

ORIGINAL ARTICLE

Effect of physical activity to reduce stress in school-going children (aged 5-12 years).Um-E-Aiman Jafri¹, Ibrahim Shakoor², Kashmala Khan³, Narmeen Kausar⁴

ABSTRACT... Objective: To determine the effect of regular, structured physical activity sessions over a 12-week period on reducing perceived stress among school-going children aged 5-12 years. **Study Design:** Quasi-experimental study. **Setting:** Private Primary and Secondary Schools in Karachi, Pakistan. **Period:** 1st September 2025 to 1st February 2026. **Methods:** Children aged 5 to 12 years with baseline moderate stress and medically fit for physical activity were enrolled. Participants attended supervised 30-minute structured physical activity sessions three times weekly for 12-week period. Perceived stress was assessed at week-0 and week-12 using the 10-item Perceived Stress Scale for Children (PSS-C), scored 0 to 4 per item. Data were analyzed in IBM-SPSS version 26 using appropriate tests with $p < 0.05$ as significant. **Results:** Out of a total of 239 children analyzed, 129 (54.0%) were males, and 110 (46.0%) females, with median age 8.0 (6.0 to 10.0) years. Baseline median PSS-C score was 20.0 (18.5 to 23.0). Attendance at least 75% occurred in 178 (74.5%) children, while adverse events included muscle soreness 23 (9.6%), fatigue 18 (7.5%), and bruises in 4 (1.7%) children. PSS-C decreased to 14.2 (11.6 to 18.3), median reduction 6.0 (3.0 to 9.0) ($p < 0.001$). Low stress at week-12 was found in 111 (46.4%) children, moderate in 122 (51.0%), and high in 6 (2.5%) children. **Conclusion:** Twelve-week structured physical activity delivered through schools was associated with a significant reduction in perceived stress among children aged 5 to 12 years with moderate baseline stress.

Key words: Children, Fatigue, Physical Activity, School, Stress.

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INTRODUCTION

Globally, mental health disorders affect an estimated 10-20% of children and adolescents, with stress being a prominent factor impacting daily functioning and development.¹ Recent reports have highlighted an alarming increase in psychosocial stressors among children due to heightened academic competition, family expectations, and limited recreational opportunities.^{2,3} Prolonged exposure to stress can lead to physical, emotional, and psychological health issues, including anxiety, depression, sleep disturbances, and poor academic performance.⁴ The COVID-19 pandemic further aggravated stress through social isolation and disruptions in schooling.

Physical activity is widely recognized as an accessible and non-pharmacological strategy to alleviate stress, enhance emotional resilience, and improve well-being.⁵ According to the World Health Organization (WHO), children aged 5-17 years

should participate in at least 60 minutes of moderate-to-vigorous physical activity daily.⁶ Unfortunately, in Pakistan, physical education is often deprioritized in school systems, with limited facilities and emphasis on academic achievements over extracurricular activities.⁷ Regional data indicated that the prevalence of stress among school-going children was 33.7%.⁸ Raj and Kanagasabapathy showed that 50% of students who were involved in low levels of physical activity had high stress levels ($p < 0.001$).⁹ A study conducted among primary school children from Iran found that more than half of the children had worry, fast heartbeats, fear, chills, and feelings of sadness, while 46.6% reported headaches, and 41.8% reported tiredness.¹⁰ A study found that students with low levels of physical activity had a mean stress score of 7.07 ± 3.45 vs 6.43 ± 3.45 among those who had moderate/high levels of physical activity, and the difference was found to be statistically significant ($p < 0.001$).¹¹

