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EFFECT OF PHYSICAL ACTIVITY ON SOCIAL EMOTIONAL DEVELOPMENT OF 4 AND 5 YEARS OLD CHILDREN

EFEITO DA ATIVIDADE FÍSICA NO DESENVOLVIMENTO SOCIOEMOCIONAL DE CRIANÇAS DE 4 E 5 ANOS

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Abstract
Background: Early childhood (05 years) is a critical neurodevelopment period, where physical activity is central to the development of motor, cognitive and psychosocial outcomes. Although the world has recommended a regular exercise among children, a significant percentage of children, especially in the low and middle-income-countries such as Pakistan do not follow these recommendations. There is little evidence on the relationship between social-emotional development and physical activity in preschool children. Objective: To evaluate the frequency of social-emotional development based on the physical activity level among preschool-aged children. Methods: The research was an analytical cross-sectional study carried out in Pediatric Outpatient Department of Fauji Foundation Hospital during December 2025 to March 2026. They enrolled 200 preschool children (3-5 years old) by non-probability consecutive sampling. A structured Preschool Physical Activity Questionnaire (based on

Resumo
Contexto: A primeira infância (0 a 5 anos) é um período crítico para o desenvolvimento neurológico. em que a atividade física é fundamental para o desenvolvimento motor. cognitivo e psicossocial. Embora haja recomendações a nível mundial para que as crianças pratiquem exercício físico regularmente. uma percentagem significativa de crianças. especialmente em países de rendimento baixo e médio. como o Paquistão. não segue essas recomendações. Existem poucos dados sobre a relação entre o desenvolvimento socioemocional e a atividade física em crianças em idade pré-escolar. Objetivo: Avaliar a frequência do desenvolvimento socioemocional com base no nível de atividade física entre crianças em idade pré-escolar. Métodos: A investigação consistiu num estudo transversal analítico realizado no Serviço de Consultas Externas de Pediatria do Hospital Fauji Foundation. entre dezembro de 2025 e março de 2026. Foram recrutadas 200 crianças em idade

NASPE guidelines) was used to measure physical activity, and the Ages and Stages Questionnaire: Social-Emotional, Second Edition (ASQ:SE-2) was used to measure social-emotional development. Daily time spent in activity levels were used to classify participants into high and low physical activity. The SPSS version 23 was used in statistical analysis. Chi-square tests and multivariable regression models were used to determine associations between variables. Results: There was a significant difference in the scores of social-emotional developments between children who were more physically active and those who were less physically active ($p < 0.001$). A higher proportion of children in the low physical activity group fell into the "at-risk" and "delayed" categories. Developmental outcomes were negatively related to screen time and sedentary behavior. Conclusion: There is a close relationship between increased physical activity and social-emotional development in preschool children. These results emphasize the research that active lifestyles should be encouraged in early childhood through early interventions and parental awareness programs.

Keywords: Physical Activity. Preschool Children. Social-emotional Development. ASQ:SE-2. Pakistan. Early CHILDHOOD Development

pré-escolar (3-5 anos) através de amostragem consecutiva não probabilística. Foi utilizado um Questionário Estruturado de Atividade Física Pré-escolar (baseado nas diretrizes da NASPE) para medir a atividade física. e o Questionário de Idades e Estágios: Socioemocional. Segunda Edição (ASQ:SE-2) para medir o desenvolvimento socioemocional. O tempo diário dedicado aos níveis de atividade foi utilizado para classificar os participantes em atividade física elevada e baixa. A versão 23 do SPSS foi utilizada na análise estatística. Foram utilizados testes do qui-quadrado e modelos de regressão multivariável para determinar associações entre as variáveis. Resultados: Verificou-se uma diferença significativa nas pontuações de desenvolvimento socioemocional entre as crianças mais ativas fisicamente e aquelas menos ativas fisicamente ($p < 0.001$). Uma proporção mais elevada de crianças no grupo de baixa atividade física enquadrou-se nas categorias «em risco» e «atrasadas». Os resultados de desenvolvimento estavam negativamente relacionados com o tempo passado em frente ao ecrã e o comportamento sedentário. Conclusão: Existe uma relação estreita entre o aumento da atividade física e o desenvolvimento socioemocional em crianças em idade pré-escolar. Estes resultados reforçam a investigação de que estilos de vida ativos devem ser incentivados na primeira infância através de intervenções precoces e programas de sensibilização dos pais.

