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EFFECTS OF PHYSICAL ACTIVITY ON CHILDREN'S DEVELOPMENT – A REVIEW

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ABSTRACT

Introduction: Physical activity is vital for the holistic development of children, benefiting physical, cognitive, social, and emotional domains. Engaging in regular physical activities from an early age fosters a healthy body, emotional and social well-being, and cognitive development.
Aim: This study explores the diverse benefits of physical activity on childhood development, focusing on physical health, cognitive functions, social skills, and emotional well-being.
Materials and Methods: A comprehensive literature review was conducted, analyzing existing research on the impact of physical activity on various aspects of childhood development. Searches were performed across databases such as PubMed and Google Scholar using keywords like "childhood physical activity" and "childhood sport."
Results: Physical activity promotes healthy growth, enhances cardiovascular and musculoskeletal health, and helps maintain a healthy weight, reducing obesity risks. It improves memory, attention, and executive functions, contributing to better academic performance. Socially, it fosters peer relationships, enhances social skills, and cultivates leadership qualities. Emotionally, it aids in emotional regulation, boosts self-esteem, and reduces anxiety and depression.
Discussion: The findings highlight the multifaceted benefits of physical activity on children's development, corroborating existing literature. Despite robust evidence, limitations such as reliance on self-reported data and cross-sectional study designs constrain causal inferences. Future research should use objective measures and longitudinal approaches, considering interactions with diet, sleep, and lifestyle factors.
Conclusion: Physical activity significantly benefits childhood development across physical, cognitive, social, and emotional domains. Addressing limitations in existing research will enhance the understanding and application of physical activity in promoting holistic child development.

KEYWORDS

Childhood Physical Activity, Physical Education, Development, Physical Health

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Introduction

Physical activity plays a crucial role in the holistic development of children, offering a wide array of benefits across various domains. Research indicates that engaging in physical activities from an early age not only fosters a healthy body [1], but also promotes emotional, social, and cognitive development [2]. It is well-documented that physical activity contributes to the maintenance of energy balance, healthy growth, and the development of the cardiorespiratory and musculoskeletal systems in children and adolescents. Furthermore, physical activity is linked to improved psychological well-being, social interaction, academic achievement, and cognitive functioning, highlighting its importance in enhancing self-esteem, social well-being, and overall competence [3]. The positive impact of physical activity on child health, social and emotional development, and academic outcomes underscores the significance of incorporating regular physical activity into the daily lives of children to support their overall well-being and development.

Aim

The aim of the study is to explore the multifaceted benefits of physical activity on childhood development. Specifically, it seeks to understand how regular physical activity influences physical health, cognitive functions, social skills, and emotional well-being in children. The study aims to provide a comprehensive overview of the positive impacts of physical activity, supported by existing research, and to highlight the importance of integrating regular physical activity into children's daily lives to support their overall development and well-being.

Materials and methods

This study is a comprehensive literature review that aims to consolidate and analyze existing research on the impact of physical activity on various aspects of childhood development. The review covers physical, cognitive, social, and emotional development domains. For this review, the authors performed searches across various databases such as PubMed and GoogleScholar. The keywords used included "Childhood physical activity", “childhood sport”. The studies were examined for their relevance to the subject of this review.

Current state of knowledge

- Importance of Physical Activity in Childhood

Physical activity during childhood is crucial due to its multifaceted benefits on children's development. Engaging in regular physical activity not only promotes a healthy body but also enhances emotional, social, and cognitive development [1]. Research emphasizes that physical activity positively influences social and emotional behavior in preschool children, highlighting a significant correlation between physical education and social-emotional development [4]. Furthermore, physical activity plays a pivotal role in mitigating global health issues like obesity, hypertension, anxiety, and depression, ultimately reducing morbidity and mortality from cardiovascular diseases [5]. Studies also show that children who meet physical activity guidelines demonstrate improved health outcomes, with vigorous physical activity being a key predictor of positive health trajectories [6]. Encouraging physical activity in early childhood not only fosters physical health but also nurtures essential social, emotional, and cognitive skills critical for overall well-being.

