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Physical Activity to Help Students Perform Better in the Classroom

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Abstract:

This literature review evaluates how physical activity can improve student academic performance. Articles from the last decade provide strong evidence students, given access to physical activity, show improved academic performance. Physical activity improves the brain's functioning and different kinds of physical activity impact cognitive performance. Researchers acknowledged a strong correlation between physical activity and the development of overall wellness and academic confidence. Research also shows students with learning and cognitive disabilities benefit academically and behaviorally from physical activity. Physical activity is an essential element of the development of children and adolescents.

Key words: Social-emotional health, well-being, cognitive performance

Elliot and Erwin's (2013) research reported physical activity in schools influences young people's health through improved physical literacy. Piercy et al. (2018) described a study looking at the impact of physical activity on the lives of adolescents to foster growth, improved sleep, and reduced development of chronic diseases. Lynch and Soukup (2016) showed in their research social health can be strengthened by playing games or participating in group physical activity activities can have an impact on student social-emotional and academic performance. Urena-Lopera and team (2020) demonstrated physical activity and sports can motivate adolescents to achieve high academic performance. Mandolesi and Poverino's (2018) study shows adolescents' cognitive ability improved when they participate in regular physical activity, with benefits beyond the classroom. Students with learning disabilities also have improved concentration, motivation, and classroom behaviors (Stanish et al., 2019).

This literature review acknowledged physical activity should be integrated into the school day. It focused on the impact physical activity has on (a) brain development, (b) fitness and health, (c) academic performance, (d) social-emotional health, and (e) outcomes for students with special needs.

Literature Review

Physical activity improves brain development

Steven-Smith (2016) research determined children's brains processed at higher levels when students were active. The movement stimulated the neurons and electrical wiring which facilitated the brain's ability to take in information and learn. Researchers have found the same parts of the brain which process movement are the same sections processing learning (Steven-Smith 2016). The brain can adapt and change, known as brain plasticity, depending on the ability of the neurons to modify the strength and composition of their connection in response to

both external and internal stimuli (Di Liegro et al., 2019). The mechanism through which exercise might facilitate brain health is increasing the expression of brain-derived neurotrophic factor (BDNF), a natural protein found in the brain (Marquez et al., 2015). In 2015, a research group in several European hospitals completed an experiment looking for physical change in the brain as a result of physical activity. The group recorded an increase in the BDNF during and throughout the physical activity (Marquez et al., 2015). Phillips et al. (2014) and the United States research group studied the BDNF to see what effects they had on the brain during physical activity. They found the proteins linked to the BDNF had positive traits when the body was placed under exercise stress. These positive traits included immunological benefits and an improved overall immune response within the body. Physical activity reduced inflammatory responses affecting some chemical and cognitive thought processes. (Phillips et al., 2014)

Hung et al. (2018) discovered during research, physical activity activated brain electrons to file at a higher rate in the areas of the brain also affecting learning. The research then showed those areas are also firing during testing. Hung et al. (2018) findings showed exercise can improve the concentration of teenagers in the classroom.

Wassenaar et al. (2019) conducted a study on physical activity on the brain and found, using brain imaging, the brain after physical activity showed more activity than the control group. The research also showed the same activity in the areas of the brain when students were being assessed (Wassenaar et al., 2019).

Di Liegro et al. (2019) researched how different physical fitness types affect brain-derived neurotrophic factors. Their research found physical activity duration, intensity, and type had marginal factors for brain activity and improvement. Their research concluded regular physical activity at any level was far more beneficial than no physical activity. (Dilegro et al.,

2019)

Research by Hannaford (2013) found the brain uses the same connection to move our bodies during physical activity is used to process learning in reading and math—using electrode connections placed on a subject's head and mapping the areas used during reading, calculating math, and physical activity. Hannaford (2013) learned the areas of the brain which light up while reading or calculating math are the same when subjects participate in physical activity.

Physical activity improves fitness and health

Kerr, Valois, and Farber (2013) stated in their research physical activity improves students' total well-being. There have been various interventions showing increased physical activity, improved dietary patterns, and reduced tobacco, alcohol, and other drug use, which can also impact adolescents' behavior (Kerr et al., 2013). Benes, Finn, Sullivan, and Yan (2016) concluded in their research teenagers qualified as obese, whether from genetic, behavioral, and environmental factors, face far more life issues. They showed the potential for adverse health effects is high blood pressure, diabetes, high cholesterol, higher chances of stroke or cancer, and some forms of arthritis. Benes et al. (2016) also found health risks are not the only concern; body mass index (BMI) has been shown to have a significant negative correlation with students' academic performance.

