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Exercise, Resilience, and Cognitive Flexibility among University Athletes: A Cross-Sectional Study in Pakistan

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ABSTRACT

Physical and cognitive challenges associated with university sports along with those related to academics create a dual-career environment, which requires university athletes to be psychologically adaptable to cope with these difficulties. The cross-sectional study currently undertaken was designed to examine the relationships among physical activity, psychological resilience, and cognitive flexibility in 200 university athletes (male = 140, female = 60) selected conveniently from University of Gujrat, Zamindara Football Academy, and fitness centers of Pakistan. In order to measure the variables, the International Physical Activity Questionnaire - Short Form was used to measure physical activity, the Brief Resilience Scale was used to measure the psychological resilience and the Cognitive Flexibility Scale was used to measure the cognitive flexibility. The results of the Spearman correlation test showed a positive correlation between physical activity and resilience ($\rho = .383$, $p < .001$). On the other hand, the results of the simple linear regression test showed that physical activity significantly predicted the resilience ($F(1, 198) = 13.723$, $p < .001$, $\beta = .255$, 6.5%). Physical activity did not have a significant correlation with cognitive flexibility ($\rho = .123$, $p = .083$), whereas resilience did not have a significant correlation with cognitive flexibility ($\rho = -.038$, $p = .594$). Mann Whitney U Tests showed that males, team-sport participants, and private university athletes scored significantly higher physical activity and/or resilience scores than their opposite categories, whereas no statistically significant demographic differences were found for cognitive flexibility. The internal consistency of all measures used in the study was relatively low (.470 for IPAQ-SF, .268 for BRS, .614 for CFS), which is considered to be one of the study's limitations. The results provided in this paper serve as evidence to stress buffering and biopsychosocial models of the exercise-resilience connection in the non-Western developing countries.

Introduction

Physical activity has been found to be related to a variety of psychological benefits, such as a reduction in anxiety and depression, better emotional regulation, and higher levels of well-being (Biddle et al., 2019; Rodriguez-Ayllon et al., 2019). Research shows that structured physical activities can help decrease psychological distress as much as some psychological and pharmacological treatments (Singh et al., 2023). The possible reasons why this happens include a number of factors that interact with each other: physiologically, physical activities influence the levels of serotonin and dopamine, and lower cortisol response (Kandola et al., 2019); neurologically, they foster plasticity of brain areas related to emotional regulation and executive functioning, which includes prefrontal cortex and hippocampus (Herrera et al., 2024; Stillman et al., 2020); and psychologically, they give the person numerous chances for success and mastery that can result in higher self-efficacy (Gordon et al., 2018). All of these findings suggest that physical activity is not just a factor of physical fitness, but an important one for psychological adaptation.

Of all the psychological characteristics affected by physical activity, resilience has been given more attention in sporting contexts. It is no longer seen as a static personal characteristic but rather as a process of adaptive behavior emanating from the interaction of an individual's psychological resources with their environment (Hill et al., 2018). In sports competition, the resilient athlete can regulate their emotions and cope well with challenges such as injury and poor performance while maintaining motivation (Fletcher & Sarkar, 2012; Gupta & McCarthy, 2022). As per the stress buffering hypothesis (Cohen & Wills, 1985), physical activity could be one of the buffers that enable athletes to become resilient, as physical challenges are constantly presented and mastered and, therefore, help build coping mechanisms against the stress encountered both academically and in sports (Kandola et al., 2019; Singh et al., 2023).

Another construct which is also pertinent to athletic performance and adaptability is cognitive flexibility, an executive function that helps people change their attention and behavior in response to new task demands (Dajani & Uddin, 2020; Miyake et al., 2000). This construct plays an important role in the field of sports because of its contribution to decision-making and strategy adaptation under the conditions of time pressure and fatigue (Vestberg et al., 2020). Cognitive flexibility is associated with higher adaptivity of coping strategies and decision-making in competition situations (Başoğlu et al., 2025; Yu & Pei, 2026). Exercise has been suggested as a tool to improve cognitive flexibility due to increased activation of the prefrontal cortex and better attention control (Ren et al., 2021; Shi et al., 2022; Ye et al., 2023). According to theoretical assumptions, resilience and cognitive flexibility interact and can mutually reinforce each other because cognitive flexibility results in generation of various coping strategies under stress, and resilient individuals are likely to perceive stressors as manageable (Weber et al., 2023).