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In Pakistan, limited data exists on the mental health and stress management strategies for children, and even fewer studies focus on physical activity as a means of stress reduction. Only 15% of Pakistani children meet the WHO-recommended daily physical activity levels¹², highlighting a significant gap in implementing health guidelines in schools. Not much literature is on view evaluating the effects of physical activity on the stress of school-going children. Therefore, the current study was planned to determine the effect of regular, structured physical activity sessions over a 12-week period on reducing perceived stress levels measured by the Perceived Stress Scale for Children (PSS-C) among school-going children aged 5-12 years in Karachi, Pakistan. The findings of this study would not only provide information about the rising prevalence of stress-related disorders and limited implementation of activity-based health programs but also help to endorse the proven physiological and psychological benefits of exercise. The findings may inform school health policies, guide teacher training, and provide sustainable, low-cost strategies for stress management in urban Pakistani settings. Based on both literature and prior engagement with local schools, it is expected that regular, supervised physical activity will yield a statistically significant reduction in perceived stress scores in participating children.

METHODS

This quasi-experimental study was conducted at private primary and secondary schools in Karachi, Pakistan, from 1st September 2025 to 1st February 2026, after obtaining approval from the institutional ethical committee (Letter number: IRB/KMDC/KMU/09/2025, dated: 27/08/2025). Written approval from the concerned authorities of the school was also obtained. A sample size of 239 was calculated using the OpenEpi online sample size calculator, considering the anticipated prevalence of stress among school-going children as 33.7%⁸, with a 95% confidence level and a 6% margin of error. The inclusion criteria were children of any gender aged 5-12 years with baseline moderate stress levels. Only those children who were medically fit to participate in physical activity (through direct observation by the research team and by obtaining a relevant medical history from parents or guardians)

were included. The exclusion criteria were children with pre-existing psychiatric disorders diagnosed by a psychiatrist and currently on medication for anxiety, depression, or other psychiatric conditions. Those who were already registered in other physical activity clubs were also excluded. Informed and written consent from parents/guardians was obtained after explaining to them the objective and safety of the study.

Following the eligibility criteria, the children went through documentation of their demographic data, which included age (years) and gender (male/female), monthly family income (<20000/20000-50000/>50000), and family history of stress or psychiatric illnesses (yes/no) were collected. Participants were engaged in structured physical activity sessions that lasted approximately 30-minute, 3 times a week, throughout a period of 12-week, with activities including a mix of aerobic exercises, stretching routines and team sports like football / cricket, and recreational games designed by a certified pediatric physical trainer. Each session was supervised by a trained physical activity instructor. A 10-item PSS-C was used to measure baseline (at week 0) and post-intervention stress levels (at 12-week). Each question was scored on a 5-point Likert scale, ranging from 0 to 4. The total PSS-C score determined the stress level of the children. The stress level was categorized as low stress (normal range, no significant stress) with PSS-C scores 0-13, moderate stress (noticeable stress levels that may require monitoring) with PSS-C scores 14-26, and high stress (significant stress levels requiring intervention) with PSS-C scores 27-40.¹³ Attendance and reasons for missed sessions or dropouts were recorded. Given that the study involved assessment of stress, with potential emotional or behavioral concerns, a qualified psychologist or psychiatrist was available for consultation and referral. Any participant identified with a high stress level or emotional difficulties during the study was referred to the psychologist/psychiatrist for further evaluation and support. The primary outcome was recorded as a reduction in stress levels. A special proforma was designed to collect all relevant study data.

Data were entered and analyzed using IBM-SPSS

Statistics, version 26.0. The qualitative data were shown as frequencies and percentages. The quantitative data were represented as mean and standard deviation (SD) or median and interquartile range (IQR). The normality distribution of the data was checked by applying the Shapiro-Wilk test. Comparative tests were applied within these strata to assess the effect of the intervention while minimizing confounding influences. A paired sample t-test or Wilcoxon-signed rank test was used to compare paired quantitative data. An independent sample test, or Mann-Whitney U test, was used to compare independent quantitative data. Analysis of variance or Kruskal-Wallis test was also used as necessary. For inferential statistics, $p < 0.05$ was considered statistically significant.

