

Gross Motor Development and the Implications for Learning

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Keywords:

Education: The Process of receiving or giving instruction, generally in a school setting

Introduction:

Twenty years ago, when you walked through a neighborhood, it was a challenge to maneuver through the groups of children playing together outdoors. Bikes lined the driveways, while children sat criss-crossed on the sidewalk, drawing with chalk and playing jacks. Others played hopscotch and stickball using balled up socks, dried apples that fell from the trees and broomsticks and branches. These children were creating active games to play together, using their imaginations, and most importantly being physically active. They negotiated, bargained, compromised, brainstormed and even argued. They won and they lost. They fell down and scraped their knees and elbows. They got dirty. Now, when you walk through a neighborhood, you walk in silence. It is difficult to even find any children outside. Most are cooped up in front of a screen playing video games or studying for tests. The only movement many modern children experience is the swipe of their pointer finger or the patter of their hands on a keyboard.

The purpose of this thesis is to identify the acquisition of developmentally appropriate gross motor and physical skills and to investigate the effects of incorporating physical activity into the classroom environment. I have explored current and foundational research literature to meet this goal with the intention, and hope that my findings will initiate further discussion and research work in this increasingly important area of development and curriculum for children. As

an elementary and middle school student at the Progressive School of Long Island, I became intrigued by the high success rate of the students. I began to look for a common reason and immediately recognized the potential correlation between movement and learning. Every morning at the Progressive School, the entire student body gathered in the gym for a yoga inspired movement period. Throughout the day, movement was encouraged through classroom housekeeping, and running errands. The students also had outdoor recess every day, except in severe weather conditions. We brought boots, hats and gloves and played in the snow, helped rake the leaves and maintained our own garden. Play was so ingrained that we automatically created recess games combining physical and mental challenges.

Is there really a correlation between movement and learning? Students succeed in a classroom when they are engaged and focused in their learning (Cotman, 2002). Keeping their bodies active is essential in an effective learning environment. Movement has been shown to directly correlate to the growth of a child's mental, social and health development. We will look at physical activity and the lack of movement in classrooms and how it negatively impacts education. There are many skills that can be enhanced by keeping students active throughout the instructional day. Research performed by The Center for Disease Control and Prevention shows a positive association between physical activity in a child's life and cognitive skills, academic achievement, test scores, attitude and behavior. This paper shows the importance of bringing movement into the educational environment.

Learning is an active, life-long process. The skills and lessons learned from birth onward will be continually utilized throughout one's entire life. It is through physical activity that children begin to develop essential life skills. When physical activity is integrated into a child's

life, it can lead to the development of cognitive skills, social skills, academic achievements, positive attitude and behavior. However in classrooms, now more than ever, movement is often replaced by endless amount of school work and preparation for testing with the student positioned statically at a desk or table. This sedentary behavior has been shown to have many negative effects on a child's life. Incorporating physical activity into the classroom environment is vital in helping promote healthy growth and development in students. Physical activity is often solely seen as a way to strengthen the body physically but many are not aware of its benefits on academic performances. Being physically active will support a child in developing a strong foundation of motor and movement skills in all areas that they will build upon for their entire lives.

Often as adults, physical activity is seen as a luxury, however in a child's life it is essential in their development. Moving does not just create physical benefits, it reaches all areas of life and learning. Physical activity is "any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a resting level" ("The Association," 2010). Living an active lifestyle supports all areas of development especially cognitively and socially for all ages and stages of childhood. From birth, motor stimulation is essential to growth. Physical activity often includes gross motor skills. These involve movement of the large muscles of the arms, legs and torsos. (Team, 2019). Children need strong motor skills to engage in school-aged activities. Strong gross motor skills allow children to walk, run, climb and throw. These skills allow them to participate in classroom activities that need body control: sitting upright for the entirety of a lesson, carrying a lunch tray, hanging up their coats, taking care of

their personal needs, walking in a crowded hallway and participating in physical education class. We rely on these physical skills in our everyday lives.

Children spend most of their waking hours in a school environment. This should translate to a majority of physical activity taking place there. It is important for teachers to learn about motor development to incorporate it into their classrooms. From the way a child is sitting, writing, even raising their hand relates back to physical activity. We are even seeing the lack of muscle strength in the way children raise their hands in class. Often they struggle to keep their hands raised for an extended period of time and can be seen supporting it with their other hand. Elementary school teachers that have incorporated physical activity throughout the day see its benefits in every aspect of a child's growth. Daily physical activity needs to be seen as a necessity, not just a priority in the classroom.