However, university athletes represent a unique subset within this research field. As dual career athletes, they have to fulfill the requirements of two different domains: the physical and competitive demands of organized sport and the cognitive and time challenges posed by the academic environment, which is linked to high levels of stress, fatigue, and role conflicts (Lopes Dos Santos et al., 2020). This double challenge may make university athletes more dependent on psychological adaptability, encompassing resilience and cognitive flexibility, to maintain their functioning in both fields (Purcell et al., 2019; Weber et al., 2023). However, despite this potential need for the examined variables, there is not enough research done on exercise and psychological functioning among university athletes specifically. In other words, the current literature is mostly focused on general student and community samples (Biddle et al., 2019; Rodriguez-Ayllon et al.,

2019) and elite or professional athletes (Vestberg et al., 2020). Furthermore, even though there is some evidence on resilience as a mediator of stress and burnout in sport (Lu et al., 2016) and cognitive flexibility as an executive function in sport performance (Miyake et al., 2000), there is no enough empirical research that explores the three constructs within one model.

Another area of difference that exists is that of geographic and cultural representation. The majority of evidence that currently exists on exercise, resilience, and cognitive flexibility comes from Western samples, while psychological literature on athletes in developing nations, including Pakistan, is still lacking (Schinke et al., 2016). As the psychological concepts like resilience can be culturally and linguistically rooted, as well as psychological measures created in a Western setting cannot be readily used in other settings (Gupta & McCarthy, 2024), there is a definite need for research on the relationship between these variables in Pakistani university athletes.

The current study was designed to bridge the above mentioned gap by assessing the associations between physical activity, resilience and cognitive flexibility in a sample of Pakistani university athletes, as well as investigating the role of cognitive flexibility as a mediator for the relationship between physical activity and resilience. It is important to note that due to using a cross-sectional correlational design, any associations identified in the study would be considered as such. In terms of theoretical framework, the current study relied on the biopsychosocial model (Engel, 1977), the stress-buffering model (Cohen & Wills, 1985; Fletcher & Sarkar, 2012), the cognitive flexibility theory (Spiro et al., 1988) and the theory of executive functions (Miyake et al., 2000) to conceptualize physical activity as a variable, which can promote psychological flexibility via biological, psychological and social interaction pathways. From a practical perspective, results of the current research could be used in the development of practices in university sport departments, coaching staff and sport psychologists in Pakistan to promote psychological health of student-athletes who face dual commitments at universities.

Taking into account the above stated theoretical background and previous literature review, the following hypotheses were investigated:

H1: Physical activity will be positively associated with resilience among university athletes.

H2: Physical activity will be positively associated with cognitive flexibility among university athletes.

H3: Resilience will be positively associated with cognitive flexibility among university athletes.

H4: Cognitive flexibility will significantly mediate the relationship between physical activity and resilience among university athletes.

Method

Research Design

In order to analyze the relationships between physical activity, psychological resilience, and cognitive flexibility in university athletes, a cross-sectional correlational design of survey research was adopted. A quantitative and non-experimental method of data collection was used as the intention was not to manipulate a variable but to describe the associations among three variables naturally occurring. Due to the correlation-based methodology, all results have been analyzed only for their associations.

