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# Mechanism Between Physical Activity and Academic Anxiety: Evidence from Pakistan

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**Abstract:** A plethora of research has explored the benefits of physical activities on several variables such as academic performances, quality of life, fitness, levels of stress, and depression. However, less research considered the impact of physical activity on academic anxiety, self-enhancement, and self-criticism. This study examines the influence of physical activity on academic anxiety with self-enhancement and self-criticism playing a mediating role. Data for this model has been collected by using structured questionnaires administered to 418 Pakistani university students (undergraduate, graduate and post-graduate) aged between 18 and 36 years old. Structural equation modeling through analysis of moment structures (AMOS) was applied to find that physical activity significantly reduces academic anxiety and self-criticism, and it develops self-enhancement. Further, self-enhancement was negatively associated with academic anxiety while self-criticism is directly related to academic anxiety. More importantly, self-enhancement and self-criticism partially mediated between physical activity and academic anxiety of university students in Pakistan. This research recommends governments to support physical activity programs for university students.

**Keywords:** physical activity; self-enhancement; self-criticism; academic anxiety; university students; multiple mediation models

## 1. Introduction

The beneficial effects of physical activity (PA) on mental health, quality of life and academics have been described in several studies [1,2]. Existing studies emphasized the relationship between physical activity and academic performance [1,3,4], depression [2,5,6], fitness [7–9], happiness [10], anxiety [11–13] and psychological distress [14]. However, a systemic review conducted by Larun et al. [15] with randomized control trials revealed that physical activity was not associated with anxiety among students. This makes us curious to find out the reasons behind these inconsistent results. There may be a different mechanism playing a role between physical activity and anxiety demonstrating that very little is known about the rapport that regulates physical activity and anxiety or depression [16]. Psychologically, mechanisms repeatedly suggested in the literature include

self-esteem [17] and self-efficacy [18] and a few studies have tested these variables [19,20]. Several scholars have considered other possible theoretical frameworks, for instance, cognitive processes might play a role between the two constructs [16,21,22]. Further, instead of these well-known benefits, physical activity in students (children and youths) has not been satisfactory in Pakistan [23]. This is particularly true in developing economies due to the severe lack of physical activity. For instance, a study conducted by Arat and Wong [24] in six middle-income countries indicated unsatisfactory physical activity among people.

The current research has tried to fill this gap because there is little research linking physical activity to academic anxiety through self-enhancement and self-criticism. Therefore, we have designed this study to investigate the mediating effect of two cognitive propensities, self-enhancement and self-criticism between physical activity and academic anxiety (AA) of university students in Pakistan. Moreover, this research has been conducted in Pakistan, a country where 37.6% of students have been found inactive [25] and having almost a few research in the context of physical activity and anxiety. This is particularly true in Pakistan where no student is shown to participate in physical activity or given undivided attention [23]. This issue encouraged the current research team to conduct a study on physical activity with Pakistani students.

### 1.1. Theoretical Framework

#### 1.1.1. Physical Activity and Academic Anxiety

During their academic life, university students face various problems such as irregular sleeping, financial stress, living away from home, academic pressure, depression which have a negative influence on their academic performance [26,27]. Out of these issues, anxiety is reported as one of the major problems among graduate students that negatively affects their quality of life and academic performance [28]. Anxiety demonstrates the fear and worries of students about their academic outcomes. Hence, the reduction of anxiety is crucial for students [29]. Stathopoulou [16] claimed that physical activity is a key action for controlling and reducing anxiety. Further, physical activity is beneficial for decreasing depression, mental stress, anxiety and for boosting mood enhancement [30,31]. Therefore, to have a healthy life and minimizing anxiety, students and adolescents need to participate in regular physical activities such as sport, hiking, walking, running and jogging [4,32–34]. Additionally, studies have shown that students can reduce their depression, stress, and anxiety by adopting the habits of regular exercise and physical activity [13,35]. A study conducted in Pakistan by Khanzada [11] showed that students who actively perform physical activity had a low level of depression and anxiety. Considering the evidence presented, we suppose that students who participate in physical activity and do regular exercise would have less academic anxiety compared to those who are not physically active.

#### 1.1.2. Self-Enhancement as a Mediator

According to the theory of positive illusions, self-enhancement means possessing positive views of the self [36]. Skayannis et al. [37] state that people can enhance their quality of life, positive feeling, lifestyle, wellbeing, motivation and personality mobility through PA. Also, PA should be promoted among adolescents to keep them healthy.

Physical education and physical fitness facilitate students to develop their self-enhancement and self-confidence while a lack of participation in physical education classes reduces enhancement among students [38]. Individuals often strive for high status, fitness and functional abilities that can be gained through performing moderate to vigorous physical activity [39,40]. Timo et al. [41] reported that PA exercise helps in the achievement of an effective lifestyle by motivating and cultivating enhancement among individuals. They further scrutinized that young people and adults can gain their self-enhancement and quality of life through PA. Daily exercise is considered a significant factor for mental strength and a favorable construal leading individuals to feel better [42]. PA and exercise increase happiness, build positivity among youths and reduce the adverse concerns which in turn

stimulate enhancement [43]. PA diminishes mental and physical stress among individuals and increases social interaction and support in the community [44]. In general, individuals who participate in PA and exercise are physically and psychologically healthy and their self-enhancement is developed [45].

Physically active students frequently feel positive about themselves, have high self-esteem and see themselves in a positive status which in turn facilitates them in getting desirable academic results and decreasing anxiety [46]. Physical activity provides health-related benefits out of which self-development and self-enhancement are remarkable and may facilitate better academic performance [47]. Considering the potential benefits, many individuals incline to participate in exercise and sports activities. In turn, these benefits (e.g., self-enhancement) encourage their social interaction and reduce the anxiety level [48,49]. PA and exercise enhance self-esteem, motivation, self-efficacy, positive emotion, positive body image and social interaction that are the attributes of self-enhancement. In turn, these abilities and the positive consequences reduce anxious thinking among students and increase academic performance [50,51]. Consequently, daily exercise is a significant element of high satisfaction in life, a high level of happiness, high self-esteem that can result in low depression and anxiety among individuals [52]. We can also argue that regular exercise is a vital factor of general health and encourages individuals to take responsibility for well-being and self-enhancement [12]. In addition, self-enhancement and self-esteem diminish anxiety among people [53]. Furthermore, it is claimed that the relationship between physical activity and academic outcomes are mediated by psychosocial factors and characteristics of the students (e.g., self-esteem and depression) [2]. In general, it is believed that daily exercise and physical activity maintains self-enhancement that can provide support in the reduction of anxiety, stress, and depression [54]. Hence, self-enhancement could be a potential mediator between PA and AA.

#### 1.1.3. Self-Criticism as a Mediator

Self-criticism (SC) is a cognitive tendency to have negative views of self [55]. According to Halamová and Kanovský [56], self-criticism should be reduced as it negatively influences the daily routine activities and mental health of the individuals. For instance, it is argued in an experimental study that regular exercise and physical activity significantly reduces criticism among individuals [57]. In this perspective, Vancampfort et al. [58] also scrutinized that self-criticism, lack of motivation and lack of confidence can be solved (e.g., removed) with the help of regular exercise and physical activity because one who rarely or occasionally participates in sport, hiking, dance, and exercise often face self-criticism [59]. Students who regularly exercise and participate consistently in physical activity have a high level of awareness, tolerance and general information. Hence, they do not accept criticism without a reasonable argument. Conversely, inactive students have internal conflict, a low level of self-confidence and self-alteration that can result in “being cheap with critic statements” [60]. Individuals who exercise daily have a low level of depression and often avoid criticism [61]. A study reports that lack of exercise, lack of fitness and imbalance eating often lead to self-criticism that can be mitigated through regular physical activity [62]. Physically active adults, due to their activeness in daily exercise have a low risk of health issues. Therefore, they maintain their motion and have less inclination toward self-criticism [63,64]. A study of Pakistani samples scrutinizes that physically active individuals are more satisfied with their personal life and positively interact with their family members. They usually do not demonstrate symptoms of depression and negative thinking [65]. Physical activity protects individuals from depression and in turn, they perceive a low level of self-criticism [66]. Hence, we hypothesize that physically active students have less self-criticism and less academic anxiety than physically inactive students. So, SC is expected to mediate between PA and AA.

