

Original Research Article

Assessment of physical literacy and its association with sleep disturbance among school-going children aged 8 to 15 years: a cross-sectional study

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ABSTRACT

Background: Physical literacy has emerged as a crucial element in supporting healthy growth, motor competence, and lifelong participation in physical activity. Sleep, similarly, is fundamental to cognitive, emotional, and physical development. Despite the importance of both, limited evidence exists regarding their interaction in Indian school-aged children. It was hypothesized that children with higher physical literacy would demonstrate fewer sleep disturbances. To test this, a cross-sectional study was conducted using validated questionnaires to assess physical literacy and sleep health among school-going children.

Methods: A cross-sectional study was conducted among 100 children (53 boys, 47 girls). Physical literacy was evaluated using the physical literacy in children questionnaire (PLCQ), and sleep disturbances were assessed through the child and adolescent sleep checklist (CASC). Data were analyzed using SPSS 29.0 with independent t-tests and Pearson's correlation.

Results: The mean physical literacy score was 95.63 ± 13.68 , and the mean sleep disturbance score was 21.03 ± 8.89 . No gender differences were found in either variable. A significant negative correlation ($r = -0.541$, $p < 0.001$) indicated that children with higher physical literacy experienced fewer sleep-related issues. Age showed a mild but significant positive correlation with sleep disturbance ($p = 0.040$).

Conclusions: Physical literacy appears to have a favorable association with sleep health. Children with higher physical literacy scores are less likely to experience sleep disturbances. Integrating structured physical literacy-based programs in schools may contribute to improved sleep quality and overall well-being.

Keywords: Children, Physical activity, Physical literacy, School health, Sleep disturbance

INTRODUCTION

Physical inactivity, poor physical fitness, and rising childhood obesity represent major global public health challenges, contributing significantly to the increasing burden of non-communicable diseases such as cardiovascular diseases, diabetes, and certain cancers, while also adversely affecting quality of life and increasing healthcare costs.¹ Physical activity plays a vital role in children's physical development, supporting the acquisition of both gross and fine motor skills. However,

a high prevalence of overweight and obesity has been reported among school-going children in Pune, India, highlighting the growing concern of inadequate physical activity in this population.¹

Physical activity is defined as any bodily movement produced by skeletal muscles that results in a substantial increase in energy expenditure above resting levels. Exercise is a structured and repetitive subset of physical activity aimed at improving or maintaining components of physical fitness. Regular engagement in physical

activity provides extensive physical, psychological, social, and cognitive benefits for school-aged children. Recognizing these benefits, international and national guidelines recommend that children aged 5-17 years engage in at least 60 minutes of moderate-to-vigorous physical activity daily.² Despite these recommendations, studies from Maharashtra indicate that nearly 62% of children do not meet the recommended activity levels, with a higher proportion of girls (64%) being inactive compared to boys (60.2%).³ Globally, physical inactivity is considered one of the most significant public health problems of the 21st century, with approximately 81% of children and adolescents failing to achieve sufficient physical activity levels, leading to poor physical fitness and related health consequences.⁴

In recent years, physical literacy has emerged as an alternative and holistic approach to promoting lifelong engagement in physical activity. The World Health Organization recognizes physical literacy as a key component in enhancing enjoyment and sustained participation in physical activity.² The International Physical Literacy Association defines physical literacy as the motivation, confidence, physical competence, knowledge, and understanding required to value and take responsibility for engagement in physical activities throughout life.⁵ Physical literacy encompasses four interrelated domains: physical competence, cognitive understanding, affective or psychological attributes such as motivation and confidence, and social engagement in physical activity.² The central principle of physical literacy lies in an individual's ability to integrate physical competence with affective characteristics, thereby supporting sustained participation in physical activity.⁴

Although physical literacy is relevant across the lifespan, childhood represents a critical developmental phase for acquiring motor skills, confidence, and positive physical activity experiences that underpin lifelong engagement. Children with higher physical literacy levels tend to be more confident and capable of participating in a wide range of physical activities, whereas lower physical literacy is associated with reduced physical activity behaviors.² Physical literacy has therefore gained recognition as a potential strategy to counter sedentary behavior, childhood obesity, and poor physical fitness across both developed and developing countries.¹ Furthermore, the World Health Organization identifies physical literacy as one of the three pillars of health promotion aimed at achieving sustainable health development by 2030.⁵

Sleep is another fundamental determinant of child and adolescent health, influencing hormonal regulation, energy balance, immune function, and overall homeostasis. Adequate sleep is associated with reduced risk of chronic diseases, improved mental health, enhanced academic performance, and better quality of life, making sleep health an important public health concern.⁷ In children and adolescents, sleep plays a

critical role in tissue repair, immune support, and consolidation of newly acquired knowledge and skills.⁸ Despite guidelines recommending 8-10 hours of sleep for adolescents, a substantial proportion fail to achieve adequate sleep duration, increasing the risk of obesity, behavioral problems, and impaired academic outcomes.⁸

Both physical activity and sleep independently contribute to cognitive functioning and academic achievement, primarily through mechanisms such as improved attention, working memory, and memory consolidation.⁶ Physical activity promotes neurogenesis and angiogenesis, while sleep strengthens synaptic connections formed during wakefulness, together supporting optimal cognitive performance.⁶ Considering the shared influence of physical activity and sleep on health and cognition, examining sleep health within the framework of physical literacy is increasingly important. However, limited evidence exists regarding the association between physical literacy and sleep disturbance among Indian school-going children. Therefore, the present study aimed to assess physical literacy and sleep disturbance among children aged 8 to 15 years and to examine the association between these two important health determinants.