Participants

The sample consisted of 200 university athletes (140 male, 60 female) recruited through convenience sampling from the University of Gujrat, Zamindara Football Academy, and affiliated fitness facilities in Pakistan. Eligibility criteria required that participants (a) be currently enrolled as university students, (b) be actively engaged in organized sport or regular structured physical training at the time of data collection, and (c) be at least 18 years of age. Participants were drawn from a mix of team-sport (n = 110) and individual-sport (n = 90) backgrounds, and from both public-sector (n = 156) and private-sector (n = 44) universities, to allow for exploratory demographic comparisons. Regarding competitive level, 116 athletes (58.0%) competed at the university level, 59 (29.5%) at the inter-university level, and 25 (12.5%) at the national level. Sample size was informed by conventions for detecting small-to-moderate correlation and regression effects with adequate statistical power in cross-sectional survey research.

Procedure

The data collection took place on-site within university sport complexes, football academy, and the related fitness centers. The athletes were approached by the research team during the practice sessions and were informed about the aim of the research, the voluntary character of participation, and the confidentiality of their responses. Informed written consent was received from each participant before the survey distribution. The participants were asked to complete the set of questionnaires consisting of demographic form followed by three self-reports in the predetermined sequence. Completion took approximately 15–20 minutes. No monetary or material incentives were offered. The study protocol was reviewed and approved by the relevant institutional ethics/review body prior to data collection, and procedures adhered to the ethical principles for research involving human participants outlined in the Declaration of Helsinki.

Measures

Demographic and sport-related information.

A brief investigator-constructed form collected participant age, sex, university affiliation (public vs. private), degree program, department, and sport-related information including sport type (team vs. individual), level of participation (university, inter-university, or national), duration of sport participation, and exercise frequency and duration per session. Sex, sport type, and university sector were subsequently used as grouping variables in demographic comparisons.

Physical activity.

Physical activity was assessed using the International Physical Activity Questionnaire—Short Form (IPAQ-SF), a widely used self-report instrument that estimates time spent in vigorous activity, moderate activity, and walking over the previous seven days, converted into a continuous total activity score. Higher scores reflect greater self-reported physical activity. In the present sample, internal consistency for the IPAQ-SF was weak (α = .470), consistent with known psychometric limitations of the instrument when used to capture heterogeneous activity domains, and is addressed as a limitation in the Discussion.

Psychological resilience.

Resilience was measured with the Brief Resilience Scale (BRS), a six-item self-report measure assessing the ability to bounce back or recover from stress. Items are rated on a Likert-type scale, with negatively worded items reverse-scored prior to computing a total score; higher scores indicate greater resilience. Internal consistency in the current sample was low (α = .268), which is discussed as a limitation affecting the interpretation of resilience-related findings.

Cognitive flexibility.

Cognitive flexibility was assessed using the Cognitive Flexibility Scale (CFS), a 12-item self-report measure capturing individuals' perceived ability to generate multiple alternative explanations and solutions and to adapt behavior to novel or changing situations. Items are rated on a Likert-type scale, with higher summed scores reflecting greater self-perceived cognitive flexibility. Internal consistency in this sample was moderate (α = .614).

Data Analysis

All analyses were performed via IBM SPSS Statistics (Version 27). Prior to conducting any inferential analyses, the data were examined for missing values, outliers, and normality using visual assessment (histograms, Q-Q plots, boxplots) and the Shapiro-Wilk test. As the assumptions of normality were not met for all three main variables of interest, non-parametric methods were preferred in conducting the correlations and comparisons.

The Spearman’s rank-order correlation coefficients (ρ) were calculated to measure the associations between physical activity, resilience, and cognitive flexibility (H1–H3). Simple linear regression was conducted to find out whether physical activity significantly predicted resilience, with physical activity as the predictor and resilience as the outcome variable. To test the mediating effect of cognitive flexibility on the relationship between physical activity and resilience (H4), mediation analysis was supposed to be performed based on the causal steps approach suggested by Baron & Kenny (1986) and Hayes (2018), which assumes that significant associations at zero-order level should take place before testing the indirect effects.

For assessing whether there are any differences in physical activity, resilience, and cognitive flexibility scores across demographic subgroups (sex: male vs. female; sport type: team vs. individual; university sector: public vs. private),

Mann–Whitney U tests were used to compare physical activity, resilience, and cognitive flexibility scores across demographic subgroups (sex: male vs. female; sport type: team vs. individual; university sector: public vs. private), given the non-normal distribution of scores. An alpha level of .05 was used to determine statistical significance for all inferential tests.