RESULTS

A total of 270 school-going children were initially assessed for eligibility, and 31 were excluded as they did not meet the eligibility criteria. Among 239 children analyzed, 129 (54.0%) were males, and 110 (46.0%) females. The median age was 8.0 (6.0-10.0) years, ranging between 5-12 years. There were 127 (53.1%) children who had monthly family income between 20,000 to 50,000 PKR. Family history of stress or psychiatric illness was reported in 39 (16.3%) participants. The median BMI, heart rate, and baseline PSS-C score were 16.6 (15.2-18.0) kg/m², 94 (88.0-101.0) beats/minute, and 20.0 (18.5-23.0), respectively. Table-I is showing details about the characteristics of study participants.

TABLE-I		
Characteristics of children (n=239)		
Characteristics		Number (%)
Gender	Male	129 (54.0%)
	Female	110 (46.0%)
Age groups (years)	5-8	135 (56.5%)
	9-12	104 (43.5%)
Monthly family income (PKR)	<20,000	56 (23.4%)
	20,000 to 50,000	127 (53.1%)
	>50,000	56 (23.4%)
Family history of stress or psychiatric illness		39 (16.3%)

Attendance of at least 75% of planned sessions was recorded in 178 (74.5%) children, attendance

between 50% and 74% in 42 (17.6%), and attendance below 50% in 19 (7.9%). Minor adverse events were documented as muscle soreness in 23 (9.6%), fatigue in 18 (7.5%), and minor bruises in 4 (1.7%). At the end of the 12-week period, stress category distribution showed low stress in 111 (46.4%), moderate stress in 122 (51.0%), and high stress in 6 (2.5%). Intervention adherence, follow-up evaluation, and adverse events are summarized in Table-II.

TABLE-II		
Intervention adherence, follow-up evaluation, and adverse events (n=239)		
Variables		Number (%)
Attendance proportion	≥75	178 (74.5%)
	50-74	42 (17.6%)
	<50	19 (7.9%)
Stress category	Low	111 (46.4%)
	Moderate	122 (51.0%)
	High	6 (2.5%)
Minor adverse events	Muscle soreness	23 (9.6%)
	Fatigue	18 (7.5%)
	Minor bruises	4 (1.7%)

PSS-C scores declined over the 12-week intervention period. The median PSS-C score decreased from 20.0 (IQR 18.5 to 23.0) at baseline to 14.2 (IQR 11.6 to 18.3) at week 12, corresponding to a median paired reduction of 6.0 (IQR 3.0 to 9.0) points. This reduction was statistically significant on paired comparison ($p < 0.001$). The change in PSS-C score is reported in Table-III.

TABLE-III				
Change in perceived stress from baseline to week-12 (n=239)				
Final Outcome	Baseline Week-0, Median (IQR)	Week-12, Median (IQR)	Median Paired Reduction, Median (IQR)	P-Value
PSS-C score	20.0 (18.5-23.0)	14.2 (11.6-18.3)	6.0 (3.0-9.0)	<0.001

Wilcoxon signed-rank test

Gender ($p=0.415$), age ($p=0.187$), and monthly family income ($p=0.224$) did not influence final PSS-C scores significantly. Children with a family history of stress or psychiatric illness had a median

reduction of 4.3 (2.1 to 7.2) compared with 6.1 (3.2 to 9.1) among those without a reported history ($p=0.083$). Details about the stratified analyses of the median reduction in PSS-C score across various baseline characteristics of participants are shown in Table-IV.

