Physical Activity's Impact on Academic Achievement in School-Aged Children

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Introduction

Physical activity is an integral component of any healthy lifestyle. However, it can be more beneficial than we have previously believed it to me. The overall lack of physical activity in modern youths has also led to extremely high prevalence of childhood obesity and also early onset diabetes ." In the United States, childhood obesity doubled from 10% in 1999–2000 to 19% in 2015–2016, with >18 million children currently having obesity. This parallels the increase of type 2 diabetes in youth" [1]. Physical activity not only benefits a child's body mass index (BMI) and decreases the likelihood of certain chronic diseases but it can also be beneficial to their academic achievement. The current Centers for Disease Control and Prevention's (CDC) physical activity recommendation for children and adolescents is currently 60 minutes a day of moderate to vigorous physical activity that includes resistance and cardiovascular exercise . However, currently only about 24% of children in this age range meet the recommended daily activity needs[4].

The purpose of this review of literature was to examine the relationship between physical activity and academic outcomes in school aged children. School aged children were defined in the review as children from ages 6 to 18 years old. Academic evates one's heart rate above resting heart rate .An additional goal was to examine if it is possible to discern if physical activity itself was the principal propagator of increased academic performance or rather an indication of behavioral and external factors operating in conjunction.

Methodology

Eaglesearch, a Tennessee Tech University tool for students, was used to find studies through a variety of databases as well as the *Academy of Nutrition and Dietetics* Evidence Analysis Library (EAL). Search terms used included: physical activity and academic performance, physical activity and its impact on academic achievement, and physical activity and its impact on academic outcomes for school aged children. Literature inclusion criteria: peer reviewed articles published between the dates of January 1, 2010 to December 31, 2020, and studies must have been conducted in a modernized country with a similar schooling system as the United States . Studies that did not offer a full online text option were automatically excluded. Specific search parameters were studies that compared academic achievement whether it be grade point average or standardized test scores and physical activity level. Government databases, such as the CDC and the National Heart, Lung, and Blood Institute were also used for particular statistics as well as to determine national requirements of physical education for public school systems and existing federal grants for physical education programs.

Discussion

In a systematic review by Chaddock et al, aerobic fitness and overall physical activity in children was reviewed to examine the impact of aerobic exercise on not only the neurocognitive but also the anatomical development of the brain. Aerobic fitness was measured using two methods VO_2 max and Progressive Aerobic Cardiovascular Endurance Run (PACER) test. Brain function, brain structure, academic achievement, and cognitive control were the dependent variables examined in this review of literature. In more physically active children certain areas and structures of the brain were larger in comparison to less physically fit children. One particular area of the brain were substructures of the basal ganglia, the dorsal and ventral striatum. The dorsal striatum related to stimulus response and the ventral striatum with effect and reward meaning children with higher levels of aerobic fitness had higher levels of on taskness. This was found to be the case in an experiment using a flanker test, a test where the participant is asked to focus on a central task and is disrupted by flanking stimuli. Cognitive control processes include a broad class of mental operations including goal or context representation and maintenance, and strategic processes such as attention allocation and stimulus-response mapping. Cognitive control is associated with a wide range of processes and is not restricted to a particular cognitive domain[6]. Two components of cognitive control: inhibition and working memory are associated with higher math scores. In a study included in the review by Chaddock et al the intervention group, which completed 90 min a week of moderate to vigorous physical activity using the Physical Activity Across the Curriculum program, exhibited increased performance on measures of overall academic achievement, and achievement in the areas of reading, spelling, and arithmetic using the Wechsler Individual Achievement Test – 2nd edition. These findings suggest a strong correlation to aerobic fitness and improved brain anatomy and cognitive function.

A systematic review by Marques et al. was based on objective values as well as self-reported physical activity of four longitudinal studies. There were 51 studies included in the systematic review the review used Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. None of the studies included in the meta-analysis accounted for the time of day in which the activity occurred. This is important because some beneficial effects of physical activity are acute and would be more impactful closer to the time of activity. Analysis of the studies found there is a positive and significant relationship between cardio-respitory fitness and academic outcome. The significance was higher in studies in which physical activity was self-reported versus studies that used objective means of physical activity reporting. Overreporting of one's physical activity is believed to be the cause of the discrepancy. Higher academic achievement in the more physically fit is believed to be due to students who strive for success in the academic realm would also look for success in other areas such as physical fitness. Another theorized explanation is that because cardiorespiratory fitness enhances brain structure and cognitive function more fit students are able to retain and recall information more easily. More objectively based reporting of physical activity needs to be done to strengthen the correlation between physical activity and academic achievement.

Overall the review has found that physical activity was inconsistent as a positive factor on academic. Physical activity has shown to have a positive impact on academic outcomes as well as improving brain structure, neural plasticity, and overall mental health. Physical activity is a key proponent of overall well-being, well-being seems to be more indicative of academic achievement compared to just physical activity.

Implications

Increasing physical activity in youths not only boosts academic outcomes it can potentially have a meaningful impact on improving other areas of concern such as body image, socialization beyond digital means, and improving behavioral outcomes. It would also be a small step toward improving the health of the nation. Aerobic fitness has not only shown to improve academic achievement but it also improves the physical structure of the brain. Providing children with the opportunity to be physically active during the school day has shown to improve scores in reading and mathematics. The short term benefits of increased standardized test results or reducing preventable diseases such as diabetes in children the importance of school promoted exercise is undeniable.

Balancing the current education system to include more physical education opportunities in primary schooling. Connecting physical activity to improved academic outcomes is key in creating and building upon existing federal grants and programs that promote physical activity and overall healthy lifestyles. One current federal grant is the *Carol M. White Physical Education Program* which is a federal grant that helps to fund community and education based physical education initiatives. With the effects of physical activity on the human body more emphasis on community and school based physical activity interventions targeted at school-aged children. This should act as a piece of the foundation of future school curricula.

Conclusion

The purpose of this review of literature was to examine the relationship between physical activity and academic outcomes in school aged children. Physical activity is positively impactful on the academic outcomes of the school aged children who partake in it. There has yet to be a study to identify the mechanism of this phenomenon or determine if this is nothing more than a casual relationship between physical activity and academic outcomes. However, there is a strong correspondence that aerobic fitness improves the function and structure of the brain as well as improving academic performance and cognitive control. A few studies have suggested that aerobic based exercise can not only increase mental performance but also beneficially affect the anatomy of the human brain. With that there needs to be more research conducted in this area, more specifically research examining the mechanism of the relationship of exercise and academic achievement. A key limitation of this literature and other similar reviews and meta-analyses is that there is currently not enough research into this subject.

Physical activity has shown to have an impact on performance in an academic setting, which does not come as a surprise to conventional wisdom. However, what the underlying cause of the occurrence includes many factors beyond physical activity such as socioeconomic status. Socioeconomics not only affects physical activity but also influences quality of educational system, neighbor safety, and nutritional intake all of which impact physical activity. On-taskness and other classroom behaviors can be boosted by increasing physical activity however, that does not address the source, which is academic outcomes are a by-product of individual well-being. Although research has been inconsistent on whether physical activity has a positive impact on academic achievement it is not detrimental to it. Creating an environment in primary educational schools that promotes the wellbeing of the individual and creating more opportunities for academic diversity.

References

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