#### 1.1.4. Current Study

Considering the above presented theoretical and empirical argument, we can argue that physically active students doing physical activity intend to possess high self-enhancement and a low level of

self-criticism that in turn reduces their academic anxiety. We have formulated the following hypotheses for the study:

**Hypothesis 1 (H1).** *Physical activity significantly reduces academic anxiety.*

**Hypothesis 2 (H2).** *Physical activity significantly increases self-enhancement.*

**Hypothesis 3 (H3).** *Physical activity significantly decreases self-criticism.*

**Hypothesis 4 (H4).** *Self-enhancement significantly reduces academic anxiety.*

**Hypothesis 5 (H5).** *Self-criticism leads to academic anxiety.*

**Hypothesis 6 (H6).** *Self-enhancement mediates the relationship between physical activity and academic anxiety.*

**Hypothesis 7 (H7).** *Self-criticism mediates the relationship between physical activity and academic anxiety.*

The research model is shown in Figure 1.

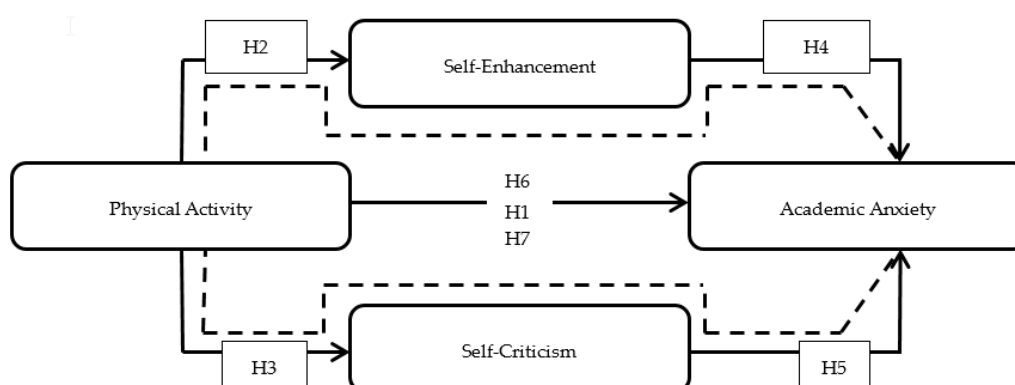


Figure 1. Research model.

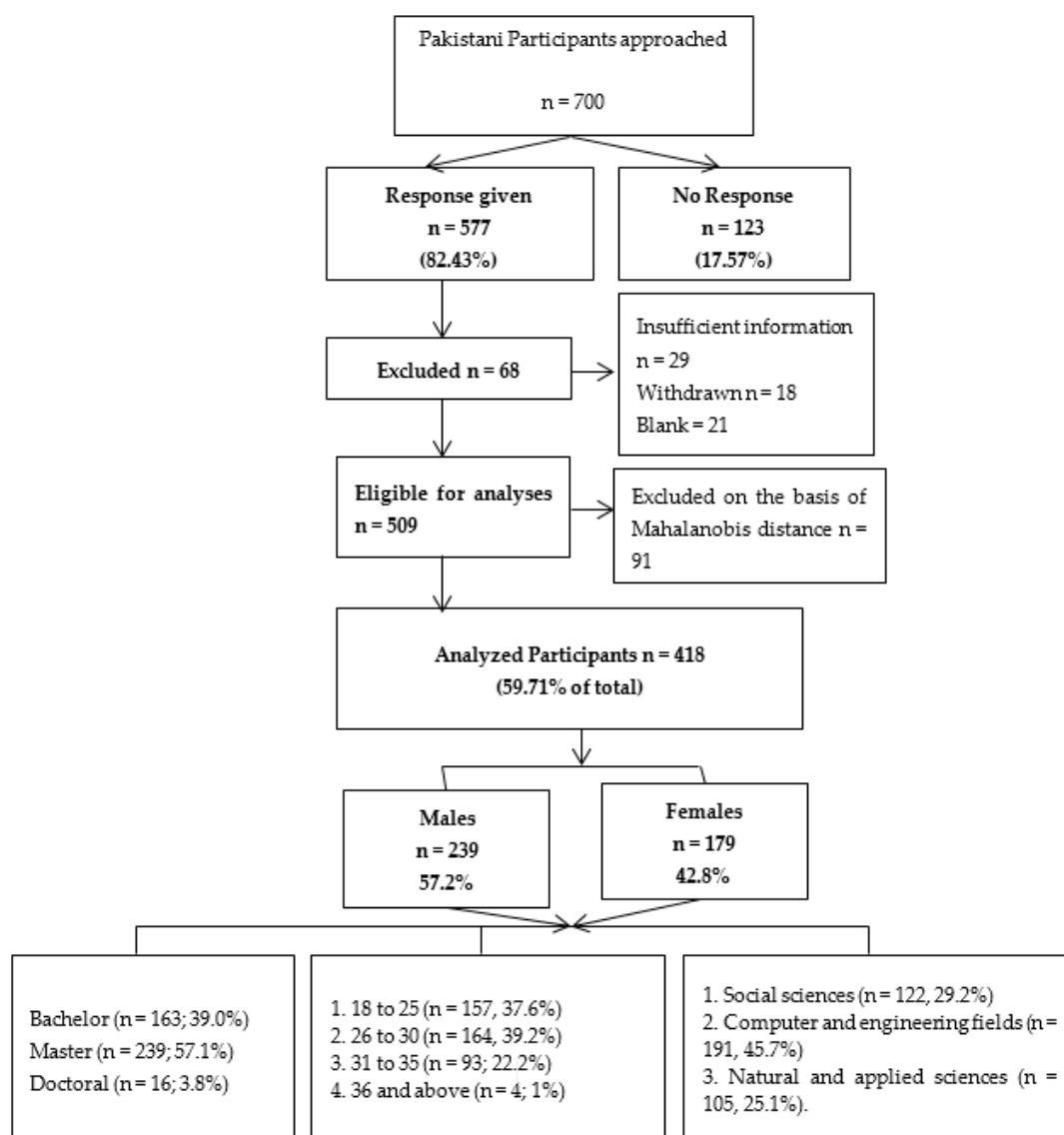
## 2. Method

### 2.1. Participants

The model of this research is tested on the empirical evidence collected from Pakistani students. To gain useful insights, students from bachelor (13 and 14 years of education), master (15 and 16 years of education), MS/M Phil (17 and 18 years of education) and Ph.D programs have been studied. It was difficult to get the number of enrolled students in each program e.g., social sciences, computer, and engineering, natural and applied sciences. Hence, we used a convenience sampling technique asking participants to sign informed consent before participation.

### 2.2. Data Collection

We distributed 700 questionnaires in all universities after taking necessary permissions. Five hundred and seventy-seven (577) questionnaires were received back with a response rate of 82.43%. We detected 509 usable for analyses after scrutiny but 91 cases were also removed after Mahalanobis distance calculated. Finally, 418 useable cases were entered into analyses. Further details are presented in the flow chart in Figure 2.



**Figure 2.** Sample characteristics

### 2.3. Measurement of Variables

Structured questionnaires were used for data collection and a hard copy approach was followed because data collection through email provides a lower response rate [67]. We used the English version of the questionnaires as the official and institutional language in Pakistan is English. In the cover letter of the questionnaire, it was mentioned that the data of this study would be used for research purposes only.

The measures of the current study were physical activity, Self-enhancement, Self-criticism, and Academic Anxiety. All have been taken as mono-factorial constructs. The control variables were age, educational background, kind of study, and gender.

#### 2.3.1. Physical Activity

There are a few valid and reliable measures of physical activity which are described in prior studies [1,34,61,66,68]. In the present research, we have used the five items Physical Activity Questionnaire used by Cho [69] who Validated it in the Asian culture and we have adopted for Pakistan. Physical Activity Questionnaire is a five items scale collecting data about type, frequency, intensity, duration, and length of physical activity which are measured on a 5-point Likert scale.

Example questions are “during a week, how often do you participate in the activity in your free time?” and “how intensely do you participate in the activity?” The range of alpha in the Cho study was 0.61 to 0.78. While the test-retest reliability of the tool was ranged between 0.61 to 0.91 [69]. In the current study, we presented data for the revalidated in Pakistani setting as the tool has never been used in Pakistan before. All items were loaded on one single factor when exploratory factor analysis was applied by using varimax rotation. The results for exploratory factor analyses, validity and reliability can be seen in Table 1. All results show acceptable, reliability, convergent and discriminant validity for the scale in the Pakistani context.