Early Motor Development

From birth through, it is essential to develop strong motor abilities. Early childhood development can be defined as: “a set of concepts, principles and facts that explain describe and account for the processes involved in change from immature to mature status and functioning” (Grisham, 2013). This is a time where a child grows, changes and becomes aware of self and the world they are in. A child in this stage must learn to tolerate, become aware of, and understand movement. The earliest intentional movements of this age such as: swatting at mobile, reaching for toys and looking at caregiver’s eyes form the basis of purposeful movement and paying attention (Mays, 2011, pg. 4). When a child at this age is given the opportunity to move it helps

them develop spatial relations and visual perception skills. Neurological organization helps to efficiently combine these experiences.

This early gross motor stage is not goal directed or intentional. Newborns are hard wired for survival and everything, socialization, movement etc. focuses upon this phenomenon. Movement is guided by primitive reflexes that will eventually become integrated into major motor milestones. These sensory motor responses help a child learn about the world around them. Motor development growth at this age is referred to as cephalocaudal and proximodistal patterns. Cephalocaudal, meaning most of the movement of a newborn initiates at the top of the body, and moves from the head to the feet. Proximodistal relates to movement taking place in the center of the body and moving out toward the extremities. These are generally hardwired responses to stimuli. The first actions are reflexes such as rooting and sucking. These reflexes provide nourishment, a basic need. Also at this stage there are postural reflexes that help maintain body's orientation, and body righting that help to maintain the head upright and in midline. (Bukatko, 2012). Some of these actions are automatic such as sucking. Some relate to touch, such as grasping of a hand as it closes around an object. Some are even a response to an abrupt movement, such as when a baby is startled. These movements generally take place from zero to three months, forming the basis of development.

Simple, intentional movements such as reaching for a colorful object, form the basis for the next stage of development. These movements develop into larger more advanced automatic and essential movements. Children begin to lift their heads, try to sit up and perform a stepping movement. They begin to have automatic postural reactions by neck righting when their head turns and their body follows, body on body when the body follows the legs and flips over and

labyrinthine righting when in prone the head lifts up (Bukatko, 2012). These movements help pave the way for later more advanced movements. As a child ages, motor skills are performed more deliberately and purposefully.

In order for children to fully reach their developmental milestones, they must be supported by their caretakers. They need to be in an environment where they can be exposed to various life experiences in order to fully develop their senses. Within the first year a child should be able to sit up, crawl, stand and begin to form the basis for walking. Children can be supported by activities performed by caretakers such as bouncing, rocking and rubbing. They also should make sure they are positioned properly in car seats, cribs and baby carriers. A child does not need “designer toys” to reach these milestones. A child’s motor skills have been proven to grow the most in environments with simple objects such as balls, blocks, objects they can pull to stand up on, and any safe objects they are able to explore. It is important to support these children's growth in the beginning stages of life.

Children may present deficits due to immobility at these early stages of life. Some motor skill deficits have been caused by babies who are premature or considered medically fragile, babies positioned extensively to decrease Sudden Infant Death Syndrome-SIDS, babies positioned excessively in car seats/strollers/cribs, and excessively coddled infants. Children need to experience the world by moving around. Leaving a child in one position for a prolonged time can be detrimental to growth (Mays, 2011, pg. 49).

SIDS is an extremely controversial topic and has caused parents to stop “tummy time” a position believed to be necessary to developing core strength in children. This position is essential to the development of a strong trunk, neck and shoulder girdle. “Tummy time is the

basis for this, strengthening neck muscles, then back and arm and eventually lifting the trunk up, strengthening hand and core muscles” (Abdelbary, 2019). It allows the child to independently lift their head, look around and reach for an object. Without experience in this position, significant developmental milestones are missed. It is therefore important that caretakers help support these basic movements to help a child thrive (Ratliff, 2010, pg. 293).