- Historical perspective on children's physical activity levels

Historically, children's physical activity levels have been a concern, with studies showing a decline in activity levels throughout primary school [7]. Research indicates that the problem of low physical activity among preschool children has been increasing, emphasizing the importance of interventions involving parents, teachers, and extracurricular activities to promote physical activity[8]. Studies on physical activity during school hours reveal that a significant proportion of children and adolescents do not meet the recommended levels of moderate-to-vigorous physical activity, highlighting the need for schools to develop strategies to help children achieve the recommended activity levels [9]. Device-measured data from Norway shows fairly stable physical activity levels in youth over the years, but concerns arise from the declining activity levels among specific age groups, indicating the necessity for more systematic monitoring and new strategies to promote physical activity in children and adolescents [10].

- Impact of physical activity on height

Studies have shown that increased physical activity levels can lead to reductions in body mass, adipose tissue, and skinfold thickness, contributing to a decrease in obesity and overweight among children [11]. Additionally, physical activity influences childhood growth by affecting energy allocation trade-offs, leading to changes in anthropometric indices such as height, weight, and triceps skinfold thickness[12]. Regular physical activity is crucial for promoting favorable body composition and bone mineralization, which are essential for linear growth in children and adolescents [13-14]. While light to moderate physical activity has been found to have a beneficial effect on growth and bone development, intense physical training, especially when combined with dietary restrictions, may potentially attenuate linear growth and pubertal development [15].

- Impact of physical activity on weight

Research studies have consistently shown that increased physical activity levels in children lead to a reduction in body mass and adipose tissue, contributing to a decrease in obesity and overweight cases [11, 16]. Furthermore, engaging in physical exercise has been linked to improvements in physical fitness, decreased inflammatory markers, and better biochemical parameters, all of which are essential for preventing obesity-related complications in children [17]. Studies have also highlighted the importance of combining physical activity with appropriate dietary habits, as this combination has been found to have a health-promoting effect on body weight, leading to a significant portion of children maintaining a normal body weight[18]. Implementing structured physical activity interventions in schools has been identified as an effective strategy for reducing the prevalence of childhood obesity and promoting healthy behaviors among school-aged children [16].

- Impact of physical activity on motor skill development

Childhood physical activity significantly influences motor skill development in children. Engaging in organized physical activities in sports clubs has been shown to enhance motor competence, with children in such programs demonstrating higher levels of motor skills compared to those not involved in organized activities [19]. Regular physical activity, including aerobic training, strength training, dance, yoga, and walking programs, plays a crucial role in improving mood, mental health, and overall physical development in children, contributing to better health and quality of life [20]. Studies have also highlighted the positive association between physical activity intensity, such as moderate and vigorous activities, and fundamental motor skills and physical fitness in young children, emphasizing the importance of promoting physical activity from an early age for optimal physical development [21]. Additionally, research supports the causal evidence that both traditional and exergaming-based physical activity interventions lead to significant improvements in motor skill performance in typically developed children aged 6-12 years, further underlining the positive impact of physical activity on motor skill development in childhood [22].

- Role of physical activity in bone density and strength

Childhood physical activity plays a crucial role in bone density and strength, influencing bone health from early childhood through adulthood. Research emphasizes that children's bones are particularly responsive to exercise during growth periods, making interventions in childhood ideal for maximizing bone health [23]. Various types of exercises, including weight-bearing activities and plyometric exercises, have been shown to enhance bone density and strength, contributing significantly to bone health [23-24]. Additionally, adequate nutrition and physical activity during childhood and adolescence have long-term implications for bone mineral density and content, highlighting the importance of lifestyle factors in skeletal health [25]. Studies have also found positive associations between vitamin D status, moderate-to-vigorous physical activity, and bone health in prepubertal children, underscoring the significance of lifestyle choices in promoting optimal bone health from a young age [26].

- Influence on muscle development and coordination skills

Childhood physical activity plays a crucial role in muscle development and coordination skills in children. Research indicates that engaging in physical activities such as aerobic training, strength training, dance, yoga, and walking programs not only enhances mood and mental health [20], but also significantly improves general coordinative abilities in preschool children aged 4 and 5 years old [27]. Furthermore, physical activity programs have been shown to enhance motor skills and daily functionality in children and adolescents with Developmental Motor Coordination Disorder (DCD) [28]. Regular physical activity in childhood not only encourages growth and development but also contributes to better health, quality of life, and cognitive development, highlighting the long-term benefits of early engagement in physical activities for overall well-being and motor skill development [20].