### 2.3.2. Self-Enhancement

Self-enhancement and self-protection strategies scale by Hepper et al. has been used in the study [70,71]. It is a 20-item scale developed for measuring self-enhancement strategies of students in a comparative study of Chinese and U.S. students [71]. Students have responded on a five-point Likert scale. The tool has already been used in eastern and western cultures, yet we have revalidated the tool in the current study for Pakistani culture. A sample item to measure self-enhancement is “Asking for feedback when you expect a positive answer”. All the values for convergent validity, discriminant validity, and reliability show that the tool is valid and reliable in the Pakistani setting as reported in Table 1, and the measurement model for the scale is given in latter tables.

### 2.3.3. Self-Criticism

Self-criticism was measured with a 22-item scale (see Table 1). The items 6, 8, 11, 12, 16, 20 and 21 are reverse coded items. These items were adapted from the study of Thompson and Zuroff [72] who have tested and validated the English version of the scale. A representative item is “I have a nagging sense of inferiority”. The scale has already been used for university students in Pakistan [73]. However, it was revalidated by applying exploratory factor analyses and confirmatory factor analyses. Reliability, factor loadings, and validity results have been presented in Table 1. Results show that the tool is highly valid and reliable. Further, the measurement model presents a good fit.

### 2.3.4. Academic Anxiety

This research used the 6-item state and trait anxiety scale [74] adapted from a previous study [75] in which it confirmed the validity and reliability of the English version of the tool. It is a widely used tool. Sample items of the academic anxiety scale were “I feel upset”, “I am relaxed”. The tool has been revalidated in Pakistan as well (see Table 1) confirming the monofactorial structure as explored by the former authors. Table 1 displays the validity and reliability of the tool in terms of the Pakistani context. Further, the measurement model in Table 4 exhibits a good fit for the scale.

### 2.3.5. Control Variables

We have controlled age, educational background, a degree in which they study, and gender to reduce the spurious results of the research. For the categorical variables, we have performed group difference analysis in AMOS. Age and educational background are controlled in the structural model. We have found no significant difference between males and females, and the same was the case for study majors. Therefore, we have excluded them from the analysis. However, age and education have generated mix results that have been discussed in the structural models.

## 3. Results

### 3.1. Exploratory and Confirmatory Factor Analyses

Exploratory and Confirmatory factor analyses have been performed to find out the reliability and validity of tools (see Table 1) and Cronbach’s alpha was calculated in SPSS ver. 20 (IBM, Armonk, NY, USA) [76]. Then, we have executed convergent validity by taking a square of the standardized

estimate of each item and then dividing the average of squared values by the number of items for each factor. This is the Average Variance Extracted (AVE) which is greater than 0.5 and less than composite reliability (CR). After that, discriminant validity was calculated by comparing maximum shared variance (MSV) and the square root of AVE with inter-construct correlations. It can be seen that  $AVE > MSV$  and  $\sqrt{AVE} >$  the inter-construct correlations. Findings indicated that the tools are reliable and valid [77,78].

**Table 1.** Factor loading, Validity, and Reliability of tools.

| Variables and Items  | EFA              |          | CFA  |              |      |
|--|------------------|----------|------|--------------|------|
|  | Estimate         | C.R.     | AVE  | $\sqrt{AVE}$ | MSV  |
| <b>Physical Activity</b>   | $\alpha = 0.912$ | 0.91     | 0.67 | 0.82         | 0.12 |
| 1. What type of physical activity are you doing?   | 0.831            | 0.87 *** |      |              |      |
| 2. During a week, how often do you participate in the activity in your free time?  | 0.710            | 0.75 *** |      |              |      |
| 3. How intensely do you participate in the activity?   | 0.861            | 0.82 *** |      |              |      |
| 4. How long do you do the activity in your free time?  | 0.740            | 0.77 *** |      |              |      |
| 5. How monthly have you been performing the activity?  | 0.821            | 0.88 *** |      |              |      |
| <b>Self-enhancement</b>  | $\alpha = 0.954$ | 0.95     | 0.50 | 0.71         | 0.12 |
| 1. When you achieve success or really good grades, thinking it was due to your ability.  | 0.831            | 0.71 *** |      |              |      |
| 2. Thinking of yourself as generally possessing positive personality traits or abilities to a greater extent than most people  | 0.810            | 0.74 *** |      |              |      |
| 3. Remembering hardships that you had to overcome to be really successful.   | 0.710            | 0.72 *** |      |              |      |
| 4. When you do poorly at something or get bad grades, thinking it was due to bad luck.   | 0.700            | 0.76 *** |      |              |      |
| 5. When you achieve success or really good grades, thinking it says a lot about you as a person.   | 0.820            | 0.71 *** |      |              |      |
| 6. Believing that you are changing, growing, and improving as a person more than other people are.   | 0.811            | 0.75 *** |      |              |      |
| 7. Thinking about how you have grown and improved as a person over time; how much more good/honest/skilled you are now than you used to be.                            | 0.830            | 0.68 *** |      |              |      |
| 8. When you do poorly at something or get bad grades, thinking that the situation or test was uninformative or inaccurate.   | 0.726            | 0.70 *** |      |              |      |
| 9. When you achieve success or really good grades, playing up the importance of that ability or area of life.  | 0.813            | 0.71 *** |      |              |      |
| 10. Believing you are more likely than most people to be happy and successful in the   | 0.728            | 0.71 *** |      |              |      |
| 11. In times of stress, reminding yourself of your values and what matters to you  | 0.750            | 0.69 *** |      |              |      |
| 12. When you do poorly at something or get bad grades, thinking hard about the situation and feedback until you find something wrong with it and can discount it       | 0.811            | 0.66 *** |      |              |      |
| 13. Spending time with people who think highly of you, say good things about you, and make you feel good about yourself  | 0.751            | 0.71 *** |      |              |      |
| 14. When someone says something ambiguous about you, interpreting it as a positive comment or compliment.  | 0.714            | 0.67 *** |      |              |      |
| 15. In times of stress, thinking about your positive close relationships and loved ones.   | 0.841            | 0.68 *** |      |              |      |
| 16. Revising very little for a test, or going out the night before an exam or appraisal at work, so that if you do well, it would mean you must have very high ability | 0.840            | 0.67 *** |      |              |      |
| 17. Asking for feedback when you expect a positive answer  | 0.813            | 0.75 *** |      |              |      |
| 18. Generally getting over the experience of negative feedback quickly, so a few hours/days/weeks after a negative event you no longer feel bad.                       | 0.821            | 0.70 *** |      |              |      |
| 19. Thinking about how things could have been much worse than they are.  | 0.816            | 0.72 *** |      |              |      |
| 20. Revising very little for a test, or going out the night before an exam or appraisal at work, so that if you do poorly, it would not mean you are incompetent       | 0.811            | 0.70 *** |      |              |      |

Table 1. Cont.