As a child ages they begin to integrate their cognitive and motor skills. Around the age of one, there are certain milestones should be achieved. Children begin to independently sit and transition independently from lying down to sitting up. They also begin to perform actions of bilateral integration. Bilateral activities involve inter-hemispheric communication and include clapping and pushing a scoot toy. As children advance through their developmental sequence, their bilateral activities become more complex, leading to crawling, pulling to standing and eventually walking (Ratliff, 2010, pg. 293).

Generally, motor development at this stage follows a consistent sequence, however there can be deviations due to environmental differences. Children may present with deficits arising at this stage due to this factor. If a baby is not able to crawl by the age of one, it may be due to dynamic balance and core strength deficits secondary to a lack of experience. Children who do not have adequate time and exposure to explore their environment may demonstrate delays in this area. Crawl time is a necessary motor stimulation that a child needs in order to build up cross lateral integration, rhythmic ability and visual- motor control (Meyer 2017). Children at this age may also have deficits coordinating movement in a specific sequence and deficits coordinating both sides of the body. If a child spends a considerable amount of time strapped into a car seat or stroller, they do not have the practice or trunk strength to develop advanced motor patterns. A

child observed in a classroom who is unable to sit on their chair and often falls off can be related to deficits in moving as a newborn. The cause of this inability to stay seated without falling at may be due to weak core. Weak core strength and postural fatigue can be related to lack of movement and tummy time as a young child. During the first years of life, movement is a basis for physical development.

Pre-K Motor Acquisition

Children are to come into early education with a certain level of physical abilities. By the time a child is entering Pre-K he or she is expected to be able to perform certain motor sequencing actions. A child is expected to be walking with the ability to maintain balance and anticipate the force and speed necessary to move through a series of movements (Mays, 2011, pg. 103). A child entering Pre-K should also have basic fine motor control, bilateral play skills, and adequate depth perception. These skills allow the child to move safely among the stationary objects in their classroom, as well as navigate around moving peers. It gives them the ability to judge the distance between the boundaries of their own bodies and their environment, and therefore play and learn safely, while maintaining an appropriate personal space. A child who has not reached these milestones often is clumsy and tentative before performing movement. The child may have a lack of confidence when moving in busy environments such as the classroom.

Motor Skills and the School Age Child

As a child is entering Kindergarten, there are still more skills that are developing. Hand-eye coordination, strength, spatial awareness and isolated movements are some of the main skills addressed. These are further developed through basic activities that will enhance a child's physical skills. Throwing and catching develop hand-eye coordination. Swinging on a playground swing, is a simple activity that develops isolated movements, a sense of rhythm, sequencing, organizing sensory input, strength, and endurance all while doing the simple action of swinging (Mays, 2011, pg. 108). Riding a bike supports the development of dynamic balance, bilateral reciprocal coordination, attention and focus, cause and effect, timing, spatial awareness and planning, cardiovascular benefits, social benefits and confidence. All these simple enjoyable activities can help a child positively develop inside and outside of the classroom.

By school age, many children have not developed the motor skills and strength necessary to perform classroom related tasks (Mays, 2011, pg. v). These skills range from adequate motor planning to safely navigate a classroom, adequate trunk strength to remain upright without external support in sitting, bilateral coordination necessary to sit criss-cross on the carpet, to upper extremity strength necessary to complete a writing assignment. Developing motor skills in a child is more than creating an "athlete" is has to do with creating a competent individual full of the essential skills needed to succeed in school and in life.

A lack of motor skills can also cause a child to lack social skills and increase behavior problems in the classroom. Children require motor development to play and interact in a classroom with their peers. Children today are seen more and more not getting enough early

motor stimulation needed for school success. As a child begins to develop motor abilities they begin to play with their peers. A child with a lack of motor skills can be seen as uncoordinated and clumsy by their classmates. A child with these deficits can be seen exhibiting “behavior problems, poor social relationships, low self esteem and experiences frustrations and inadequacies” in the classroom (Ayers, 2013). This causes children to find difficulties in keeping up with peers physically and can turn them away from social situations and interactions, negatively affecting their education.

Brain Development Through Motor Activity

With more and more advances in research, we can see there is a greater correlation between physical activity and its effects on the brain and education than previously thought. “Modern brain research can be applied to parenting, teaching, and educational policy to improve school readiness and bolster academic achievement” (Meyer, 2017). If a child is lacking in their motor skills, more often than not they can also see a decrease in their cognitive skills and academic performance. 75% of brain development occurs after a child is born (Ginsburg 2007). By keeping a child physically active it can stimulate the brain by forming connections between nerve cells. Essentially, the more we keep a child moving around and active in a classroom, the more likely they are to absorb and understand the information being taught.