Golan and Walter (2018) studied how physical activity can change how the body looks on the outside and has a tremendous effect on the body's internal parts. Golan and Walter's (2018) studied physical activity and its effect on obese adolescents provides young people with significant health benefits, including obesity prevention, improved well-being, cardiovascular fitness, and bone health. Furthermore, physical activity behaviors adopted during adolescence are likely to persist into adulthood, underscoring the relevance of adequate participation during this

stage of life (Golan & Walter, 2018). Kerr et al. (2013) described students with little activity have a higher chance of developing obesity, type 2 diabetes, high amounts of dietary fat, and engage in less physical activity. He also described in his research even modest physical activity changes will improve health (Kerr et al., 2013).

Phillips et al. (2014) described the cardiovascular benefits of sustained physical activity include improved exercise capacity, alterations in lipid profiles, reductions in obesity indices, increased heart recovery rates and variability, reduced resting pulse, and improved blood rheology and hemodynamics. Physical activity results in increased levels of pro-inflammatory, anti-inflammatory cytokines, cytokines inhibitors, and chemokines depending upon the intensity and duration of such exercise. The immunological benefits of sustained physical activity include the overall enhancement of immune function and anti-inflammatory processes (Phillips et al., 2014). Mora et al. (2016) described in studies physical activity helps students develop healthy habits such as eating three healthy meals a day, improved concentration during classes, and better academic performance.

Lynch and Soukup (2016) described in their research a physically educated person has learned skills necessary to perform a variety of physical activities, is physically fit, does regularly participate in physical activity, knows implications of and benefits from involvement in physical activities, and values physical activity and its contributions to a healthful lifestyle. Eagle et al. (2012) research how physical activity and nutrition helps fuel the body and the mind. According to Eagle et al. (2012), finding food with high sodium, high fat, and low protein profiles is increasingly available, convenient, and inexpensive. Adolescents who choose foods this way tend to have less energy and participate in less physical activity (Eagle et al., 2012).

Researchers Florence, Asbridge, and Veugelers (2008) studied how diet quality affects

academic performance. Students who rated their diets improved 26.0 to 86.0 percent on the diet assessment questionnaire had improved literacy assessment scores from the beginning (Florence et al., 2008). The researchers also found students placed at a lower academic and sociodemographic level of two were 26% less likely to fail the test, and at level three, 41% were less likely to fail (Florence et al., 2008). Mora et al. (2019) related research shows students who eat three balanced meals a day regularly demonstrate improved academic performance compared to students with less balance and irregular meals. Elliot and Erwin (2013) determined in their research teenagers' need for physical activity is even more critical because recess is no longer a part of the school day. Adolescents spend more time studying and less time being active (Elliot, and Erwin, 2013).

Physical activity improves academic performance

Mora, Llovera, & Mosqueira (2019) reported academic performance was linked to students participated consistently in 60 minutes of physical activity each day. Physical activity has been shown to directly link learning and improved cognitive performance, behavior, and social interaction (Blasberg, 2017). A research study completed by Western Governor University (2020) demonstrated cognitive thinking and learning are based on the experiences we have and how meaningful they are to how well we learn it. Physical activity gives students a meaningful experience and affects the mind to allow it to learn and recall the information (WGU, 2020). It has been shown the brain uses the same connection and areas of the brain when it comes to movement and cognitive thinking (Steven-Smith, 2016). The relation of the BDNF proteins in the brain play a significant role in cognition and motor function (Phillips et al., 2014).

Zientarski, a teacher at Naperville High School in Illinois, created a study discussion a significant shift in the amount of physical activity for students. From his research and the

Language Arts department's help at his school, he discovered moderate to vigorous exercise three times a week made a tremendous difference in reading performance. The study sparked significant change in his school, where a student struggled with reading and later math made measurable improvements. Students participated in Zientarski zero period physical education class improved their reading level by an average of 1.4 years (Zientarski, 2016).

Mandolesi and Polverino (2018) discovered more physical activity and feeling of well-being; students develop better cognitive thought processes. Cross-sectional and epidemiological studies showed PE enhances cognitive functions in adolescents, improving memory abilities, efficiency of intentional processes, and executive-control processes (Mandolesi & Polverino, 2018). Wassenaar et al. (2019) found similar outcomes in their research showed improved comprehension, better mood, and better overall classroom behaviors.