Results

Preliminary Analyses

No missing data were present across the three primary measures (N = 200 for all variables). The Shapiro-Wilk test demonstrated that the variables physical activity, $W(200) = .975$, $p = .001$, resilience, $W(200) = .904$, $p < .001$, and cognitive flexibility, $W(200) = .893$, $p < .001$, departed significantly from the normal distribution, which validated the use of non-parametric tests (Spearman correlation, Mann–Whitney U) for the primary analyses.

Table 1. Descriptive Statistics for Study Variables (N = 200)

Variable	M	SD	Median	Min	Max	Skewness	Kurtosis
Physical Activity	137.25	63.13	129.00	0	321	0.46	−0.28
Resilience (BRS)	21.49	4.46	21.00	14	50	1.53	7.39

Cognitive Flexibility (CFS)	36.39	10.51	39.00	10	55	−1.09	0.70

The final sample (N = 200) comprised 140 male (70.0%) and 60 female (30.0%) athletes. Most attended public universities (n = 156, 78.0%) versus private universities (n = 44, 22.0%). Team-sport athletes (n = 110, 55.0%) slightly outnumbered individual-sport athletes (n = 90, 45.0%). Regarding competitive level, 116 athletes (58.0%) competed at the university level, 59 (29.5%) at the inter-university level, and 25 (12.5%) at the national level.

Correlational Analyses (H1–H3)

Spearman correlations among the three study variables are presented in Table 2. Consistent with H1, physical activity was significantly and positively associated with resilience, $\rho(198) = .383$, $p < .001$. Contrary to H2, physical activity was not significantly associated with cognitive flexibility, $\rho(198) = .123$, $p = .083$. Contrary to H3, resilience was not significantly associated with cognitive flexibility, $\rho(198) = -.038$, $p = .594$.

Table 2: Spearman Correlations among Study Variables

Variable	**1**	**2**	**3**
Physical Activity	-		
Resilience	.383***	-	
Cognitive Flexibility	.123	−.038	-

*Note. N = 200. *** p < .001.*

Regression Analysis: Physical Activity Predicting Resilience

A simple linear regression confirmed that physical activity significantly predicted resilience, $F(1, 198) = 13.72$, $p < .001$, $R = .255$, $R^2 = .065$, adjusted $R^2 = .060$, $SE = 4.32$. Physical activity accounted for approximately 6.5% of the variance in resilience scores.

Table 3: Regression Coefficients for Physical Activity Predicting Resilience

Predictor	**B**	**SE**	**β**	**t**	**p**	**95% CI**
Constant	19.02	0.73	—	25.98	< .001	[17.58, 20.47]
Physical Activity	0.018	0.005	.255	3.70	< .001	[0.008, 0.028]

Table 4: ANOVA Summary for Regression Model

Source	**SS**	**df**	**MS**	**F**	**p**
Regression	256.02	1	256.02	13.72	< .001
Residual	3693.96	198	18.66		
Total	3949.98	199			

Mediation Analysis (H4)

As reported above, physical activity was not significantly associated with cognitive flexibility (ρ = .123, p = .083), and cognitive flexibility was not significantly associated with resilience (ρ = −.038, p = .594). Because both zero-order associations required for a mediating pathway were non-significant, formal mediation testing was not pursued further, and H4 was not supported.

Demographic Comparisons

Mann–Whitney U tests examined group differences in physical activity, resilience, and cognitive flexibility by sex, sport type, and university sector (Table 5).

Sex. Male athletes reported significantly higher physical activity (mean rank = 115.18 vs. 66.25), U = 2145.00, z = −5.48, p < .001, and significantly higher resilience (mean rank = 108.39 vs. 82.09), U = 3095.50, z = −2.96, p = .003, than female athletes. No significant sex difference emerged for cognitive flexibility, U = 3530.00, z = −1.79, p = .074.