Movement acts as a “power on” button for the brain. Many areas of the brain work hand in hand with physical activity to help a child learn. The cerebellum’s purpose is to coordinate the timing of both thoughts and movements, as well as signal to the brain where the body is in time

and space. The cerebellum also works in conjunction with other areas of the brain to maintain postural control (Fritz, 2013). This area of the brain plays a significant role in motor planning, coordination and execution. Recently it also has been discovered to have a role in higher cognitive learning. The cerebellum originally was believed to only function for coordination and motor control but, recent brain imaging techniques have discovered its role in attention, language processing, rhythm and more key cognitive functions (Brown, 2010, pg.34). Physical activity also stimulates other areas of the brain causing: “cerebral capillary growth, blood flow, oxygenation, production of neurotrophins, growth of nerve cells in the hippocampus (center of learning and memory), neurotransmitter levels, development of nerve connections and brain tissue volume” (“The Association”, 2010). These changes can benefit a student's learning experience by improving attention, supporting the way a child will store, process and retrieve information, enhance focus, and potentially create a more positive mindset of a student. Children can benefit from these brain functions when activity is incorporated into their daily lives.

In Jane Healy's *Failure to Connect* (1999), she discusses her findings of brain development through motor activity. When rats lived in an environment that provided active engagement and physical movement, their brains subsequently became more highly developed with better organization of information. “Certain visual-spatial skills that contribute to math and science thinking are also learned from using the whole body to navigate through space while running, jumping, climbing, etc. Just like the rats studied, a child's mind learns in the same way. The child's muscles can be referred to as ‘smart instruments’ that register the spatial properties of objects in the environment and build a foundation for higher conceptual understanding:

proportion, velocity, engineering, design” (Healy, 1999, pg. 220). We can see a direct relationship between a child’s strong motor skills and how they support academic learning.

Currently, children are different, neurologically, than when studied in the past. The way information is processed, accessed, absorbed and used is different (Jukes, 2004). This is believed to be caused by the lack of physical activity and social interactions between children. There is a lack of imagination, social skills, problem solving, and teamwork, because of the lack of movement. The relationship between being active and cognitive skills can be pictured as a pyramid. Without a strong foundation of motor skills, children cannot support high-level cognitive functions (Newman, 1997). The motor skills of walking, climbing and crawling lay the base for cognitive skills children should acquire. When children are sedentary and not actively playing, their cognitive abilities tend to lack because they are unsupported.

Evolution of Play

Generally, children enjoy physical activity but, sedentary activities have taken over their lives. The most simple way for a child to incorporate physical activity into a child’s life and education is play! There is a positive correlation between play and brain development. Jaak Panksepp, a renowned play researcher proved play stimulates areas of the brain that develop nerve growth, emotions and executive decisions (Brown, 2010, p. 33). Play activity helps sculpt the brain and the capabilities to process and respond to our environment. Through the actions of play a child makes connections to its world and adds to its neural connections in the brain (36). It is crucial to provide children with opportunities to play and interact to help support them in reaching their full potential. Grisham discusses the following:

In play we can imagine and experience situations we have never encountered before and learn from them. We can create possibilities that have never existed but may in the future. We make new cognitive connections that find their way into our everyday lives. We can learn lessons and skills without being directly at risk (34).

Play is proven to be a driving force to help a child thrive in their environment. It is an activity that has been around since the beginning of time. Although the children of today may be “busier” than previously, they must find time to simply play.

One of the first written accounts of play was over 2,000 years ago when it was suggested by Plato. He believed all early education should be a sort of play and should develop around play situations. Play keeps children active and social with one another. Even in ancient Greek worlds, play was used by children to stay active in sports, learn and socialize (D’Angour, 2013, p. 301). As time has gone on play has continually kept the same role. In the 18th-19th centuries children began to assume adult roles and had to entertain themselves. This was done by playing and imagining games. As the 20th century hit, this is the last time we saw a majority of children truly playing. They had lazy days full of self-exploration and adventures. They rolled down hills, fished and climbed trees in nature. In urban areas they could be seen jumping rope, and playing stickball and hopscotch throughout the streets. They learned to take risks and problem solve in the real world. This all came to an end once the 21st century hit and “helicopter parenting” became the norm. Children are being deprived of climbing trees because parents fear the risks that come along with it. More children are being admitted to the hospital for falling out of bed than climbing a tree (Asthana, 2008). In a technological society, parents overcompensate in protecting their children physically as they feel they have lost their ability to protect them