Zientarski (2016) found in his research the intensity and duration of physical activity were linked to the improvement of cognitive thinking. Zientarski's (2016) study learned 20-35 minutes of vigorous physical activity means heart rates maintaining 155 and above three times a week. Students improved reading scores of up to 1.4 years. (Zientarski, 2016) Research completed by Shaw, Gomes, Poloskaia, and Jankowska (2015) demonstrated vigorous to moderate physical activity results in changes to cardiovascular fitness. Improved fitness, in turn, leads to short- and long-term effects on cognitive performance in areas of attention, working memory, fluid intelligence, spatial processing, and verbal processing (Shaw et al., 2015). Mitts (2018) research found, as students participate in physical activity, each showed significant improvements in the classroom; students are improving by better classroom interaction, which affects the students' learning (Mitts, 2019) Benes et al. (2016) discovered students have planned physical activity during all classes had a positive effect on improved comprehension. Research

showed improved knowledge of the class content and increased positive attitude toward class (Benes et al., 2016)

Another study completed by Vanzandz (2011) looked at how the physical activity of running affected students' ability to write concerning the classroom. The researcher found students had improved writing and communication skills. Vanzandz (2011) showed students' physical activity allowed them to focus on the task and recall information. Cosgrove, Chen, and Castelli (2018) research found physical activity as it pertained to grit and students' absences in school. Their research discovered academic performance and physical activity are tied to grit and how often they were absent. Cosgrove et al. (2018) demonstrated students with grit had good attendance, which in part they had better academic performance, which was motivated by the fitness goals they had set for themselves.

Participating in sports improves academic performance

Soytürk and Öztürk researched how non-academic physical activities can enable alternative success environments for many youths who cannot achieve high levels of success at school to gain confidence and develop themselves (Soytürk & Öztürk 2020). Shaw et al. (2015) study found evidence the cognitive demands required in team sports, highly skilled activities and regular exercise discipline may also improve cognitive performance. Soytürk and Öztürk (2020) showed evidence sports encompass physical activity and social, mental, and emotional health, which will help teenagers develop behavior, focus, and work skills. Beighle and Moore (2012) studied the use of these sports programs to take place before or after school to determine if a correlation improves the classroom. They studied how intramural and school-based youth sports, physical activity opportunities organized around seasons like football, basketball, baseball, individual sports like badminton or pickle ball, and how students performed in the classroom

(Beighle & Moore, 2012). Beighle and Moore (2012) found students who participated in these physical activities had better scores in reading assessment than those who did not participate, and students who had before school sport showed a slight better improvement. Dolittle (2016) agreed in the research they conducted sports for students is one way students develop an understanding of physical fitness and is essential for the rest of their lives

Kendzoir (2016) discussed in research extracurricular activities are often more than just playing games for students. It helps teenagers develop better work and discipline, which they can use in the classroom. Soytürk and Öztürk (2020) show sports and extracurricular activities allow students to develop positive life skills, learn behavior management skills, and be motivated to do well academically to participate in competitions. Trudeau and Shephard (2008) found participation in extracurricular physical activity was a significant predictor of better academic results and higher academic expectations. Their study also found extracurricular activities were predictors of better academic achievement because of the motivation for students to participate in those sports (Trudeau & Shephard, 2008). Research by Daley and Leahy (2003) looked at how physical activity and sport participation affected academic achievement. From the results of their questionnaires, they found students participated in sports teams had overall better assessment scores (Daley & Leahy, 2003). One the other hand Huang et al. (2012) research showed little improvement for students who participate in organized sports has many effects on academic scores. There seemed to be many other factors affect the outcomes (Huang et al., 2012).

Urena-Lopez et al. (2020) research looked at athletes and how participation in sport motivated them to do well academically. Their research showed students' motivation for academic performance was high during practice and training but lower when the competition got closer because of the stress (Urena-Lopez, 2020). The research showed motivation for academic

performance stays consistent, which allows for higher academic success. (Urena-Lopez, 2020)

Sayer, Shapiro, and Webster's (2003) research indicated sports and recreation participation improves and enhances the self-concept, competence, and social skills of individuals. Huang et al. (2012) research showed physical activity, such as sports and recreation, affected self-efficacy as a powerful cognitive predictor of behavior. Sayers et al. (2003) studied intramural and other sports programs available in many communities, including those at YMCA and community recreation centers. Their research found families, locating these programs close to them, was necessary, and it allows them to have access to physical activity and sports programs. There is a connection between physical fitness and the students' academic performance. (Sayer et al, 2003)