- Effects of physical activity on brain structure and function.

Childhood physical activity has profound long-term effects on brain structure, as evidenced by various research studies. Regular exercise during youth has been shown to increase the number of neuronal cells and dendritic arborization in the cerebral cortex and hippocampal formation, leading to lasting morphological changes in these brain regions [29]. Additionally, engaging in physical activity programs has been linked to improved white matter microstructure in the genu of the corpus callosum, indicating enhanced myelination and structural integrity of white matter tracts crucial for cognitive and motor functions [30]. Furthermore, differences in brain anatomy and sensory function have been observed between more and less physically active individuals, suggesting that better aerobic capacity may modify brain morphology and automatic processes in identifiable brain regions involved in memory and motor control [31]. These findings underscore the importance of childhood physical activity in promoting optimal brain health and function throughout life.

- Correlation between physical activity and academic achievement.

Childhood physical activity has a significant impact on academic achievement, although the relationship can vary based on different factors. Research indicates that physical activity interventions can lead to improvements in on-task behavior, creativity, fluid intelligence, and working memory [32]. While some studies suggest a weak correlation between physical activity and academic performance in elementary school students [33], others highlight a positive association between physical activities like aerobic fitness and academic achievement, particularly in mathematics, science, language, social studies, and overall grades among school children [34]. Additionally, the duration, frequency, and intensity of physical activity interventions play a crucial role in influencing specific aspects of cognition and academic outcomes, with differential effects observed on various cognitive functions based on the type of physical activity undertaken [35].

- Impact of childhood physical activity on memory, attention, and executive functions.

Childhood physical activity has a significant impact on memory, attention, and executive functions. Research indicates that physical activity involving cognitive engagement can enhance executive functions in children, particularly inhibition and positive affect [36]. Additionally, interventions combining physical activity with cognitive training have shown potential benefits for cognitive outcomes in preschool children, although the expected cognitive improvements were not always observed [37]. Furthermore, executive function training based on motor activity has been found to significantly improve working memory and sustained attention in children with Attention-Deficit/Hyperactivity Disorder (ADHD) [38]. Moreover, engaging in science activities has been shown to facilitate the development of cognitive flexibility and attention shifting in preschool children, highlighting the transfer of executive functions from play-based activities to everyday tasks [39]. Overall, regular physical activity, especially when combined with cognitive engagement, can positively influence memory, attention, and executive functions in children, offering a holistic approach to cognitive development.

- How physical activity helps in managing emotions.

Physical activity plays a crucial role in managing emotions in children by positively impacting their emotional development and regulation skills. Research indicates that participation in physical activity and sports is correlated with improved emotional regulation in children [40-41]. Different intensities of physical activity, such as moderate and vigorous activity, have been found to positively affect emotions in children and adolescents, with positive emotions being more strongly influenced by acute physical activity [42]. Additionally, physical education classes in preschool have been shown to positively influence emotional competence in young children, highlighting the importance of early exposure to physical activity for emotional development [43]. Furthermore, physical education has been identified as a subject that facilitates emotional expression in students, emphasizing the need for methodologies that enhance emotional education in this context to improve emotional management skills in primary and secondary school students [44].

- Influence on self-perception and confidence levels.

Engaging in physical activities during childhood has a significant impact on confidence levels later in life. Research suggests that higher levels of physical activity in childhood are associated with improved self-confidence and interpersonal relations in adolescents, particularly through activities like moderate-vigorous physical activity (MVPA) and tests measuring lower-limb muscle strength, speed-agility, and cardiorespiratory fitness [45]. Furthermore, childhood physical activity has been linked to better labor market outcomes in adulthood, with persistently active individuals showing the highest levels of employment and the lowest levels of unemployment, indicating a positive correlation between childhood physical activity and long-term success [46]. These findings underscore the importance of promoting physical activity in childhood as a means to enhance confidence levels and overall well-being throughout life.