Sport type. Team-sport athletes reported significantly higher physical activity (mean rank = 109.64 vs. 89.33), U = 3944.50, z = −2.47, p = .014, and significantly higher resilience (mean rank = 108.99 vs. 90.12), U = 4016.00, z = −2.30, p = .021, than individual-sport athletes. Cognitive flexibility did not differ by sport type, U = 4929.50, z = −0.05, p = .960.

University sector. Physical activity did not differ significantly between public and private university athletes, U = 3050.00, z = −1.13, p = .260. However, athletes from private universities reported significantly higher resilience (mean rank = 126.83 vs. 93.07) than those from public universities, U = 2273.50, z = −3.43, p = .001. Cognitive flexibility did not differ by sector, U = 2949.50, z = −1.43, p = .154.

Table 5: Mann–Whitney U Test Statistics for Demographic Comparisons

Comparison	Variable	U	Z	p
Male (n = 140) vs. Female (n = 60)	Physical Activity	2145.00	−5.48	< .001
	Resilience	3095.50	−2.96	.003
	Cognitive Flexibility	3530.00	−1.79	.074
Individual (n = 90) vs. Team (n = 110)	Physical Activity	3944.50	−2.47	.014
	Resilience	4016.00	−2.30	.021
	Cognitive Flexibility	4929.50	−0.05	.960
Public (n = 156) vs. Private (n = 44)	Physical Activity	3050.00	−1.13	.260
	Resilience	2273.50	−3.43	.001
	Cognitive Flexibility	2949.50	−1.43	.154

Table 6: Reliability Statistics for Study Measures

Measure	N Items	M	SD	α
IPAQ-SF	7	137.25	63.13	.470
BRS	6	17.58	3.66	.268
CFS	12	43.05	7.71	.614

Internal consistency (Cronbach's α) was weak for the IPAQ-SF (7 items, $\alpha = .470$) and the BRS (6 items, $\alpha = .268$), and moderate for the CFS (12 items, $\alpha = .614$), based on the full sample ($N = 200$, no missing data). These reliability estimates fall below the conventional threshold of .70 for two of the three measures and are addressed in the Discussion as a limitation relevant to interpreting the correlational and Mann-Whitney findings.

Discussion

The present study investigated the association between physical activity, psychological resilience, and cognitive flexibility of 200 Pakistani university athletes and the mediating role of cognitive flexibility on the relationship between physical activity and resilience. Three main findings emerged. First, physical activity was significantly and positively associated with resilience, supporting H1 and offering modest predictive value (accounting for roughly 6.5% of variance in resilience scores). Second, physical activity was not significantly associated with cognitive flexibility, and resilience was not significantly associated with cognitive flexibility, failing to support H2 and H3. Third, because neither of the zero-order associations required for mediation reached significance, cognitive flexibility could not be shown to mediate the physical activity–resilience relationship, and H4 was not supported. Demographic comparisons further revealed that male athletes, team-sport athletes, and — for resilience only — private-university athletes reported more favorable psychological profiles than their counterparts, while cognitive flexibility showed no significant demographic variation at all.

Physical Activity and Resilience

The positive association between physical activity and resilience ($\rho = .383$, $p < .001$) is consistent with a substantial body of evidence linking regular physical activity to psychological adaptability (Biddle et al., 2019; Rodriguez-Ayllon et al., 2019; Singh et al., 2023), and it extends this evidence to a population — Pakistani university athletes — that has received little empirical attention (Schinke et al., 2016). The regression result, in which physical activity significantly predicted resilience but explained only about 6.5% of its variance, is compatible with the stress-buffering model (Cohen & Wills, 1985) and biopsychosocial accounts (Engel, 1977): physical activity appears to be one contributor to resilience among several, rather than its primary determinant. This is an intuitive pattern for a dual-career population, where resilience is likely also shaped by academic pressures, coaching relationships, financial circumstances, family support, and prior adversity — factors outside the scope of the present model (Lopes Dos Santos et al., 2020; Purcell et al., 2019).