Wilson (2009) described how youth develop from participation in physical activities in five constructs: (1) competence in academic, social, and vocational areas; (2) confidence; (3) connection to family, community, and peers; (4) character; and (5) caring and compassion. Wilson (2009) demonstrated the use of out of school activity and found those interviewed enjoyed better school interactions and academic performances (Wilson, 2009). Research supported those community-based PA clubs and groups as benefiting the academic performance of students. (Wilson, 2009)

Physical activity improves social-emotional health

Shaw, Gomes, Polotskaia, and Jankoska (2015) studied students who physically feel good tend to have a better emotional state. The research also showed systematic efforts to increase physical activity could improve physical fitness, mental health, and academic performance (Shaw et al., 2015). Shaw et al. (2015) points out how a better understanding of physical activity increases student knowledge and personal confidence. Brusseau, Burns, and

Hannon (2016) reiterated the same idea physical education and other physical activity helped students develop physical literacy, giving them the confidence to deal with emotional issues because of an overall sense of well-being.

Burton and Vanheest's (2007) research showed as students improve their physical fitness and academic performance, their emotional state improves. Their research showed higher levels of physical activity and academic achievement improve student self-worth to improve overall wellness, including a better emotional outlook (Burton & Vanheest, 2007). According to Shenner-Golan and Walter (2018), a moderate increase in physical activity would bring in an increase in well-being. Physical activity will allow adolescents to cope with stresses and crises occur. (Shenner-Golan and Walter, 2018)

Dalaey and Leahy (2003) studied the well-being and self-esteem benefits from the increase in physical activity. Delaey and Leahy's (2003) research has demonstrated regular physical activity plays a crucial role in improving well-being, and it was commonly felt exercise exerts a positive impact on psychological health. Daley and Leahy's (2003) research also showed those who participated in physical activity had a better feeling of self-worth and social competence . In research completed by Andrieieva et al. (2019), a positive emotional environment determines the psychophysiological capabilities of a person, and an increase in school students' physical activity will favor the creation of positive emotions and increase of mental performance of school students.

Baniff's (2011) research showed social, mental, and emotional health also correlates with improved physical activity and improved students' overall health. Baniff (2011) demonstrated movement in the classroom helps students be more attentive to instruction, reduce stress levels, improved classroom behavior, increased alertness, enhanced learning due to physical locations of

seating, and ability to reach higher potentials. Students showed more effective behavior management and a better overall social climate in the classroom or the school (Chen et al., 2019). Soytürk and Öztürk (2020) agreed adolescents' physical activity and sports over teenage school years develop socio-emotional adult-role within friendships and interaction with peers. Laird, Fawkner, and Niven (2018) conducted research found physical activity and led to improving social interaction between peers as long as the teenagers feel peers and teachers are supporting them. Jakauc et al. (2019) research looked at how physical activity, social support, and self-esteem affected each other. Jakauc et al. (2019) the research did not show self-esteem was affected by physical activity, but it did show students felt they had improved social support.

Leisterer and Jekauc (2019) conducted a study looking at the emotional effects of physical education on students. The researcher found four main areas trigger emotions: attractiveness of the task, social belonging, perceived competence, and autonomy. The researchers found physical activity was a link to positive emotions and interaction with peers and teachers (Leiserer & Jekauc, 2019) Another study looked at how physical activity can be used as a motivator and how it affects adolescents' social-emotional health. What they discovered were students were motivated to master the skills in groups, and as individuals (Klos et al., 2020).

How physical activity improves outcomes for students with special needs

Zentarski's (2016) studied increased physical activity was especially useful for students with learning disabilities and showed students who struggled with reading improved up to 1.6-grade leaves in the semester. Yazagani, Yee, and Chung (2013) researched students with special needs were also obese. These researchers found physical activity can be used to improve concentration and behaviors in the classroom (Yazagani, 2013). Research by Stanish et al. (2019) found students with special needs do not receive enough physical activity. They

demonstrated students with special needs show improved concentration and behaviors when they have participated in physical activity three to six times a week (Stanish et al., 2019).