Palavras-chave: *Atividade Física. Crianças em Idade Pré-Escolar. Desenvolvimento Socioemocional. ASQ:SE-2. Paquistão. Desenvolvimento na Primeira Infância*

1 INTRODUCTION

Child development is the most intense during the birth to five years of age, which is a critical phase of brain development throughout the human lifespan. This early phase is a special chance to improve the development of a child motor, functional, social, cognitive, and emotional aspects [1]. Exercise is a core part of early childhood development and has a major impact on various dimensions of health and well-being [2].

Early childhood physical activity facilitates motor skill development, enhances musculoskeletal wellbeing, cardiorespiratory fitness, and decreases adiposity later on [3]. Growing data is also pointing to physical activity to be a major determinant of cognitive and neural development. High intensity of physical activity has been shown by systematic reviews to be linked to better cognitive functioning, executive functioning, and academic performance in children and adolescents [4,5]. Moreover, children with frequent physical activity have less anxiety, depression, and behavioral issues, have higher levels of self-esteem and better psychosocial adaptation [6].

The World Health Organization (WHO) advises that children in preschool age should take at least three hours of physical activity per day whereas children in older ages should take at least one hour of moderate to vigorous intensity physical activity [7]. Even with these recommendations, it has been indicated across the world that only two out of every five children are physically active to the level that is required. Physical inactivity is particularly high in Pakistan and especially among girls (85 per cent as opposed to 70 per cent in boys) mainly because of socio-cultural restrictions [8].

Although school-going children typically enjoy more formal chances of physical activity and social interaction in the educational settings, preschool children are largely reliant on the supervision of their parents. This age bracket is often neglected and this leads to less participation in physical activities. Moreover, there is a lack of agreement on the kind, length, and level of activities that should be given to the preschool-aged children and parental awareness about their significance is also lacking [9,10]. Use of electronic gadgets has also led to sedentary lifestyles adversely impacting the physical well-being, mental strength, and social-emotional health of children.

Local studies show that despite a high percentage of children (90–93%) do engage in daily routine activities, a substantial percentage have excessive screen time (about 13%). Furthermore, less physically active children have been found to have more sleep problems and less social interaction than their more physically active counterparts. Both physical activity and social engagement during early childhood development has been linked to increased family interaction, which has been linked to improved social outcomes in children.

Although the importance of childhood physical activity has been increasing worldwide, a lack of studies in Pakistan on the relationship between childhood physical

activity and social-emotional development in preschoolers has been identified. Thus, an intervention in this gap is necessary in the creation of evidence-based interventions to support holistic development in early childhood. Moreover, the Ages and Stages Questionnaire: Social-Emotional (ASQ:SE) has been modified and tested with other populations and can be used to assess social-emotional skills in young children to offer a systematic method of measuring developmental outcomes [11].

2 OBJECTIVE

To evaluate the frequency of social-emotional development based on the physical activity level among preschool-aged children.

3 METHODOLOGY

The cross-sectional study is an analytical study that was carried out in the Pediatric Outpatient Department of Fauji Foundation Hospital, during December 2025 and March 2026. Non-probability consecutive sampling was used to enroll 200 preschool children aged 3 to 5 years. A structured Preschool Physical Activity Questionnaire based on NASPE guidelines was used to measure levels of physical activity and included both structured and unstructured activity. The validated Ages and Stages Questionnaire: Social-Emotional, Second Edition (ASQ:SE-2) was used to gauge social-emotional development. Kids were divided into high and low activities on the basis of hours of daily activity. Demographic and behavioral data were recorded. SPSS version 23 was used to perform statistical analysis at $p < 0.05$.

4 INCLUSION CRITERIA

Children (boys and girls) aged 3-5 years, who were physically healthy and attended routine pediatric check-ups. The children whose parents/primary caregivers were present and ready to fill the necessary questionnaires were included.