It is also important to mention that the small effect size needs to be seen in combination with the poor internal consistency of the Brief Resilience Scale in this particular sample ($\alpha = .268$, see below for more details). The unreliability of a measurement typically leads to underestimating a relationship compared to its population value (an effect that can be referred to as an effect of attenuation), which means that the real relationship between physical activity and resilience in this particular sample could be slightly higher than the .383 value observed above.

The Null Findings for Cognitive Flexibility

The lack of any association between physical activity and cognitive flexibility ($\rho = .123$, $p = .083$) can perhaps be considered as the most theory-related null finding from this study in the context of the overall literature, which has suggested that physical activity, especially aerobic and mind-body exercise, acts as an impetus for executive functions such as cognitive flexibility by virtue of enhanced activation of the prefrontal cortex (Ren et al., 2021; Shi et al., 2022; Ye et al., 2023).

Several non-competing explanations may account for this discrepancy. First, much of the supporting evidence comes from experimental or intervention studies isolating specific exercise modalities (e.g., aerobic training, mindfulness-based movement), whereas the present cross-sectional design captured general physical activity across a heterogeneous athlete population, which may dilute any modality-specific cognitive benefit. Second, the CFS measures a general, trait-like self-perception of adaptability rather than a performance-based executive function assessment; self-report cognitive flexibility may be less sensitive to the physiological mechanisms (e.g., prefrontal neuroplasticity) proposed to link exercise and cognition than task-based measures such as set-shifting paradigms. Third, university athletes already engage in substantial baseline physical activity as part of sport training, which may create a restricted range problem — with most athletes clustered at moderate-to-high activity levels, there may be too little variability in physical activity to detect its relationship with cognitive flexibility, even if one exists in the broader population.

The similarly non-significant association between resilience and cognitive flexibility ($\rho = -.038$, $p = .594$) is more surprising given that both constructs are typically framed as complementary components of adaptive functioning under stress (Weber et al., 2023). One interpretation is that resilience and cognitive flexibility, while theoretically related, are empirically distinct in this population — resilience here may be capturing more affective/motivational recovery from setbacks, while the CFS captures a more cognitively oriented, self-perceived adaptability that does not covary with emotional bounce-back. Issues of culture and measurement could be involved as well, since both scales were created and validated in Western cultures, and there is no certainty that the constructs and their conceptualization of "flexibility" and "resilience," as measured and reported by the subjects, are compatible in the context of Pakistani university athletes (Gupta & McCarthy, 2024). Given the low reliability of the BRS in particular, however, measurement error remains a strong candidate explanation and should not be discounted (see Limitations below).

Cognitive Flexibility as a Non-Mediator

Because H4 depended on significant physical activity–cognitive flexibility and cognitive flexibility–resilience associations, and neither materialized, the proposed mediation model could not be supported. This finding does not necessarily indicate that cognitive flexibility plays no role in the exercise–resilience relationship in principle; rather, it indicates that, as measured in this sample, cognitive flexibility does not function as the connecting mechanism. This is a meaningful contribution in its own right: much prior theorizing has treated cognitive flexibility as an intuitively plausible mediating mechanism (Weber et al., 2023) without extensive direct testing in athlete populations, and the present findings suggest that this pathway should not be assumed without further scrutiny — particularly with more psychometrically robust and possibly performance-based measures of cognitive flexibility.

Demographic Differences

Male athletes had a significantly higher level of physical activity and resilience compared to female athletes, but no difference was found in terms of cognitive flexibility. Such findings can partly be explained by sociocultural processes in Pakistan, as male athletes are usually more likely to have better access to training venues, coaching and motivational assistance to engage in competitive sports than female athletes (Schinke et al., 2016). This is a plausible explanation of why male athletes have a higher level of physical activity and resilience developed due to their participation in sport activities. Team-sport athletes were also characterized by having a higher level of physical activity and resilience in comparison to individual-sport athletes.