| Variables and Items   | EFA              | CFA      |      |      |      |      |
|---|------------------|----------|------|------|------|------|
|   |                  | Estimate | C.R. | AVE  | √AVE | MSV  |
| <b>Self-criticism</b>   | $\alpha = 0.967$ |          | 0.97 | 0.58 | 0.76 | 0.06 |
| 1. I am very irritable when I have failed.  | 0.851            | 0.86 *** |      |      |      |      |
| 2. I have a nagging sense of inferiority.   | 0.820            | 0.81 *** |      |      |      |      |
| 3. I am very frustrated with myself when I don't meet the standards I have for myself.          | 0.852            | 0.87 *** |      |      |      |      |
| 4. I am usually uncomfortable in social situations where I don't know what to expect.           | 0.811            | 0.63 *** |      |      |      |      |
| 5. I often get very angry with myself when I fail.  | 0.710            | 0.88 *** |      |      |      |      |
| 6. I don't spend much time worrying about what other people will think of me.                   | 0.719            | 0.76 *** |      |      |      |      |
| 7. I get very upset when I fail.  | 0.811            | 0.79 *** |      |      |      |      |
| 8. If you are open to other people about your weaknesses, they are likely to still respect you. | 0.705            | 0.76 *** |      |      |      |      |
| 9. Failure is a very painful experience for me.   | 0.813            | 0.66 *** |      |      |      |      |
| 10. I often worry that other people will find out what I'm really like and be upset with me.    | 0.811            | 0.67 *** |      |      |      |      |
| 11. I don't often worry about the possibility of failure.                                       | 0.821            | 0.77 *** |      |      |      |      |
| 12. I am confident that most of the people I care about will accept me for who I am.            | 0.716            | 0.73 *** |      |      |      |      |
| 13. When I don't succeed, I find myself wondering how worthwhile I am.                          | 0.855            | 0.77 *** |      |      |      |      |
| 14. If you give people the benefit of the doubt, they are likely to take advantage of you.      | 0.813            | 0.89 *** |      |      |      |      |
| 15. I feel like a failure when I don't do as well as I would like.                              | 0.811            | 0.68 *** |      |      |      |      |
| 16. I am usually comfortable with people asking me about myself.                                | 0.815            | 0.65 *** |      |      |      |      |
| 17. If I fail in one area, it reflects poorly on me as a person.                                | 0.823            | 0.83 *** |      |      |      |      |
| 18. I fear that if people get to know me too well, they will not respect me.                    | 0.811            | 0.71 *** |      |      |      |      |
| 19. I frequently compare myself with my goals and ideals.                                       | 0.750            | 0.74 *** |      |      |      |      |
| 20. I seldom feel ashamed of myself.  | 0.899            | 0.88 *** |      |      |      |      |
| 21. Being open and honest is usually the best way to keep others' respect.                      | 0.781            | 0.63 *** |      |      |      |      |
| 22. There are times that it is necessary to be somewhat dishonest to get what you want.         | 0.716            | 0.65 *** |      |      |      |      |
| <b>Academic Anxiety</b>   | $\alpha = 0.864$ |          | 0.86 | 0.50 | 0.71 | 0.09 |
| 1. I feel calm  | 0.719            | 0.73 *** |      |      |      |      |
| 2. I am tense   | 0.719            | 0.77 *** |      |      |      |      |
| 3. I feel upset   | 0.831            | 0.69 *** |      |      |      |      |
| 4. I am relaxed   | 0.801            | 0.71 *** |      |      |      |      |
| 5. I am content   | 0.716            | 0.66 *** |      |      |      |      |
| 6. I am worried   | 0.730            | 0.69 *** |      |      |      |      |

Note: \*\*\* =  $p$ -value 0.001. CR = Composite Reliability, AVE = Average Variance Extracted, MSV = maximum shared variance, Extraction Method: Principal Component Analysis. Rotation Method: Varimax, 1 = physical anxiety, 2 = self-enhancement, 3 = self-criticism, 4 = academic anxiety.

### 3.2. Common Method Bias

Results derived from a cross-sectional data set might have threats of common method bias [79]. To check this issue, we have applied the Harman One factor test using principal component analysis as an extraction method in SPSS. All the items were included in the process (un-rotated factor solution). The results indicated four factors with eigenvalues greater than one of which the first factor explained 27.20% variance. Additionally, we have also executed analysis by adding a common latent factor to the model. We have reached to the conclusion that the data are free of common method bias as there is no difference between the regression weights of two models (model with CLF and model without CLF).

### 3.3. Descriptive Statistics

Descriptive statistics, mean (M), standard deviation (SD) and normality of the data, are reported in Table 2. As you can see self-enhancement has the highest mean ( $M = 3.72$ ) while academic anxiety has the lowest ( $M = 2.78$ ). Conversely, PA shows the highest standard deviation ( $SD = 0.68$ ) and

self-enhancement shows the lowest (SD = 0.39). Data of this research are normally distributed as skewness and kurtosis values are in the acceptable range +2 as per recommendations [80].

**Table 2.** Descriptive Statistics.

| Factors           | Mean | Standard Deviation | Skewness | Kurtosis |
|-------------------|------|--------------------|----------|----------|
| Physical activity | 3.62 | 0.68               | −0.91    | 1.66     |
| Self-Enhancement  | 3.72 | 0.39               | −0.15    | 0.81     |
| Self-Criticism    | 3.24 | 0.52               | −0.48    | −0.63    |
| Academic Anxiety  | 2.78 | 0.49               | 0.78     | 1.36     |

### 3.4. Correlation

Table 3 shows the Pearson correlation that has been executed in SPSS. We have found a significant negative correlation of physical activity with academic anxiety ( $r = -0.281, p < 0.01$ ), and self-criticism ( $r = -0.115, p < 0.05$ ); a significant positive relationship between physical activity and self-enhancement ( $r = 0.347; p < 0.01$ ); a significant positive relationship between self-criticism and academic anxiety ( $r = 0.248, p < 0.01$ ); and a significant negative correlation between self-enhancement and academic anxiety ( $r = -0.310, p < 0.01$ ).

**Table 3.** Correlations among variables.

| Factors           | 1        | 2      | 3         | 4         | 5        | 6 |
|-------------------|----------|--------|-----------|-----------|----------|---|
| Age               | 1        |        |           |           |          |   |
| Education         | −0.099 * | 1      |           |           |          |   |
| Physical activity | −0.009   | −0.051 | 1         |           |          |   |
| Self-Enhancement  | 0.079    | −0.015 | 0.347 **  | 1         |          |   |
| Self-Criticism    | −0.053   | 0.011  | −0.115 *  | −0.092    | 1        |   |
| Academic Anxiety  | 0.078    | 0.020  | −0.281 ** | −0.310 ** | 0.248 ** | 1 |

\*\* Correlation is significant at the 0.01 level (2-tailed). \* Correlation is significant at the 0.05 level (2-tailed).

### 3.5. Model Fit Statistics

We achieved satisfactory model fits in term of Chi-square/degree of freedom ( $\chi^2/df \leq 5$ ), Standardized Root Mean Square Residual (SRMR)  $\leq 0.05$ , Root Mean Square Error of Approximation (RMSEA)  $\leq 0.05$ , Tucker-Lewis Index (TLI)  $\geq 0.90$ , comparative fit index  $\geq 0.90$ , as recommended [77,78]. Model fits for all instruments, measurement model and structural model have been shown in Table 4.

**Table 4.** Model fit statistics.

| Study Variables and Models | $\chi^2/df$ | CFI   | TLI   | RMSEA  | SRMR  | $p$   |
|----------------------------|-------------|-------|-------|--------|-------|-------|
| Physical activity          | 3.77        | 0.99  | 0.98  | 0.082  | 0.015 | 0.000 |
| Self-enhancement           | 2.85        | 0.95  | 0.94  | 0.067  | 0.352 | 0.000 |
| Self-criticism             | 4.85        | 0.93  | 0.90  | 0.0812 | 0.041 | 0.000 |
| Academic anxiety           | 2.74        | 0.93  | 0.97  | 0.042  | 0.074 | 0.000 |
| Measurement model          | 2.31        | 0.911 | 0.901 | 0.056  | 0.046 | 0.000 |
| Structural model           | 1.602       | 0.92  | 0.91  | 0.075  | 0.079 | 0.000 |

### 3.6. Structural Models

#### 3.6.1. Direct Effects

The structural model approach was considered to test the hypotheses of the study. In the first structural model (Figure 3), we have examined the direct influence of physical activity on academic anxiety. The results indicate that physical activity has significant impacts on academic anxiety ( $\beta = -0.28, p < 0.001$ ) that supported H1. R2 indicates that physical activity explains a 9% change in

academic anxiety when controlled for age and education. In Figure 4, the direct effect of PA on SE is positive ( $\beta = 0.35$ ;  $p < 0.001$ ), while the direct effect of PA on SC is negative ( $\beta = -0.12$ ;  $p < 0.05$ ) supporting H2 and H3. Conversely, direct effect of SE on AA is negative ( $\beta = -0.24$ ;  $p < 0.001$ ), while SC on AA is positive ( $\beta = 0.22$ ;  $p < 0.001$ ) supporting H4 and H5.

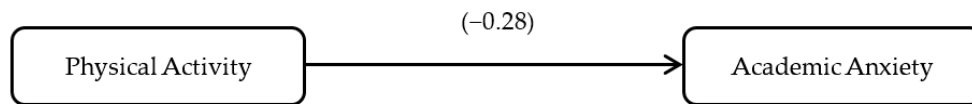


Figure 3. Structural Model 1 for direct effect.

