. This observation aligns with previous research that supports the relationship between physical activity and social-physique anxiety (Brunet & Sabiston, 2009; Herring et al., 2021; Kowalski et al., 2001), as well as the connection between social-physique anxiety and life satisfaction (Erçevik, 2021; Ürün & Öztürk, 2020). Individuals with high levels of social-physique anxiety might avoid participating in physical activities in public settings due to concerns about their bodies and the fear of judgment (Brunet & Sabiston, 2009; Eng et al., 2001) and may even have more difficulty enjoying various aspects of life (Eng et al., 2005). This anxiety could lead to a decrease in life satisfaction. On the other hand, adopting a different perspective by increasing physical activity level can have a protective effect. Engaging in activities such as exercise can enhance body confidence and a positive body image (Campbell & Hausenblas, 2009; Cruz-Ferreira et al., 2011; Legrand et al., 2020). This, in turn, may lead to a reduction in social physique anxiety. Consequently, as individuals' body concerns decrease, an improvement in life satisfaction can be observed (Ürün & Öztürk, 2020). Indeed, existing literature supports the relationship between social-physique anxiety and negative body image (Zartaloudi et al., 2023), increased anxiety disorders (Herring et al., 2021), and decreased overall well-being (Berger et al., 2021), all of which can negatively impact life satisfaction. Therefore, promoting activities such as exercise, which can help alleviate social-physique anxiety or enhance physical activity levels, has gained further significance.

This study has revealed a significant negative correlation between social-physique anxiety and life satisfaction, with self-esteem as a mediating factor in this relationship. Similar research has supported the connections between social-physique anxiety and self-esteem (Brunet et al., 2010; Hagger & Stevenson, 2010), social-physique anxiety and life satisfaction (Erçevik, 2021; Ürün & Öztürk, 2020), as well as self-esteem and life satisfaction (Bozoğlan et al., 2013; Chen et al., 2006). Self-esteem, as defined, pertains to an individual's positive or negative self-evaluations (Rosenberg et al., 1995). Social physique concerns can lead to negative self-evaluations, self-criticism, and pessimistic thoughts (Hart et al., 1989), potentially

leading to a decline in self-esteem. An individual characterized by high social-physique anxiety and low self-esteem may consequently experience a detrimental impact on their life satisfaction due to these negative self-evaluations (Hagger & Stevenson, 2010). Supporting this finding, low self-esteem has been found in the literature to be related to many variables that can negatively affect life satisfaction, such as depression (Orth & Robins, 2013) and emotional and behavioral problems (Leary et al., 1995). In summary, these findings underline that social-physique anxiety is directly related to life satisfaction, operating through the mediating influence of self-esteem.

As an additional discussion, in this study, the initial hypothesis was that self-esteem would mediate between physical activity and life satisfaction. However, the results indicated no significant correlation between physical activity and self-esteem in the constructed model. For this reason, physical activity and life satisfaction links were not included in the model. Notably, existing literature generally supports a positive relationship between physical activity and self-esteem (Altıntaş et al., 2014; McAuley et al., 2005; Tremblay et al., 2000; Zamani Sani et al., 2016). Nevertheless, sporadic studies in the literature present conflicting outcomes in this regard (Liu et al., 2015). We propose that further investigation should be conducted to discern whether this particular outcome is unique to the dataset of this study or if it might be attributed to cultural differences. These intricate findings imply the possibility of other underlying factors that might predominantly mediate the relationship between physical activity and self-esteem. Current research suggests that social-physique anxiety could potentially play a pivotal role as a mediating element in the connection between these variables.

Measurement invariance

Another objective of this research is to evaluate the measurement invariance of this research model across various genders and ages. These findings revealed that the research model achieved measurement invariance based on age variables, while measurement invariance based on gender was not attained. It is worth noting that previous research suggests potential differences in variables such as social-physique anxiety and physical activity between genders (Azevedo et al., 2007; Hagger & Stevenson, 2010; Zartaloudi et al., 2023). Gender differences might have influenced the absence of measurement invariance in the research model. However, it is significant to note that the research model demonstrated satisfactory data fit for both men and women, suggesting that the model is valid and

applicable to both genders. Therefore, despite the lack of measurement invariance, the research model can be considered applicable and relevant for both genders.

Limitations

By limiting the age range to 18-45 years, the generalizability of the findings to other age groups may be limited. Moreover, despite the study's efforts to maintain gender parity, it is essential to acknowledge that gender-related disparities may exist in the correlation between physical activity and the variables investigated in this research. Subsequent studies could examine these discrepancies by concentrating on single-gender cohorts or comparing outcomes across various age groups.

An additional constraint of this research is its cross-sectional design, which precludes causality determination. Future research with longitudinal or experimental designs could provide more insights into the relationships between physical activity, social-physique anxiety, self-esteem, and life satisfaction over time.

Moreover, the study solely investigated self-esteem as a mediating variable and did not establish a significant relationship with the level of physical activity. Future studies could explore additional potential mediator variables, such as mood measures, to enhance the comprehension of the relationship between physical activity, social-physique anxiety, self-esteem, and life satisfaction.

CONCLUSION

Overall, this study underlines the significance of physical activity in enhancing life satisfaction. The results indicate that increased physical activity is related to favorable outcomes, including elevated self-esteem and life satisfaction, while reducing social-physique anxiety. Therefore, it is recommended for individuals of various age groups to do regular physical activity to develop their overall welfare and well-being. Future research endeavors could extend these findings by examining the long-term outcomes of physical activity on health using longitudinal or experimental study designs.

PRACTICAL IMPLICATIONS

It is worth noting that engaging in physical activity has reduced social-physique anxiety and enhanced self-esteem, resulting in higher life satisfaction. Hence, promoting physical activity can yield positive outcomes for both physical and psychological well-being, contributing to an overall improvement in quality of life. Encouraging regular physical activity

can be incorporated into public health campaigns and wellness programs, as well as in individualized health plans. Furthermore, healthcare professionals can actively engage in conversations with their patients about the advantages of physical activity and offer guidance on integrating exercise into their daily routines, providing them with valuable resources and support in the process.

Physical activity is recommended to prevent and treat many physical and psychological diseases (WHO, 1997; Liu et al., 2015). Due to its lack of side effects, physical activity is readily accessible and cost-effective, making it an efficient and affordable approach to improving overall well-being. Therefore, we highly recommend that individuals of all ages increase their physical activity level and engage in exercise activities, such as using the stairs, walking instead of driving short distances, going to the gym, and walking. These recommendations can have positive results for individuals' physical and psychological well-being.

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Authors' contributions

Both authors contributed conception and design of the study; both authors have collected data; the first author analyzed, and interpretation of the data; the first author contributed to drafting the article, its critical revisions, and reviewing the results, then both of them approved the final version of the manuscript.

Conflict of interest declaration

The authors declare that they have no conflict of interest.

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