psychologically in the media driven world. Parents have found it more convenient and safe to put their child in front of a TV instead of allowing them to explore motor stimulation outside or even on the floor (Meyer, 2017). Vestibular and motor stimulation, hand-eye coordination and fine motor control are lost to their eyes glued to a screen. Children living this way however are missing out on learning essential major motor skills with the switches to this “bubble wrapped” world.

Schools have also joined in on this trend because they fear lawsuits from children getting hurt from being active. Children are discouraged from playing inside the school environment in fear that it is unsafe or a liability. Unstructured play is often highly restricted or non-existent inside the school environment. Children are increasingly being told they can't run on the playground or roll down the hill. 17% of children are told they are not allowed to participate in activities of tag or chase (Asthana, 2008). Instead of using their imagination or problem solving whose turn it is to play, children are monitored and often given set games and guidelines to play by. Schools have begun to remove see-saws and swings on playgrounds, decrease outdoor play time, and increase restrictions on games played. Play should not be spent following strict guidelines. Elementary school-aged children are meant to engage in free play, running, tag and jump rope that support development of fundamental motor skills.

“Play is an important mediator in the physical, social, cognitive and language development of young children. In spite of this, play faces many threats in America” (Chaput, 2012, pg. 3). The amount of time spent independently in sedentary activities has negatively impacted learning. Recess and free play on a regular basis should focus on these skills versus following, inactive and strict guidelines. Especially in earlier grades, at one point, physical

activity was often part of the curriculum through play and activities. Now, even in a Kindergarten classroom they are forced to be sitting learning standardized academic instruction instead of active play. (Cotman, 2019, pg. 75). This sedentary mode is an unhealthy lifestyle to be put in at such a young age. Play is rapidly becoming a lost activity in children. If play dies, the imagination goes with it. Constantly children are coming into a Kindergarten classroom and do not know how to play. Without this they do not develop an imagination, a skill necessary for growth.

Play falls within two main categories: unstructured and structured. Both are vital and necessary to a child's stages of growth and development. Within these two categories there are numerous other forms of play including unoccupied play, constructive play, social play and motor physical play (Anderson, 2010). Play gives children the opportunity to test their beliefs in the world and help them gain an understanding of the environment around them. All these various forms of play contribute to enriching a child's imagination, curiosity and purposeful learning.

Structured and Unstructured Play Affecting Motor Development

Structured play, also known as goal oriented play is the type of play that is mediated, sports oriented and generally adult regulated. This kind of play teaches sportsmanship, competition, specific skills, value of hard work and a sense of identity with a group or team (Rock, 2019). It can include activities such as following directions to assemble a toy or model, being part of an organized sports team, or card and board games that involve rules. Essentially the goal of structured play is to learn knowledge or physical development from direct guidelines

and still have fun. The negative sides of structured play can be from the supervising adults that mediate and teach fair play versus working out disagreements, and decreased opportunities to learn from risk-taking behaviors. This form as well as unstructured play can be incorporated both into home life and school.

Unstructured play allows for children to solve conflicts by themselves, develop autonomous behavior (ex: rolling down hill), and non purposeful activities that allow a child to learn about the limits and abilities of their bodies, and to understand size shape and texture of their environment. “Unstructured physical activity is wonderful for helping children gain foundational motor skills” (Newman, 1997). Children have the ability to make choices through innovation and invention and solve their own conflicts. “Unstructured play and movement such as climbing a tree or rolling down a hill are fundamental to building the neural connections that allow for an individual to properly make sense of the world around them. Vestibular and motor stimulation are lost to activities in front of a screen” (Meyer, 2017). Unstructured play allows children to have control over how they will play. When a child is able to engage in open-ended play, rather than have a purpose or an end goal they are able to play in a way that is creative and imaginative. A negative component of unstructured play is that occasionally when play is unsupervised, there can be unkind acts between children that occur. This can be viewed as a positive, however, as children learn through these experiences how to get along with each other.