### 3.6.2. Mediation (Indirect Effects)

In the multiple mediation model (Figure 4), we have checked the mediating role of self-enhancement and self-criticism between physical activity and academic anxiety. Model shows that both self-enhancement ( $\beta = -0.084$ ,  $p < 0.05$ ) and self-criticism ( $\beta = 0.026$ ,  $p < 0.05$ ) partially mediate between physical activity and academic anxiety because the indirect influence of physical activity on academic anxiety remains significant after mediation ( $\beta = -0.17$ ,  $p < 0.001$ ). R square shows that a 19% variation in academic anxiety is explained by physical activity with the mediation of SE and SC after controlling for age and education. Hence, the model supports hypotheses H6–H7.

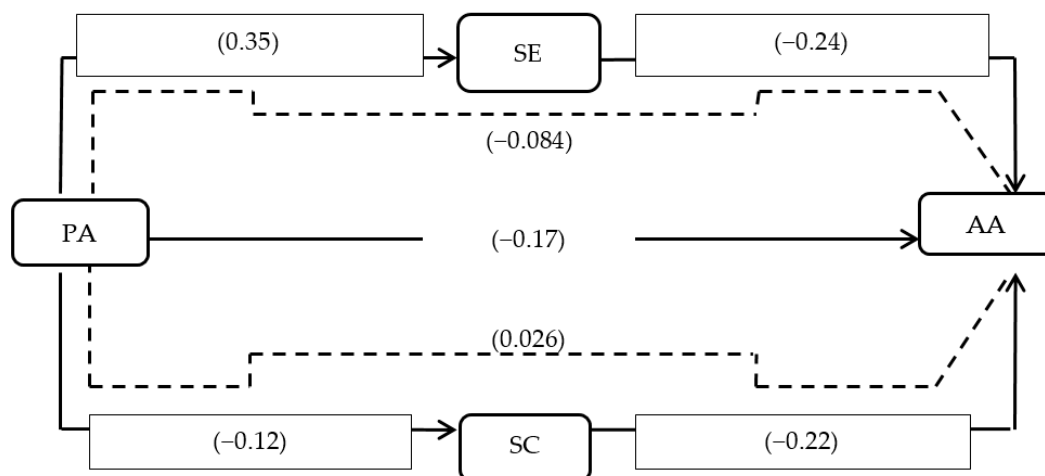


Figure 4. Structural Model for indirect effects (PA = physical activity, SE = self-enhancement, SC = self-criticism, AA = academic anxiety).

### 3.7. Hierarchical Regression Analyses

To verify the validity of results, we have also performed a hierarchical regression for testing the main model. The results of the hierarchical regression (see Table 5) endorsed the structural model developed in AMOS confirming that SE and SC partially mediate between PA and AA.

**Table 5.** Confirmation of Results with Regression analyses.

| Model |                   | Unstandardized Coefficients |                | Standardized Coefficients | <i>t</i> | <i>p</i> -Value | R2    | R2Δ   |
|-------|-------------------|-----------------------------|----------------|---------------------------|----------|-----------------|-------|-------|
|       |                   | B                           | Standard Error | Beta                      |          |                 |       |       |
| 1     | (Constant)        | 2.608                       | 0.075          |                           | 34.747   | 0.000           | 0.016 | 0.016 |
|       | Education         | 0.034                       | 0.032          | 0.054                     | 1.069    | 0.286           |       |       |
|       | Age               | 0.062                       | 0.030          | 0.102                     | 2.038    | 0.042           |       |       |
| 2     | (Constant)        | 3.351                       | 0.146          |                           | 22.915   | 0.000           | 0.091 | 0.075 |
|       | Education         | 0.036                       | 0.031          | 0.056                     | 1.168    | 0.244           |       |       |
|       | Age               | 0.049                       | 0.029          | 0.081                     | 1.665    | 0.097           |       |       |
|       | Physical_Activity | −0.199                      | 0.034          | −0.275                    | −5.841   | 0.000           |       |       |
| 3     | (Constant)        | 3.485                       | 0.278          |                           | 12.520   | 0.000           | 0.191 | 0.101 |
|       | Education         | 0.054                       | 0.029          | 0.085                     | 1.857    | 0.064           |       |       |
|       | Age               | 0.055                       | 0.028          | 0.091                     | 1.985    | 0.048           |       |       |
|       | Physical_Activity | −0.120                      | 0.035          | −0.165                    | −3.473   | 0.001           |       |       |
|       | Self_Enhancement  | −0.304                      | 0.060          | −0.240                    | −5.054   | 0.000           |       |       |
|       | Self_Criticism    | 0.206                       | 0.043          | 0.215                     | 4.808    | 0.000           |       |       |

#### 4. Discussion

This study presents the direct influence of physical activity on academic anxiety as well as the mediating role of self-enhancement and self-criticism. Data of the current study had normal distribution which is an important assumption for conducting analyses and structural models in AMOS graphics [81]. Next, validity and reliability for all tools have been assessed. Results revealed that all tools are valid and reliable in the Pakistani context. The findings are consistent with previous studies where these tools have been tested for validity and reliability in eastern cultures [69–71,73,75]. Highlighting the major findings, a key objective of the study was to investigate the direct effect of physical activity on academic anxiety. A negative association of physical activity and academic anxiety of university students in Pakistan was revealed. Current findings are in agreement with a previous study conducted by Khan [25] where a significant inverse relation has been found between physical activity and academic anxiety and stress of university students in Pakistan. Another study has reported a negative association of physical activity and stress of university students in Pakistan [2]. Our finding is also following Khandaza et al. [11] where they claim a strong association between more exercise and low frequency of anxiety and depression among adults in Pakistan.

It is described in the literature that increasing physical activity of students has been the focus of attention among scholars and practitioners because of its positive impacts on physical and psychological health [82]. Our study adds up in the body of knowledge by examining the association between PA and AA in the context of Pakistani students at the university level. Our findings are in line with the previous work [34] in which it was argued that students can reduce their anxiety and can achieve satisfactory academic success through regular physical activity such as sport, hiking, walking, and jogging.

Another aim of our study was to identify the direct relation of physical activity with self-enhancement and self-criticism. It is inferred from the results that there is a positive relation of physical activity with self-enhancement and negative with self-criticism. That is, more physical activity leads to an enhanced self and less self-criticism. It is deducted from previous research [25] that PA is positively linked with the quality of life in Pakistan. Physical activity significantly develops self-enhancement which in turn decreases academic anxiety. It supports the hypothetical notion that the greater the amount of physical activity is, the enhanced the self of an individual will be. The more enhanced one's self is, the lesser will be the academic anxiety.

Other studies support our findings reporting a negative link of self-esteem with anxiety [83,84]; and depression with physical activity [2] of university students in Pakistan. It is in line with the finding that positive feelings, lifestyle, high status, motivation, personal mobility and high quality of life can

be achieved through regular physical activity [37]. Further, it has been pointed out in past studies that physical activity helps individuals to sustain their motivation, enhancement, and status [41]. Therefore, enhancing self of students would be a proficient technique to be used by professors for getting improved outcomes and reducing students' stress, anxiety, and pressures at academic work.

To explore the direct relation of self-enhancement and self-criticism with academic anxiety of Pakistani university students, we have found that self-enhancement leads to reduce academic anxiety while self-criticism leads to increase academic anxiety. Although there is less research in Pakistan regarding self-enhancement and self-criticism especially about the academic anxiety of students, there have been less related studies conducted with other samples. For instance, a few studies have reported that low self-esteem leads to depression and anxiety [85,86]; while higher self-concept is associated with lower anxiety of university students in Pakistan [87]. Similarly, a study conducted with the general population in Pakistan [83] claims that self-esteem is negatively related to anxiety. Conversely, despite its positive effects on physical and mental health, self-criticism creates negative thinking, anxiety, and depression [88]. That is why it increases anxiety among students. This research has confirmed that physical activity facilitates students in the reduction of their self-criticism, which leads to reduce anxiety. Indeed, self-criticism negatively influences daily routine activities and can disturb individuals' health [56]. Therefore, one has to exercise regularly to reduce his/her self-criticism. Similarly, Jamil and Khalid [65] scrutinized regular exercise as a significant factor for the low level of depression and negative thinking among Pakistani participants. Our research suggests that self-enhancement should be increased as it helps in decreasing anxiety [53] and self-criticism should be avoided as it leads to a high level of anxiety [89].