- Effects of childhood physical activity on anxiety and depression

Regular physical activity during childhood has a significant impact on the development of mental health later in life. Studies suggest that engaging in physical activity during childhood and adolescence is associated with reduced risks of developing mental disorders [47]. Longitudinal research indicates that physical activity in youth can lead to better long-term mental health outcomes, such as lower levels of anxiety and depression, and improved overall well-being [48]. Furthermore, physical activity has been shown to be a preventative measure for depression and can help improve depressive and anxiety symptoms in adolescents [49]. Additionally, higher levels of physical activity in children, particularly during preschool and elementary school years, are inversely related to the occurrence of mental health problems, including attention-deficit/hyperactivity disorder (ADHD) symptoms later in life [50]. These findings underscore the importance of promoting physical activity in childhood as a means to support mental health and well-being throughout life.

- Role of physical activity in developing social interaction skills.

Childhood physical activity plays a crucial role in developing social interaction skills in children, particularly those with Autism Spectrum Disorder (ASD). Research has shown that structured physical activities, such as those found in programs like Sports, Play, and Active Recreation for Kids (SPARK) and Fundamental Motor Skill Training (FMS), can significantly improve communication behaviors and social skills in children with ASD

[51]. Additionally, studies have highlighted the positive correlation between physical education and social-emotional behavior in preschool children, emphasizing the importance of physical activity in fostering social and emotional development [4]. Furthermore, scoping reviews have indicated that physical activity settings provide increased opportunities for social interaction, underscoring the potential benefits of incorporating social skill components in PA-based interventions for individuals on the autism spectrum [52]. These findings collectively emphasize the critical role of childhood physical activity in enhancing social interaction skills and overall social development in children.

- Development of leadership qualities and sense of responsibility through physical activities.

The development of leadership qualities and a sense of responsibility through childhood physical activities has a significant impact on individuals. Research emphasizes the importance of leadership in physical education, highlighting the role of leaders in guiding students to recognize physical defects, develop confidence, decision-making skills, and organizational abilities [53-54]. Implementing interventions in youth settings, such as schools and extracurricular activities, can increase physical activity levels among children, leading to improved health outcomes and the establishment of lifelong habits [55]. By training group place leaders to create environments conducive to promoting physical activity, children can benefit from increased time spent in moderate-to-vigorous physical activity, reduced sedentary behavior, and higher quality physical activity experiences, ultimately contributing to overall well-being and health [56].

- Impact of economic status on access to physical activity opportunities.

Economic status significantly influences access to childhood physical activity opportunities. Research from various studies demonstrates that children from low-affluence families tend to engage in fewer days of physical activity, sample fewer sports, and have lower rates of sports participation compared to their peers from high-affluence families [57-58]. Additionally, socioeconomic status impacts the satisfaction of basic psychological needs in physical education, affecting motivational and affective outcomes in physical activity and intentions for out-of-school physical activity [59]. Furthermore, parental socioeconomic status plays a crucial role in promoting children's participation in physical exercise, with higher parental SES positively influencing the likelihood of children engaging in physical activity [60]. These findings underscore the importance of addressing socioeconomic disparities to ensure equitable access to physical activity opportunities for all children.

- Effects of screen time and digital media on physical activity levels.

Excessive screen time and digital media exposure have been linked to various negative effects on childhood physical activity levels. Research indicates that children are spending increasing amounts of time on screens, leading to reduced engagement in physical activities [61-62]. This shift towards sedentary behaviors has been associated with a higher risk of obesity, unhealthy dietary habits, and decreased physical fitness among children and adolescents [63]. Moreover, the lack of outdoor activities due to prolonged screen time has been exacerbated by the rise of remote learning, potentially impacting children's cognitive, motor, and social development [64]. Efforts to reduce screen time and promote in-person play and physical exercise are crucial to counteract these negative trends and support healthy development in children. Further research is needed to fully establish the causal relationship between screen time and its impact on physical activity levels and overall health outcomes [65].

- Role of educational institutions in promoting physical activity as a strategy to promote physical activity.

Educational institutions play a crucial role in promoting physical activity among students to enhance their overall health and well-being. By incorporating health-enhancing physical activities into the curriculum, institutions can positively impact students' body composition, musculoskeletal development, and reduce the risk factors for chronic diseases [66]. The focus on physical culture within educational activities can contribute to the formation of a healthy lifestyle and personality development, aligning with the societal goal of improving quality of life through physical education [67]. Additionally, academic sports programs engage the academic community in physical activities, promoting psychophysical well-being and fostering a culture of active recreation and health improvement [68]. Furthermore, integrating physical education into the educational system can help in the prevention of noncommunicable diseases, reduce health inequities, and align with the WHO Sustainable Development Goals, emphasizing the importance of physical activity in academic settings [69].