The objectives of the present study were to assess physical literacy among school-going children aged 8 to 15 years using the physical literacy in children questionnaire, to evaluate sleep time and sleep disturbance among school-going children aged 8 to 15 years using the child and adolescent sleep checklist, and to determine the association between physical literacy and sleep disturbance in this population.

METHODS

This cross-sectional observational study was conducted among school-going children aged 8 to 15 years in selected schools of Pune, Maharashtra, India. The duration of the study was six months, from April 2025 to October 2025. A total of 100 children were enrolled in the study using a convenience sampling method.

Children who were attending regular school, were between 8 and 15 years of age, and were able to read and comprehend English were included in the study. Written informed consent was obtained from parents or guardians, and assent was obtained from all participating children prior to data collection. Children with known neurological disorders, cardiopulmonary conditions, musculoskeletal impairments, recent injuries, cognitive or behavioural disorders, or those unable to follow instructions were excluded from the study.

Physical literacy was assessed using the physical literacy in children questionnaire, a standardized tool designed to evaluate multiple domains of physical literacy, including physical competence, psychological domain (motivation and confidence), cognitive domain (knowledge and

understanding), and social domain (engagement in physical activity). The questionnaire has demonstrated acceptable validity and reliability. Scores from individual domains were calculated and summed to obtain a total physical literacy score.

Sleep disturbance was assessed using the child and adolescent sleep checklist, a validated 24-item questionnaire used to identify sleep-related problems in children and adolescents. Each item was rated on a four-point Likert scale ranging from 0 (never) to 3 (always). The total sleep disturbance score was calculated by summing all item scores, with higher scores indicating greater sleep disturbance.

Data collection was carried out in a supervised classroom setting after obtaining permission from school authorities. Participants were provided with standardized instructions before completing the questionnaires, and adequate time was given to ensure accurate and independent responses. Confidentiality of all participant information was maintained throughout the study.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 29.0. Descriptive statistics were used to summarize demographic variables and outcome measures. Independent t-tests were used to compare physical literacy and sleep disturbance scores between boys and girls. Pearson's correlation coefficient was applied to determine the association between physical literacy, sleep disturbance, and age. A p value of less than 0.05 was considered statistically significant.

RESULTS

The study included a total of 100 school-going children, comprising 53 boys and 47 girls. The mean age of the participants was 11.84 ± 1.92 years, indicating a representative sample of children across the age range of 8 to 15 years.

Physical literacy scores among the participants ranged from 45 to 118, with a mean score of 95.63 ± 13.68 , suggesting an overall moderate to high level of physical literacy in the study population. Sleep disturbance scores ranged from 6 to 48, with a mean score of 21.03 ± 8.89 , reflecting varying degrees of sleep-related problems among the children.

Figure 1 shows the correlation between physical literacy score and sleep disturbance score among school-going children aged 8-15 years. A statistically significant negative correlation was observed between physical literacy and sleep disturbance ($r = -0.541$, $p < 0.001$). The scatter plot demonstrates that children with higher physical literacy scores tended to have lower sleep disturbance scores, whereas higher sleep disturbance scores were observed among children with lower physical literacy scores.

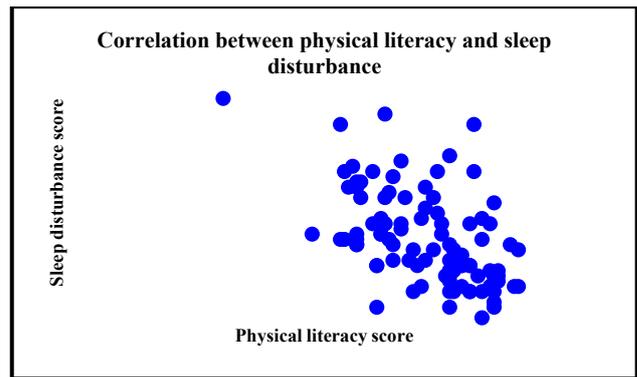


Figure 1: Physical literacy versus sleep disturbance: $r = -0.541$, $p < 0.001$ (significant negative association).