5 EXCLUSION CRITERIA

Children with a history of known developmental conditions like autism spectrum disorder or attention-deficit/hyperactivity disorder diagnosed with a neurological or psychiatric condition, or physical disability that prevented involvement in moderate-to-vigorous physical activity. Also, children with chronic medical conditions (e.g., congenital heart disease or uncontrolled asthma), those who are taking drugs that may have some influence on the behavior or activity level, and instances where the questionnaire was filled in by the person not knowing the daily routine and behavior of the child were excluded.

5.1 Data collection procedure

Informed consent was obtained and data collection was conducted by the trained pediatric residents. The pediatric outpatient department was used to recruit eligible participants. Demographic information such as age and gender was taken. The physical activity patterns during the last seven days were measured using a structured questionnaire based on NASPE guidelines that included structured and unstructured activities, sedentary behavior, and screen time. The ASQ:SE-2 tool was used to assess social-emotional development and was filled by parents. Giving each response a score was done by using standardized rules, total scores were then obtained to group children as normal, at-risk, or delayed developmental groups. The quality of data was provided by frequent monitoring and checking of filled questionnaires.

5.2 Data analysis

The data were typed into SPSS version 23 and analyzed. Qualitative variables, such as gender, physical activity levels, and social-emotional development categories, had frequencies and percentages. The quantitative variables (age, activity duration, and ASQ:SE-2 scores) were measured in terms of a mean and standard deviation. The chi-square test was used in the evaluation of the association between the physical activity levels and social-emotional development categories. Mean scores were compared using

independent t-tests to compare the mean scores between groups. The multivariate linear regression analysis was conducted to assess the association between physical activity (structured and unstructured) and social-emotional development domains adjusting the possible confounders based on age and gender. A p-value < 0.05 was considered statistically significant.

6 RESULTS

Twenty-hundred preschool children were recruited to test the relationship existing between physical activity and social-emotional development. The average age of the participants was 4.1 +.8 years, and the proportion of males was slightly greater (52%). According to the rates of physical activity, 116 (58) children were classified as being highly physically active, and 84 (42) as not.

Table 1

Characteristics of Study Participants at the baseline (n=200)

Variable	n (%) / Mean ± SD
Age (years)	4.1 ± 0.8
Gender	
Male	104 (52.0%)
Female	96 (48.0%)
Physical Activity Level	
High (≥120 min/day)	116 (58.0%)
Low (<60 min/day)	84 (42.0%)

The sample population was fairly balanced in gender, with more children having reached the recommended levels of physical activity.

Table 2

Relation between Social-Emotional Development and Physical activity.

Social-Emotional Status	High PA (n = 116)	Low PA (n = 84)	Total (n = 200)	p-value
Normal	100 (86.2%)	52 (61.9%)	152 (76.0%)	
At Risk / Delayed	16 (13.8%)	32 (38.1%)	48 (24.0%)	**<0.001**

The children who were not very active were much more prone to having poor social-emotional development than those who were.

Table 3

Mean ASQ:SE-2 Scores Comparison by Physical Activity Level.

Physical Activity Level	Mean Score ± SD	Mean Difference	95% CI	p-value
High Physical Activity	42.3 ± 11.6			
Low Physical Activity	61.8 ± 14.2	19.5	15.8 – 23.2	**<0.001**

Children who were more physically active scored much lower on ASQ:SE-2, which indicates a better social-emotional functioning.

Table 4

Relation between Screen Time and Social-Emotional Development.

Screen Time	Normal n (%)	At Risk / Delayed n (%)	Total (n)	p-value
≤ 2 hours/day	102 (85.0%)	18 (15.0%)	120	
> 2 hours/day	50 (62.5%)	30 (37.5%)	80	**0.002**

The outcomes were significantly worse in excess use of screens (>2 hours/day).

Table 5

Multivariate Linear Regression.

Predictor Variable	β Coefficient	Standard Error	95% CI	p-value
Structured Physical Activity	−0.31	0.08	−0.47 to −0.15	**<0.001**
Unstructured Physical Activity	−0.27	0.09	−0.44 to −0.10	**0.003**

Both structured and unstructured physical activity was found to significantly predict better social-emotional development scores.