There is more than just one way to play. Having a child engage in various forms of play allows them to learn about social and motor skills and cognitive thinking. Play does not always have to take the form of one category, playtime can include many different ways of playing. Some of the most common forms of play are unoccupied play, constructive play, social play and

motor physical play. Unoccupied play occurs when a child performs random movements with no clear purpose, generally during the early stages of life. Constructive play is the type of play where children create things. Children gain confidence manipulating objects and become good at creating ideas and working with numbers and concepts. This can be done through activities such as creating structures and building with materials. When children interact with each other, it is known as social play. This form uses moral reasoning to develop a sense of values in a social setting by communication. Motor-Physical play occurs when a child is using their gross motor movements. Children run, jump, play games such as hide and seek. A child is physically playing in their environment with other children while teaching social skills while enjoying healthy exercise. (Anderson, 2010). Having many forms of play gives children the opportunity to be physically active in ways that they find interesting. Although play is often only seen for its fun side, it is necessary in a child's development.

Overscheduling Affecting Motor Development

How much is too much when it comes to scheduling children? Although we want to keep children active and engaged, there is a concern placed on children spending too much time on out-of school activities. When children are overscheduled, they often become fatigued or inactive due to overstimulation (Mahoney 2012). While enriching a child is a good thing, overscheduling can lead to poor developmental outcomes. They are not given enough opportunities to be a kid when they are operating on these hectic schedules. As playtime shrinks, the number of diagnosed behavioral disorders has been shown to increase (Mahoney 2012). They become adult driven and managed, becoming unable to think through situations on their own. Having no spare time can

lead a child to act out in school settings. It is important to let kids have time to grow and explore on their own.

When unstructured play time shrinks, so do the benefits that come with it. Unstructured play time gives a child an opportunity to grow their physical, cognitive and social skills in areas they are interested in. As David Elking explains,

Despite the more than 3 million American children involved in Little League and baseball camps, Caribbeans, Central Americans and South Americans are increasingly becoming the stars of our professional teams. Many of these players grew up playing for the fun of it and never participated in organized teams (Kelly, 2019).

Players are coming from other countries without structured play and becoming better players than those who only have played in structured sport settings. As unstructured play shrinks, children are not participating in activities they find interesting. They are forced into participating in structured sports and activities that are only to keep them occupied.

Biological, Social Influences and Obesity Affecting Motor Development

Every single child is different physically, emotionally, biologically and socially. You will never come across two children developing at exactly the same rate. Normal development includes a wide range of differences. Every child is unlike anyone else in the world (Santrock, 2014, pg. 9). Gross motor skill development will be varied based on the rate of physical development, socio/economic challenges, social constructions, obesity and many other factors that account for every single child being different. “Considerable variability occurs in the rate of

physical growth and development among individuals within a group as well as among ethnic and cultural groups” (Bukato, 2012). Although every child will not be alike, they all will benefit from physical activity in their lives.

“Growth of the body and brain, sensory capacities, motor skills and health are part of *physical development* and may influence other aspects of development” (Santrock, 2014, pg. 9). Genetics, gender and ethnicity can affect the rate and growth of motor skills and development. A child’s body weight, size and strength will account for differences in gross motor skills. Physical development addresses and change in the body, including how children grow, how they move and how they perceive their environment (Grisham, 2013). These physical growth differences will also be varied based on gender. For example boys generally will have a larger muscle mass however this does not seem to play a large role in regards to differences of gross motor skills between genders. Genetics and ethnicity can affect the rate and ability of motor skill development in relation to body weight, size and strength, relevant to body weight.

Cognitive and emotional development contribute to physical growth and development of motor skills. During puberty, dramatic physiological and hormonal changes affect the developing sense of self (Santrock, 2014, pg. 10). This time children also begin to become more aware of their own physical characteristics and those of people around them. Not fitting into a “normal” body type can cause a child to not participate in as much physical activity in their environment as needed. Stereotypically in our society, taller boys seen more competent than shorter boys (Bukato, 2012). This causes those are considered shorter generally to participate less in activities socially which impacts their level of physical activity.