TABLE-IV

Stratified median (IQR) reduction in PSS-C score by baseline variables (n=239)

Characteristics		Median Reduction in PSS-C	P-Value
Gender	Male	6.1 (3.2-9.1)	0.415*
	Female	5.4 (3.1-8.4)	
Age groups (years)	5-8	5.2 (3.5-8.1)	0.187*
	9-12	6.2 (4.1-9.2)	
Monthly family income (PKR)	<20,000	5.2 (3.6-8.4)	0.224^
	20,000 to 50,000	6.0 (3.2-9.0)	
	>50,000	6.3 (4.2-9.3)	
Family history of stress or psychiatric illness	Yes	4.3 (2.1-7.2)	0.083*
	No	6.1 (3.2-9.1)	

*Mann-Whitney U test; ^Kruskal-Wallis test

DISCUSSION

This research found a reduction in perceived stress after 12-week of structured physical activity falling from a median of 20.0 (18.5 to 23.0) at baseline to 14.2 (11.6 to 18.3) at week 12 and a paired median reduction of 6.0 (3.0 to 9.0) points. This direction of effect aligns with evidence linking higher physical activity with lower school related stress and better emotional outcomes in school aged populations. A systematic review examining physical activity and school related stress reported an inverse relationship between regular physical activity and stress indicators, supporting the plausibility that structured movement can shift stress perceptions in educational settings.¹⁴ A broader school related physical activity intervention literature also indicates that interventions targeting activity during the school day can influence mental health outcomes, though effect sizes vary by population risk profile, intervention intensity, and outcome measures.¹⁵ The magnitude of change observed in this study is clinically relevant because perceived stress in childhood is associated with functional domains

such as school engagement and emotional regulation, domains that the PSS C was designed to screen.¹⁶ The observed reduction can be interpreted through several mechanisms described in paediatric exercise and stress research. Physical activity may reduce perceived stress through improved sleep continuity, enhanced self efficacy, and social connectedness from team based play, each of which influences children's appraisal of daily demands. Reviews of school based interventions that evaluate physiological stress regulation suggest that behavioural interventions can alter stress related systems including hypothalamic pituitary adrenal axis activity and cardiovascular parameters in children, indicating biological plausibility for changes in perceived stress over a school term.¹⁷

In this study, the intervention combined aerobic movement, stretching, and structured games, a mix that maps onto guideline based recommendations for children and adolescents, which emphasise regular moderate to vigorous activity and varied movement including muscle and bone strengthening activities.¹⁸ From a clinical and school health perspective, this pattern supports integrating structured physical activity with clear referral pathways for children identified at higher risk, since physical activity can be a first line supportive intervention while not replacing targeted psychological assessment when stress is severe.¹⁹ Observational data also support the value of sustained activity during preadolescence for later mental health trajectories, reinforcing the importance of interventions in the 10 to 12 year period.²⁰ International literature on school related physical activity interventions highlights that effectiveness depends on implementation quality and sustained engagement rather than baseline socioeconomic position alone, which is consistent with the pattern seen here.^{21,22}

Children presenting with functional complaints like sleep disturbance, irritability, or school avoidance may have stress related issues and structured physical activity could be advised as part of a behavioural prescription that supports stress regulation. The observed median reduction of 6.0 points as per PSS-C over a 12-week period in this research provides a useful guidance for expected change when counselling families and schools.

These results support incorporating structured activity into routine timetables rather than relying only on unstructured recess and further studies in this regard could help generating local data.

Regarding limitations of this study, the quasi experimental pre-post design without a parallel control group limits attribution because stress can change across a school term due to exams, seasonal patterns, or concurrent school events. Reliance on self-reported stress introduces response bias including social desirability and recall limitations in younger children. The study did not evaluate maintenance of stress reduction beyond week-12.

CONCLUSION

Twelve-week structured physical activity delivered through schools was associated with a significant reduction in perceived stress among children aged 5 to 12 years with moderate baseline stress. The pattern of change across gender, age, and income strata was consistent with no evidence of between group differences on subgroup testing.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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1	Um-E- Aiman Jafri: Concept, data collection, writing.
2	Ibrahim Shakoor: concept, critically manuscript review.
3	Kashmala Khan: Data collection, writing, data interpretation.
4	Narmeen Kausar: Critically review.