Moreover, a major objective of this study was to develop a model exhibiting the mediating effect of self-enhancement and self-criticism on the relationship between physical activity and academic anxiety of university students in Pakistan. The results describe that self-enhancement and self-criticism play a partial mediating role between physical activity and academic anxiety. Further, from the above findings and discussions, we can consider physical activity positively related to self-enhancement [25] which itself is linked inversely with anxiety [85]. On the contrary, PA is negatively linked to depression [2] which is a form of self-criticism [55]. Self-criticism, in turn, increases anxiety and depression [90] in a piece of evidence from eastern culture. It shows that self-enhancement and self-criticism are the potential mediators between physical activity and academic anxiety.

Although the study has several strengths, it has limitations. Self-report measures have been used in this study. Therefore, response bias or method effects could be due to the possible inflation of the relations among variables. Objective measures are suggested for future research. Another limitation is due to the sample of the study, which was selected conveniently affecting the generalizability of the results. In further studies, it would be helpful to adopt different sampling techniques. Besides, participants had been selected only from the universities in two cities (Islamabad and Rawalpindi). It would be interesting to compare the physical activity and academic anxiety of students in different provinces of Pakistan to examine the variability of results across the regions.

## 5. Implications

The current study provides a theoretical background for the benefits of physical activity and exercise for reducing the academic anxiety of students and the mediating role of self-enhancement and self-criticism between the two variables. The study is conducted in an Asian country, Pakistan where self-concept plays a different role than in western cultures, as people pay more attention to the group than to the individual in a collectivistic culture. Various studies have been carried out on the role of self-concept in physical activity but most of them are from western societies. Research on physical activity in Pakistan is highly important, as the rate of physical activity participation is extremely low. Moreover, relating personal factors such as self-enhancement and self-criticism to physical activity can be beneficial for increasing the physical activity of students. Hence, educational institutions are

advised to motivate students to increase PA and enhance self-concept for the development of the psychological aspects of students.

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## References

- Asigbee, F.M.; Whitney, S.D.; Peterson, C.E. The link between nutrition and physical activity in increasing academic achievement. *J. Sch. Health* **2018**, *88*, 407–415. [[CrossRef](#)] [[PubMed](#)]
- Kayani, S.; Kiyani, T.; Wang, J.; Zagalaz Sánchez, M.; Kayani, S.; Qurban, H. Physical Activity and Academic Performance: The Mediating Effect of Self-Esteem and Depression. *Sustainability* **2018**, *10*, 3633. [[CrossRef](#)]
- Zhang, Y.; Niu, L.; Zhang, D.; Ip, P.; Ho, F.; Jiang, Y.; Sun, W.; Zhu, Q.; Jiang, F. Social-Emotional Functioning Explains the Effects of Physical Activity on Academic Performance among Chinese Primary School Students: A Mediation Analysis. *J. Pediatr.* **2019**, *208*, 74–80. [[CrossRef](#)] [[PubMed](#)]
- De Bruijn, A.; Hartman, E.; Kostons, D.; Visscher, C.; Bosker, R. Exploring the relations among physical fitness, executive functioning, and low academic achievement. *J. Exper. Child Psychol.* **2018**, *167*, 204–221. [[CrossRef](#)]
- Dogra, S.; MacIntosh, L.; O’Neill, C.; D’Silva, C.; Shearer, H.; Smith, K.; Cote, P. The association of physical activity with depression and stress among post-secondary school students: A systematic review. *Ment. Health Phys. Act.* **2018**, *14*, 146–156. [[CrossRef](#)]
- Barbour, K.A.; Blumenthal, J.A. Exercise training and depression in older adults. *Neurobiol. Aging* **2005**, *26*, 119–123. [[CrossRef](#)]
- Harris, J.; Cale, L.; Duncombe, R.; Musson, H. Young people’s knowledge and understanding of health, fitness and physical activity: Issues, divides and dilemmas. *Sport Educ. Soc.* **2018**, *23*, 407–420. [[CrossRef](#)]
- Wang, J. The association between physical fitness and physical activity among Chinese college students. *J. Am. Health* **2019**, *67*, 602–609. [[CrossRef](#)]
- Loprinzi, P.D.; Cardinal, B.J.; Cardinal, M.K.; Corbin, C.B. Physical education and sport: Does participation relate to physical activity patterns, observed fitness, and personal attitudes and beliefs? *Am. J. Health Promot.* **2018**, *32*, 613–620. [[CrossRef](#)]
- Zhang, Z.; Chen, W. A systematic review of the relationship between physical activity and happiness. *J. Happiness Stud.* **2019**, *20*, 1305–1322. [[CrossRef](#)]
- Khanzada, F.J.; Soomro, N.; Khan, S.Z. Association of physical exercise on anxiety and depression amongst adults. *J. Coll. Physicians Surg. Pak.* **2015**, *25*, 546–548. [[PubMed](#)]
- Aşçı, F.H. The effects of physical fitness training on trait anxiety and physical self-concept of female university students. *Psychol. Sport Exerc.* **2003**, *4*, 255–264. [[CrossRef](#)]
- Pedersen, B.K.; Saltin, B. Exercise as medicine—evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand. J. Med. Sci. Sports* **2015**, *25*, 1–72. [[CrossRef](#)] [[PubMed](#)]
- Multon, K.D.; Heppner, M.J.; Gysbers, N.C.; Zook, C.; Ellis-Kalton, C.A. Client psychological distress: An important factor in career counseling. *Career Dev. Q.* **2001**, *49*, 324–335. [[CrossRef](#)]
- Larun, L.; Nordheim, L.V.; Ekeland, E.; Hagen, K.B.; Heian, F. Exercise in prevention and treatment of anxiety and depression among children and young people. *Cochrane Database Syst. Rev.* **2006**, *3*, 1–51. [[CrossRef](#)] [[PubMed](#)]
- Stathopoulou, G.; Powers, M.B.; Berry, A.C.; Smits, J.A.; Otto, M.W. Exercise interventions for mental health: A quantitative and qualitative review. *Clin. Psychol. Sci. Prac.* **2006**, *13*, 179–193. [[CrossRef](#)]
- Van de Vliet, P.; Knapen, J.; Onghena, P.; Fox, K.R.; David, A.; Morres, I.; Van Coppenolle, H.; Pieters, G. Relationships between self-perceptions and negative affect in adult Flemish psychiatric in-patients suffering from mood disorders. *Psychol. Sport Exerc.* **2002**, *3*, 309–322. [[CrossRef](#)]