- Use of technology and media to encourage physical activity.

Technology and digital media play a crucial role in promoting physical activity among children. Research has shown that mobile health (mHealth) apps can significantly increase total physical activity (TPA), reduce sedentary behavior (SB), and improve muscle strength and agility in children and adolescents [70]. Additionally, technology-mediated learning experiences have leveraged physical activity to provide active and productive learning opportunities for young people, highlighting the importance of combining physical activity with educational content [71]. Furthermore, digital media has been identified as an effective tool in promoting healthy behaviors to prevent stunting, emphasizing its potential to enhance nutrition education, balanced diets, and active participation in sports activities [72]. By utilizing technologies like mHealth apps, interactive learning environments, and digital interventions, children can be encouraged to engage in physical activity both in and out of school settings, ultimately contributing to improved health and well-being [73-74].

Discussion

The findings of this study underscore the multifaceted benefits of physical activity on children's development, encompassing physical, cognitive, social, and emotional domains. The evidence supports that regular physical activity contributes to healthy growth, improved cardiovascular and musculoskeletal health, and the maintenance of a healthy body weight. Moreover, physical activity has been shown to enhance cognitive functions such as memory, attention, and executive functions, which are critical for academic success. Additionally, participation in physical activities fosters social skills, emotional regulation, self-esteem, and leadership qualities, highlighting its role in holistic child development. The current study aligns with existing literature that emphasizes the critical role of physical activity in childhood development. For instance, Janssen and LeBlanc (2010) [75] demonstrated that physical activity is associated with multiple health benefits, including reduced risks of obesity, cardiovascular diseases, and mental health disorders. Similarly, Hillman et al. (2014) [76] found that children who engage in regular physical activity exhibit better cognitive performance and academic outcomes, which supports the findings related to enhanced brain structure and function in the current study. Moreover, the impact of physical activity on social skills and emotional regulation is corroborated by studies such as those by Diamond and Lee (2011) [77], which highlight the positive effects of physical exercise on executive functions and emotional well-being in children. The role of economic status in accessing physical activity opportunities is also consistent with findings by Sallis et al. (2012) [78], who reported that children from lower socioeconomic backgrounds have fewer opportunities for physical activity due to limited resources and access to recreational facilities.While the findings are robust, several limitations and potential biases must be acknowledged. One limitation is the reliance on self-reported measures of physical activity, which can be subject to social desirability bias and recall inaccuracies. Future studies should incorporate objective measures such as accelerometers to obtain more precise data on physical activity levels. Another potential bias is the cross-sectional nature of many studies, which limits the ability to draw causal inferences. Longitudinal studies are needed to better understand the long-term effects of physical activity on various developmental outcomes. Additionally, the sample populations in some studies may not be representative of the general population, potentially limiting the generalizability of the findings.There is also a need to consider the interaction of physical activity with other factors such as diet, sleep, and overall lifestyle, which can confound the observed effects. Future research should adopt a more holistic approach, examining the interplay of these factors to provide a comprehensive understanding of children's development. Furthermore, cultural and environmental differences can influence physical activity patterns and their outcomes. Studies should consider these contextual factors to provide more tailored and relevant recommendations for different populations.

Conclusions

Physical activity significantly benefits childhood development across physical, cognitive, social, and emotional domains. It promotes healthy growth, cardiovascular and musculoskeletal health, and helps maintain a healthy weight, reducing obesity risks. Cognitively, it improves memory, attention, and executive functions, enhancing academic performance. Socially, physical activity fosters peer relationships, social skills, and leadership qualities. Emotionally, it aids in emotional regulation, boosts self-esteem, and reduces anxiety and depression. These findings are supported by existing literature. Despite robust evidence, future research should address limitations like self-reported data, cross-sectional studies, and consider the interplay of physical activity with diet, sleep, and lifestyle factors. Addressing these will enhance the understanding and application of physical activity in promoting holistic child development.

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