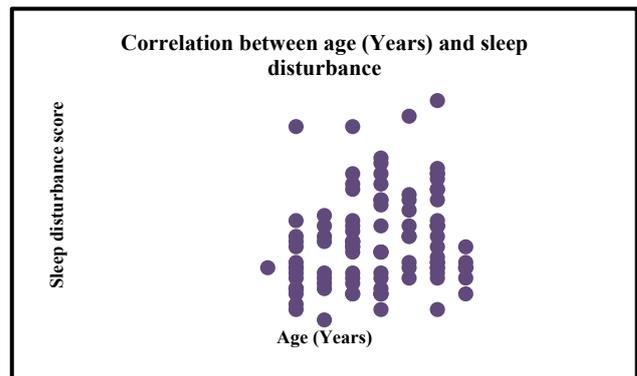


Figure 2: Age and sleep disturbance: mild positive correlation ($p = 0.040$).

Figure 2 illustrates the correlation between age (in years) and sleep disturbance score. A mild but statistically significant positive correlation was found between age and sleep disturbance ($p = 0.040$). The scatter plot indicates a trend of increasing sleep disturbance scores with increasing age among the participants.

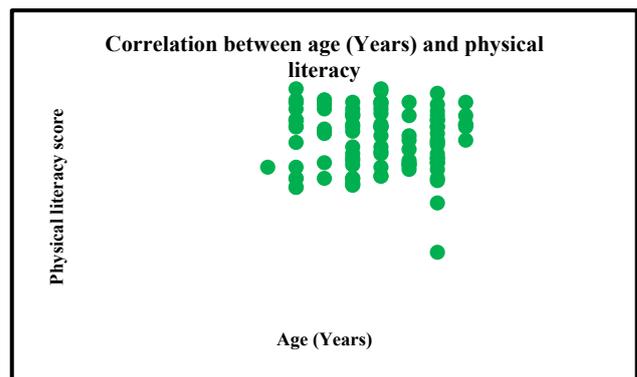


Figure 3: Age versus physical literacy: no significant correlation ($p = 0.565$).

Figure 3 depicts the relationship between age (in years) and physical literacy score. No statistically significant correlation was observed between age and physical literacy ($p = 0.565$). The scatter plot shows that physical

literacy scores remained relatively consistent across different age groups without any clear increasing or decreasing trend.

DISCUSSION

The present study examined the association between physical literacy and sleep disturbance among school-going children aged 8-15 years and demonstrated a significant inverse relationship between these two variables. Children with higher physical literacy scores exhibited lower levels of sleep disturbance, highlighting the potential role of physical literacy in supporting healthy sleep patterns. This finding aligns with the growing body of evidence emphasizing the interrelationship between physical activity-related constructs and sleep health in children and adolescents.⁹

In the present study, the mean physical literacy score indicated a moderate to high level of physical literacy among the participants. Higher physical literacy was significantly associated with reduced sleep disturbance. Similar findings have been reported by Huang et al, who observed that increased engagement in physical activity was associated with improved sleep quality and reduced sleep problems among children and adolescents.¹⁰ Physical literacy encompasses not only physical competence but also motivation and confidence to engage in physical activity, which may indirectly promote regular activity participation and thereby contribute to better sleep regulation.¹¹

The significant negative correlation observed between physical literacy and sleep disturbance in this study is consistent with previous research suggesting that children who are more physically competent and confident are more likely to engage in sustained physical activity, leading to improved sleep efficiency and reduced sleep latency.¹² Barnett et al reported that higher physical literacy was positively associated with physical activity participation and overall health outcomes, supporting the present findings that physical literacy may play a broader role in influencing health behaviors such as sleep.¹³

Gender-wise analysis in the present study revealed no significant differences in physical literacy or sleep disturbance scores between boys and girls. This finding is in agreement with earlier studies conducted in school settings, which reported comparable physical literacy levels and sleep patterns across genders when similar opportunities for physical activity were provided.¹⁴ The absence of gender differences may reflect uniform exposure to physical education and recreational activities within the participating schools.

A mild but statistically significant positive association was observed between age and sleep disturbance, indicating an increase in sleep-related problems with advancing age. This finding is consistent with previous literature describing age-related changes in sleep patterns

during late childhood and early adolescence, including delayed sleep phase, increased academic pressure, and greater exposure to electronic devices.¹⁵ However, no significant association was found between age and physical literacy scores, suggesting that physical literacy may not increase linearly with age and may instead depend on environmental factors, structured opportunities for physical activity, and early skill development.¹¹

The findings of the present study underscore the importance of addressing both physical literacy and sleep health as interconnected components of child well-being. Schools represent an ideal setting for implementing physical literacy-based interventions, as such programs may not only enhance physical activity participation but also contribute to improved sleep health, cognitive functioning, and overall quality of life among children.¹⁶ Integrating physical literacy into school curricula may therefore serve as a comprehensive strategy to promote both physical and psychosocial health.

The cross-sectional design of the study limits causal inference between physical literacy and sleep disturbance. Additionally, reliance on self-reported questionnaires may introduce reporting bias. Future longitudinal studies incorporating objective measures of physical activity and sleep are recommended to further elucidate the causal pathways between physical literacy and sleep health.

CONCLUSION

Improving physical literacy may serve as an effective, non-pharmacological strategy to enhance sleep quality in children. Schools should prioritize physical literacy components within their curricula to foster both physical and mental well being.

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