18. Craft, L.L. Exercise and clinical depression: Examining two psychological mechanisms. *Psychol. Sport Exerc.* **2005**, *6*, 151–171. [[CrossRef](#)]
19. White, K.; Kendrick, T.; Yardley, L. Change in self-esteem, self-efficacy and the mood dimensions of depression as potential mediators of the physical activity and depression relationship: Exploring the temporal relation of change. *Ment. Health Phys. Act.* **2009**, *2*, 44–52. [[CrossRef](#)]
20. McPhie, M.L.; Rawana, J.S. Unravelling the relation between physical activity, self-esteem and depressive symptoms among early and late adolescents: A mediation analysis. *Ment. Health Phys. Act.* **2012**, *5*, 43–49. [[CrossRef](#)]
21. Foley, L.S.; Prapavessis, H.; Osuch, E.A.; De Pace, J.A.; Murphy, B.A.; Podolinsky, N.J. An examination of potential mechanisms for exercise as a treatment for depression: A pilot study. *Ment. Health Phys. Act.* **2008**, *1*, 69–73. [[CrossRef](#)]
22. Faulkner, G.; Carless, D. Physical activity in the process of psychiatric rehabilitation: Theoretical and methodological issues. *Psychiatr. Rehabil. J.* **2006**, *29*, 258. [[CrossRef](#)] [[PubMed](#)]
23. Gul, Y.; Sultan, Z.; Moeinaddini, M.; Ahmed Jokhio, G. Measuring the differences of neighbourhood environment and physical activity in gated and non-gated neighbourhoods in Karachi, Pakistan. *J. Urban Des.* **2019**, *24*, 494–513. [[CrossRef](#)]
24. Arat, G.; Wong, P.W.-C. The relationship between physical activity and mental health among adolescents in six middle-income countries: A cross-sectional study. *Child Youth Serv.* **2017**, *38*, 180–195. [[CrossRef](#)]
25. Khan, B.A. Interaction of physical activity, mental health, health locus of control and quality of life: A study on University students in Pakistan. Master's Thesis, University of Jyväskylä, Jyväskylä, Finland, 20 May 2013.
26. McIntyre, J.C.; Worsley, J.; Corcoran, R.; Harrison Woods, P.; Bentall, R.P. Academic and non-academic predictors of student psychological distress: The role of social identity and loneliness. *J. Ment. Health* **2018**, *27*, 230–239. [[CrossRef](#)] [[PubMed](#)]
27. Ribeiro, Í.J.; Pereira, R.; Freire, I.V.; de Oliveira, B.G.; Casotti, C.A.; Boery, E.N. Stress and quality of life among university students: A systematic literature review. *Health Prof. Educ.* **2018**, *4*, 70–77. [[CrossRef](#)]
28. Sahranavard, S.; Esmaeili, A.; Dastjerdi, R.; Salehiniya, H. The effectiveness of stress-management-based cognitive-behavioral treatments on anxiety sensitivity, positive and negative affect and hope. *BioMedicine* **2018**, *8*, 23. [[CrossRef](#)]
29. Biasutti, M.; Concina, E. The role of coping strategy and experience in predicting music performance anxiety. *Music. Sci.* **2014**, *18*, 189–202. [[CrossRef](#)]
30. Babyak, M.; Blumenthal, J.A.; Herman, S.; Khatri, P.; Doraiswamy, M.; Moore, K.; Craighead, W.E.; Baldewicz, T.T.; Krishnan, K.R. Exercise treatment for major depression: Maintenance of therapeutic benefit at 10 months. *Psychosom. Med.* **2000**, *62*, 633–638. [[CrossRef](#)]
31. Sibold, J.S.; Berg, K.M. Mood enhancement persists for up to 12 hours following aerobic exercise: A pilot study. *Percept. Mot. Skills* **2010**, *111*, 333–342. [[CrossRef](#)]
32. Qurban, H.; Wang, J.; Siddique, H.; Morris, T.; Qiao, Z. The mediating role of parental support: The relation between sports participation, self-esteem, and motivation for sports among chinese students. *Curr. Psychol.* **2018**, *38*, 308–319. [[CrossRef](#)]
33. Kim, A.C.H.; Park, S.H.; Kim, S.; Fontes-Comber, A. Psychological and social outcomes of sport participation for older adults: A systematic review. *Ageing Soc.* **2019**, *0*, 1–21. [[CrossRef](#)]
34. Viana, R.B.; Campos, M.H.; Santos, D.D.A.T.; Xavier, I.C.M.; Vancini, R.L.; Andrade, M.S.; de Lira, C.A.B. Improving Academic Performance of Sport and Exercise Science Undergraduate Students in Gross Anatomy Using a Near-Peer Teaching Program. *Anat. Sci. Educ.* **2019**, *12*, 74–81. [[CrossRef](#)]
35. Chomitz, V.R.; Slining, M.M.; McGowan, R.J.; Mitchell, S.E.; Dawson, G.F.; Hacker, K.A. Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the northeastern United States. *J. Sch. Health* **2009**, *79*, 30–37. [[CrossRef](#)] [[PubMed](#)]
36. Taylor, S.E.; Brown, J.D. Illusion and well-being: A social psychological perspective on mental health. *Psychol. Bull.* **1988**, *103*, 193. [[CrossRef](#)] [[PubMed](#)]
37. Skayannis, P.; Goudas, M.; Rodakinias, P. Sustainable mobility and physical activity: A meaningful marriage. *Transp. Res. Procedia* **2017**, *24*, 81–88. [[CrossRef](#)]
38. Goñi, A.; Zulaika, L. Relationships between physical education classes and the enhancement of fifth grade pupils' self-concept. *Percept. Mot. Skills* **2000**, *91*, 246–250. [[CrossRef](#)]

39. Kim, J.I. Social factors associated with centenarian rate (CR) in 32 OECD countries. *BMC Int. Health Hum. Rights* **2013**, *13*, 16.
40. Fellendorf, F.; Kainzbauer, N.; Platzer, M.; Dalkner, N.; Bengesser, S.; Birner, A.; Queissner, R.; Rauch, P.; Hamm, C.; Pilz, R. Gender differences in the association between physical activity and cognitive function in individuals with bipolar disorder. *J. Affect. Disord.* **2017**, *221*, 232–237. [[CrossRef](#)]
41. Timo, J.; Sami, Y.-P.; Anthony, W.; Jarmo, L. Perceived physical competence towards physical activity, and motivation and enjoyment in physical education as longitudinal predictors of adolescents' self-reported physical activity. *J. Sci. Med. Sport* **2016**, *19*, 750–754. [[CrossRef](#)]
42. Lowe, C.J.; Kolev, D.; Hall, P.A. An exploration of exercise-induced cognitive enhancement and transfer effects to dietary self-control. *Brain Cogn.* **2016**, *110*, 102–111. [[CrossRef](#)] [[PubMed](#)]
43. Ullrich-French, S.; Cole, A.N.; Montgomery, A.K. Evaluation development for a physical activity positive youth development program for girls. *Eval. Program Plan.* **2016**, *55*, 67–76. [[CrossRef](#)] [[PubMed](#)]
44. Gyasi, R.M. Social support, physical activity and psychological distress among community-dwelling older Ghanaians. *Arch. Gerontol. Geriatr.* **2019**, *81*, 142–148. [[CrossRef](#)] [[PubMed](#)]
45. Powers, T.A.; Zuroff, D.C. Interpersonal consequences of overt self-criticism: A comparison with neutral and self-enhancing presentations of self. *J. Personal. Soc. Psychol.* **1988**, *54*, 1054. [[CrossRef](#)]
46. Lindwall, M.; Hassmén, P. The role of exercise and gender for physical self-perceptions and importance ratings in Swedish university students. *Scand. J. Med. Sci. Sports* **2004**, *14*, 373–380. [[CrossRef](#)] [[PubMed](#)]
47. Knapen, J.; Van de Vliet, P.; Van Coppenolle, H.; David, A.; Peuskens, J.; Pieters, G.; Knapen, K. Comparison of changes in physical self-concept, global self-esteem, depression and anxiety following two different psychomotor therapy programs in nonpsychotic psychiatric inpatients. *Psychother. Psychosom.* **2005**, *74*, 353–361. [[CrossRef](#)] [[PubMed](#)]
48. Biddle, S.J.; Nigg, C.R. Theories of exercise behavior. *Int. J. Sport Psychol.* **2000**, *31*, 290–304.
49. Conner, M.; McEachan, R.; Taylor, N.; O'Hara, J.; Lawton, R. Role of affective attitudes and anticipated affective reactions in predicting health behaviors. *Health Psychol.* **2015**, *34*, 642. [[CrossRef](#)]
50. Edwards, D.J.; Edwards, S.D.; Basson, C.J. Psychological well-being and physical self-esteem in sport and exercise. *Int. J. Ment. Health Promot.* **2004**, *6*, 25–32. [[CrossRef](#)]
51. Weinberg, R.S.W.; Gould, D. *Foundations of Sport and Exercise Psychology: Study Guide*; Human Kinetics: Champaign, IL, USA, 1999.
52. Pitts, B.L.; Whealin, J.M.; Harpaz-Rotem, I.; Duman, R.S.; Krystal, J.H.; Southwick, S.M.; Pietrzak, R.H. BDNF Val66Met polymorphism and posttraumatic stress symptoms in US military veterans: Protective effect of physical exercise. *Psychoneuroendocrinology* **2019**, *100*, 198–202. [[CrossRef](#)]
53. Hohenberger, C.; Spörrle, M.; Welpel, I.M. Not fearless, but self-enhanced: The effects of anxiety on the willingness to use autonomous cars depend on individual levels of self-enhancement. *Technol. Forecast. Soc. Chang.* **2017**, *116*, 40–52. [[CrossRef](#)]
54. Craft, L.L.; Landers, D.M. The effect of exercise on clinical depression and depression resulting from mental illness: A meta-analysis. *J. Sport Exerc. Psychol.* **1998**, *20*, 33–357. [[CrossRef](#)]
55. Blatt, S.J. Levels of object representation in anaclitic and introjective depression. *Psychoanal. Study Child* **1974**, *29*, 107–157. [[CrossRef](#)] [[PubMed](#)]
56. Halamová, J.; Kanovský, M. Emotion-focused training for emotion coaching—an intervention to reduce self-criticism. *Hum. Aff.* **2019**, *29*, 20–31. [[CrossRef](#)]
57. Hong, J.-H.; Ramos, J.; Dey, A.K. Understanding physiological responses to stressors during physical activity. In Proceedings of the 2012 ACM Conference on Ubiquitous Computing, Pittsburgh, PA, USA, 5–8 September 2012; pp. 270–279.
58. Vancampfort, D.; Stubbs, B.; Venigalla, S.K.; Probst, M. Adopting and maintaining physical activity behaviours in people with severe mental illness: The importance of autonomous motivation. *Prev. Med.* **2015**, *81*, 216–220. [[CrossRef](#)]
59. Biddle, S.J.; Wang, C.J.; Kavussanu, M.; Spray, C. Correlates of achievement goal orientations in physical activity: A systematic review of research. *Eur. J. Sport Sci.* **2003**, *3*, 1–20. [[CrossRef](#)]
60. Lupu, E.; Özcan, D. A study about self and criticism and the physical acts involved in their education. *Procedia Soc. Behav. Sci.* **2014**, *136*, 475–480. [[CrossRef](#)]