The observation concerning the university sector was especially notable since it deviated from the trend found for the relationship between sex and sport type: private university participants had significantly higher resilience, but not significantly different physical activity from that of public university participants. The lack of difference between sectors with respect to physical activity further implies that there is a distinction between resilience and physical activity beyond a mere correlation, and the former is shaped independently of the latter by means such as differences in institutional resources, sport psychology services, class size, or socio-economic factors related to the type of the university attended in Pakistan.

It is also important to note that cognitive flexibility did not vary significantly between demographic groups based on sex, type of sport played, or type of university attended. In light of the lack of significant relationships between the cognitive flexibility scale and physical activity and resilience, it becomes evident that the CFS is a fairly stable and trait-like measurement that does not seem to be affected much by demographic or lifestyle factors measured in the study.

Limitations

However, there are several issues limiting the validity of these results. In particular, the reliability coefficients were quite low to moderate for all scales involved: for example, IPAQ-SF reliability coefficient was $\alpha = .470$; while for BRS it was even lower at $\alpha = .268$. As a consequence, the validity of the findings of this study can be questioned because the presence of errors introduced by low reliability leads to underestimation of the strength of relationship between constructs. Indeed, the correlation coefficients might be higher among the members of this sample than they have been calculated in the present study. The low reliability of BRS is especially troubling due to its importance to the hypotheses of the study and suggests that, while this six-item scale has been validated extensively in Western settings, it is less valid when applied in the context of Pakistani university students participating in sports. It is in line with the concerns presented in the introduction about validity of psychometric tools designed in Western countries (Gupta & McCarthy, 2024).

Secondly, the cross-sectional, correlational research design does not allow the results of the research to be interpreted in terms of causality; while physical activity can help build resilience, just as possible is the fact that people who have built their resilience are more likely to engage in physical activities. Third, the convenience sampling strategy, drawn from a limited number of institutions in a specific region of Pakistan, restricts the generalizability of findings to Pakistani university athletes more broadly, let alone to athletes in other cultural or developmental contexts. Fourth, all measures relied on self-report, introducing potential shared-method variance and susceptibility to social desirability bias — a concern that may be especially relevant for a self-report resilience scale in athletic populations, where norms of toughness could shape responding. Finally, the reliance on the CFS as a self-perception measure, rather than a behavioral or task-based assessment of cognitive flexibility, may have limited its sensitivity to detect true associations with physical activity and resilience, as discussed above.

Implications and Future Directions

However, the results provide preliminary evidence for the utility of physical activity as one of the correlates of resilience amongst the Pakistani university athletes, in line with the stress buffering and biopsychosocial models, although caution must be exercised when considering the notion that cognitive flexibility, at least as self-reported, serves as the mediator between physical activity and resilience. In practical terms, the sports departments of universities and sport psychologists in Pakistan could use promotion of physical activity as part of their efforts to build resilience amongst their student-athletes, despite the fact that resilience is also influenced by structural issues like the availability of resources within institutions, as well as gender disparities in athletic programs. Further research needs to focus on validating or adapting resilience and cognitive flexibility scales to the Pakistani context prior to making any claims regarding their relationship. The longitudinal or experimental design could prove useful in ascertaining the direction of the correlation between physical activity and resilience, and future work could include the incorporation of behavioral or performance-based assessments of cognitive flexibility. Since there have been some noticeable differences by gender, type of sport played, and sector of the university, further research needs to consider some of the possible structural and sociocultural factors that may be responsible for these differences, as opposed to considering them just as demographic covariates.

Conclusion

Results from the present research suggest that there is a moderate relationship between physical activity and resilience among Pakistani university athletes, consistent with literature in general and further validating the stress buffer model as well as the biopsychosocial model of physical activity and psychological adaptation. However, cognitive flexibility, as measured by the present sample, did not turn out to have any relationship with either physical activity or resilience and could not mediate in any way in the relationships between these two variables. Findings must be interpreted with caution due to the poor to moderate reliability of the measures used, and there is a great need for cultural validation in the field of Pakistani sport psychology.

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