Stanish et al. (2016), in another research study, found students with intellectual disabilities when they enjoyed participating in physical activity had better social interactions and did better during instructional time for school. Blasberg's (2017) research found physical activity has been linked to learning and associated with positive impacts on cognitive performance, behavior, and affect. Their research hypothesized incorporating a movement intervention into the classroom might help students develop their motor skills and provide an outlet for active learners (Blasberg, 2017). Fedewa and Clark demonstrated a classroom-based physical activity program improved the on-task behavior of children with ADHD by at least 8% and up to 20% for the most off-task students (Fedewa & Clark, 2010). ADHD is one of the most common behavior disorders for students. Fedewa and Clark noted from research 20 minutes of walking for students with ADHD improve classroom behaviors (Fedewa & Clark, 2010). Another research group noted in a study found research supported 30 minutes of acute exercise improves the cognitive function of students with ADHD (Huang et al., 2018). Their research found students with ADHD had improved reading scores post-exercise compared to baseline (Huang et al., 2018). Barnett's (2017) study found to help students in the classroom are some available strategies including standing desks, stationary bikes with desktop attached, exercise balls, and cubical desks to lower distractions are all valuable in students. The use of planned physical activity breaks in the classroom will also benefit students with ADHD (Barnett, 2017). These strategies can be used to benefit students with learning disabilities and improve overall wellness in the classroom (Barnett, 2017).

Spratt et al. (2018) conducted research showing students with autism spectrum disorders

also will benefit from physical activity. Mernear and Neumeier (2015) stated in their study students on the autism spectrum tend to be less active and in poor physical health. Those on the autism spectrum disorder (ASD) benefit from physical activity in two ways, according to Mernear and Neumeier (2015); the first is biological. Physical activity improves brain structure and connections because learning and movement use the same areas of the brain. The improved physical activity leads to better focus, attention span, and problem-solving (Mernear & Neumeier 2015). Spratt et al. (2018) added adolescents with Autism show mental strengthening improves mood, improved interaction, and a better understanding of health. Mernear and Neumeier (2015) found positive behavior for students with Autism can last up to forty minutes after physical activity, which teachers can use as learning time. They also demonstrated strategies couldeg be used by physical education teachers to help students on the ASD to plan low sensory overloaded activities promote high physical effort (Menear & Smith, 2011). They promoted physical education teachers should maintain a routine and create appropriate groups will have meaningful interactions and would focus on lifelong activities (Menear & Smith, 2011).

Conclusion

In conclusion, Zientarski's (2016) study finds adolescents deserve a high-quality Physical Education program promotes physical activity, better health, well-being, and academic performance (Zientarski, 2016). The research showed the brain area deals with movement is the same area works with learning (Steven-Smith 2016). Phillip et al. (2014) demonstrated the brain develops neuroplasticity from physical activity when proteins in the brain called Brain Driven Neurotrophic Factors (BDNF) create new connections. BDNF connection helps the brain retain new information is learned (Phillip et al., 2014).

Zientarski (2016) found in his study physical activity leads to improved academic performance and better overall wellness and can be affected by the type of physical activity, and

when the students participate in the activity, they can make a difference. Zientarski (2016) demonstrated in his study when students participate in moderate to intense physical activity early in the school day or before reading or math classes, students show tremendous growth in those areas. Martin et al. (2018) concluded in a study students also develop better cognitive thinking as they can process the skill and knowledge they already have learned due to the improvement of neuroplasticity in the brain. Martin's research also explains it is beneficial to participate in other forms of physical activity in programs such as after school sports and community programs to help develop students' confidence and sense of responsibility (Martin et al., 2018). Students who participate in a variety of physical activity programs show growth in academic performance because they have a better overall feeling of well-being (Steven-Smith, 2020).

Fedewa and Clark (2010) demonstrated in their research physical activity also helps students with learning disabilities by helping them focus on energy to participate in academic work. They showed a classroom-based physical activity program improved the on-task behavior of children with ADHD by at least 8% and 20% for the most off-task students. (Fedewa and Clark, 2010) Students with ADHD benefit from regular physical activity to help them expend energy to focus on the task in the classroom and feel better about themselves (Stanish et al.,2016) Fedewa and Clark (2010) stated this is also true for students with - autism spectrum disorder. ASD students have been found to have fewer behaviors in class, which leads to improved work time for these students (Fedewa & Clark, 2010).

In conclusion, physical activity, the research presented whether before school, in a physical education class, in the general classroom, at recess, or after school, has far more overall benefits than it has negatives. Physical activity should be a priority in school to improve overall academic performance for all students. Many times physical activity is a reward or just an

opportunity to get the kids out of the classroom for a short time. Physical activity needs to become a priority in school, and there needs to be a push to find more ways to add it to the regular school day. Students will not only benefit from it in the classroom but for the rest of their lives.

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