61. Vancampfort, D.; Van Damme, T.; Probst, M.; Vandael, H.; Hallgren, M.; Mutamba, B.B.; Nabanoba, J.; Basangwa, D.; Mugisha, J. Motives for physical activity in the adoption and maintenance of physical activity in men with alcohol use disorders. *Psychiatry Res.* **2018**, *261*, 522–526. [[CrossRef](#)]
62. Dunkley, D.M.; Zuroff, D.C.; Blankstein, K.R. Specific perfectionism components versus self-criticism in predicting maladjustment. *Personal. Individ. Differ.* **2006**, *40*, 665–676. [[CrossRef](#)]
63. Singh, M.A.F. Exercise comes of age: Rationale and recommendations for a geriatric exercise prescription. *J. Gerontol. Ser. A Biol. Sci. Med. Sci.* **2002**, *57*, M262–M282. [[CrossRef](#)]
64. Taylor, A.; Cable, N.; Faulkner, G.; Hillsdon, M.; Narici, M.; Van Der Bij, A. Physical activity and older adults: A review of health benefits and the effectiveness of interventions. *J. Sports Sci.* **2004**, *22*, 703–725. [[CrossRef](#)] [[PubMed](#)]
65. Jamil, F.; Khalid, R. Factors contributing to depression during peri menopause: Findings of a Pakistani sample. *Sex Roles* **2016**, *75*, 612–622. [[CrossRef](#)]
66. Cairney, J.; Faulkner, G.; Veldhuizen, S.; Wade, T.J. Changes over time in physical activity and psychological distress among older adults. *Can. J. Psychiatry* **2009**, *54*, 160–169. [[CrossRef](#)] [[PubMed](#)]
67. Anwar, M.; Zaman Khan, S.; Ali Shah, S.Z. A Study of the Relationship Between Innovation and Performance Among NPOs in Pakistan. *J. Soc. Serv. Res.* **2020**, *46*, 26–40. [[CrossRef](#)]
68. Taranis, L.; Meyer, C. Perfectionism and compulsive exercise among female exercisers: High personal standards or self-criticism? *Personal. Individ. Differ.* **2010**, *49*, 3–7. [[CrossRef](#)]
69. Cho, M.-H. Preliminary reliability of the five item physical activity questionnaire. *J. Phys. Ther. Sci.* **2016**, *28*, 3393–3397. [[CrossRef](#)]
70. Hepper, E.G.; Gramzow, R.H.; Sedikides, C. Individual differences in self-enhancement and self-protection strategies: An integrative analysis. *J. Personal.* **2010**, *78*, 781–814. [[CrossRef](#)]
71. Hepper, E.G.; Sedikides, C.; Cai, H. Self-enhancement and self-protection strategies in China: Cultural expressions of a fundamental human motive. *J. Cross Cult. Psychol.* **2013**, *44*, 5–23. [[CrossRef](#)]
72. Thompson, R.; Zuroff, D.C. The Levels of Self-Criticism Scale: Comparative self-criticism and internalized self-criticism. *Personal. Individ. Differ.* **2004**, *36*, 419–430. [[CrossRef](#)]
73. Khan, S.R.; Naqvi, I. Self-criticism and fear of negative evaluation among university students with and without obesity. *Pak. J. Psychol. Res.* **2016**, *31*, 509–530.
74. Spielberger, C.; Gorsuch, R.; Lushene, R.; Vagg, P.; Jacobs, G. *Manual for the State-Trait Anxiety Inventory*; Consulting Psychologists Press: Palo Alto, CA, USA, 1983.
75. Marteau, T.M.; Bekker, H. The development of a six-item short-form of the state scale of the Spielberger State—Trait Anxiety Inventory (STAI). *Br. J. Clin. Psychol.* **1992**, *31*, 301–306. [[CrossRef](#)] [[PubMed](#)]
76. *SPSS Statistics for Windows*; Version 20.0; IBM Corporation: Armonk, NY, USA, 2011.
77. Hair, J.F.; Black, B.; Babin, B.; Anderson, R.E. *Multivariate Data Analysis*, 7th ed.; Prentice-Hall, Inc.: Upper Saddle Creek, NJ, USA, 2010.
78. Hu, L.T.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model. A Multidiscip. J.* **1999**, *6*, 1–55. [[CrossRef](#)]
79. Podsakoff, P.M.; Organ, D.W. Self-reports in organizational research: Problems and prospects. *J. Manag.* **1986**, *12*, 531–544. [[CrossRef](#)]
80. George, D.; Mallery, P. *SPSS for Windows Step by Step: A Simple Study Guide and Reference, 17.0 Update*; Allyn & Bacon, Inc.: Boston, MA, USA, 2010.
81. Byrne, B.M. Structural equation modeling with AMOS: Basic concepts. In *Applications, and Programming*; Routledge: New York, NY, USA, 2016.
82. Landers, D.M.; Arent, S.M. Physical activity and mental health. In *Handbook of Sport Psychology*; John Wiley & Sons: Hoboken, NJ, USA, 2007; Volume 2, pp. 740–765.
83. Fatima, M.; Niazi, S.; Ghayas, S. Relationship between Self-Esteem and Social Anxiety: Role of Social Connectedness as a Mediator. *Pak. J. Soc. Clin. Psychol.* **2017**, *15*, 12–17.
84. Ahmad, Z.R.; Bano, N.; Ahmad, R.; Khanam, S. Social anxiety in adolescents: Does self-esteem matter. *Asian J. Soc. Sci. Humanit.* **2013**, *2*, 91–98.
85. Yousafzai, A.W.; Siddiqui, M.N. Association of lower self esteem with depression: A case control study. *J. Postgrad. Med. Inst.* **2011**, *21*, 192–196.
86. Yousaf, S. The Relation between Self-Esteem, Parenting Style and Social Anxiety in Girls. *J. Educ. Prac.* **2015**, *6*, 140–142.

87. Malik, M.; Fatima, G.; Hussain Ch, A. Test Anxiety and Self-Concept of University Students Enrolled in B Ed Honors Degree Program Funded by USAID. *Bull. Educ. Res.* **2016**, *38*, 83–94.
88. Shahr, G. *Erosion: The Psychopathology of Self-Criticism*; Oxford University Press: Oxford, UK, 2015.
89. Cunha, M.; Paiva, M.J. Text anxiety in adolescents: The role of self-criticism and acceptance and mindfulness skills. *Span. J. Psychol.* **2012**, *15*, 533–543. [[CrossRef](#)]
90. Yamaguchi, A.; Kim, M.-S.; Akutsu, S. The effects of self-construals, self-criticism, and self-compassion on depressive symptoms. *Personal. Individ. Differ.* **2014**, *68*, 65–70. [[CrossRef](#)]



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