The findings of this research point to a statistical significance of the relationship between physical activity and social-emotional development in preschool children. Children who were more physically active showed better developmental outcomes (as measured by lower scores on ASQ:SE-2 and a higher percentage in the normal developmental category). On the other hand, children who were not very physically active were more likely to be at risk and delayed. The rate of developmental issues was also much more significant in the low activity group (38.1% vs. 13.8, $p < 0.001$). Physically active children also had significantly lower mean ASQ:SE-2 scores which showed better

results. The higher screen time was strongly linked to worse social-emotional status (p = 0.002). Multivariate regression analysis showed that structured and unstructured physical activity were both independent and had positive effects on developing scores. These results indicate the adverse effects of sedentary behavior in early childhood development. Altogether, the research confirms the existence of a strong statistically significant correlation between physical activity (increased) and social-emotional development. Physical activity is a key factor to optimal outcomes in early childhood and should be promoted over screen time.

7 DISCUSSION

The current research indicates that there is a strong correlation between increased physical activity and enhanced social-emotional development of preschool children. These results concur with the available literature that underlines the importance of physical activity in the development of emotional regulation, social competence and behavioral adaptation in early childhood [3,6]. The initial phases of development are a vulnerable phase where movement-related experiences impact cognitive and psychosocial pathways [1].

The strong evidence of the effect of physical activity on executive functioning, emotional regulation, and self-control of preschool-aged children is presented in systematic reviews by Morales et al. [6] and Muir et al. [4]. Equally, Carl et al. [5] found out that interventions led by physical literacy greatly enhance cognitive and psychosocial outcomes. The conclusions are reinforced by recent meta-analyses and observational studies that show that motor skill development and cognitively engaging physical activity is related with better executive functioning, prosocial behavior, and emotional competence in early childhood [13,14,15]. This research builds upon this accumulation of evidence to a Pakistani population, in which there is a lack of data on physical activity and social-emotional development [8,12].

This study found a negative correlation between excessive screen time and social-emotional development, which is consistent with evidence around the world that sedentary behaviors are connected to emotional dysregulation, attention issues and behavioral problems in young children [16,17]. Modern systematic reviews and cohort

studies have demonstrated that the more screen time in early childhood, the worse are psychosocial outcomes, such as lower levels of emotional self-regulation and dysfunctional peer interactions [16,17]. These effects seem to be determined not only by the duration but also by the circumstances and the content of the screen use [16].

These associations in low- and middle-income countries can be further worsened by cultural and environmental restrictions. Poor access to safe play areas, educational demands, and the sociocultural influence, especially on girls, may limit their access to physical activities, which leads to a further dependence on behaviours that are based on the use of a screen [18,19]. There is evidence of family-level influences, such as parental modeling and support, that have a central role in controlling the movement behaviors and socio-emotional outcomes of children [19].

Altogether, the results of this study help highlight the significance of not only encouraging physical exercise at an early age but also unstructured physical activity and at the same time working on excessive screen time. Parent, educator of early childhood and community-based interventions are necessary to promote active lifestyles and facilitate optimal social-emotional development. Promotion of physical activity being embedded in the policy of health and education of early childhood could provide a viable approach to enhancing developmental outcomes, especially in resource constrained contexts [2,7,20].

8 CONCLUSION

The research presents statistically significant relationships between physical activity and social-emotional development of preschool-aged children. Emotional regulation, social interaction, and adaptive functioning were evidently better in children who participated in more daily physical activity than in those with low activity levels. On the other hand, more sedentary behavior and longer screen time were related to worse development.

These results confirm the importance of early-life physical activity in promoting the holistic development of children. Since the problem of sedentary lifestyle is becoming more rampant, especially in low-resource areas, the need to introduce specific interventions that will lead to a rise in physical activity among young children is pressing.

Awareness programs among parents, community based play programs, and policy level approaches must be used to encourage active lifestyles. The suggested longitudinal research in the future would help to investigate the causal relationships and effects on development in the long run.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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