In an interview by Dr. Gray, who is an American researcher and scholar and research professor of psychology at Boston College documents why free play is essential for children's healthy social and emotional development, he outlines steps through which we can bring free play back to children's lives. Free play can help children to accept one another in a more welcoming way. In his research he has also found that as the amount of play has decreased, there has been a “gradual but overall dramatic increase in anxiety, depression, feelings of helplessness, suicide, and narcissism in children and adolescents” (Grey, 2011). When children play together, they are less likely to focus on what physical differences bring them apart and more likely to focus on the activity they are playing.

Obesity has become a well-known health concern in children. In 2018 according to the Center for Disease Control and prevention from children and adolescents aged 2-19, 18.5% were considered to be obese (Classroom, 2019). Physical activity plays an important role in keeping children healthy and preventing children becoming overweight. Correlating with this statistic, only 17% of children and adolescents are reaching the daily physical activity recommendations (“The Association”, 2010). A lack of exercise, an unhealthy environment, poor eating habits/fast food and short sleep duration lead to children becoming obese. This vicious cycle. without the appropriate amount of activity obesity may stay with children into adulthood, putting their health at great risk.

We can help attempt reduce obesity in children by increasing physical activity in children. Physical activity not only will support reducing the risks of obesity but will help increase the overall well-being of the child. “Active behaviours have been displaced by more sedentary pursuits which have contributed to reductions in physical activity energy expenditure”

(Pradinuk, 2011). We can create a basis for an active lifestyle in children by engaging them in activities to keep them active. Even adding 15 minute physical activity breaks sporadically throughout the school day can elevate mood, decrease obesity (Cotman, 2002). It is important to incorporate because it will help not only decrease a symptom such as childhood obesity being active has the potential to enhance the overall well-being and prevent other health conditions from emerging.

Technology Affecting Motor Development

Technology has allowed for instant access to knowledge at our fingertips. To find out anything or explore any place, technology has given us the instant gratification of this without having to leave the couch (Fritz, 2013). Even the minor physical activity of getting up from the couch, walking over to a bookshelf, reaching up for an encyclopedia, carrying the book back to a table and opening it, is eliminated. Today since less children are going outside to play, more are solely playing over electronic devices. The American Academy of Pediatrics recommends that children spend a maximum of one to two hours of screen time per day however, a Kaiser Foundation study showed that elementary aged children use on average 7.5 hours per day of entertainment technology (Rowan, 2017). Children right now on average are using electronics for several hours more than recommended. Children have begun to rely on technology as a way to play. Using technology in place of physical activity and play can lead to delays socially, emotional and especially physically.

Excessive screen time has been linked to an increase in physical disabilities and motor skill delays. Relying on screens to play has caused limitations by lacking necessary challenges the body needs to achieve optimal motor development as well as limiting creativity and

imagination. “Sedentary bodies bombarded with chaotic sensory stimulation are resulting in delays in attaining child developmental milestones” (Rowan, 2017). Critical factors of childhood development cannot be achieved while looking at screens. Children need to move for at least 60 minutes a day. Currently less than 24% of students aged 6 to 17 are participating in 60 minutes of physical activity every day (“CDC,” 2019). The countless hours spent in front of a screen need to be changed into activities that incorporate movement. “Child obesity and diabetes are now national epidemics in both Canada and the U.S., causally related to technology overuse” (Rowan 2017). Children are not moving, touching, having human connections or being exposed to nature. All of which relate to a child’s physical activity and support a healthy motor development. Technology has advanced our society in many aspects however has turned children inactive.

Think about baseball and its physical demands. A person who plays baseball needs to stand for long periods, use their hands to control a bat, catch, run, keep their balance, twist their bodies, use a majority of the muscles in their body, use quick reflexes and be physically fit enough to be playing a game for over an hour. Today, the only physical demands a child is participating in is moving a controller to simulate a baseball game through a screen. This video gaming overload is giving children a false perception of the world (Fritz, 2013). For example, hitting a home run on a video game is not going to transfer to real world success. Hitting a home run on a real baseball field takes a lot more motor skills and hand eye coordination.

Kids are spending more time with electronics than with their families. More parents are working, creating less supervision and entertainment causing children to sit in front of screens. It is more convenient to have a child on an iPad indoors versus having to supervise them outside.

64% of children are sent home without a parent there. Why go outside when you can stay inside playing video games, and watching TV? (Jukes, 2004). Children have become unmotivated to be physically active when they are left alone. Digital gadgets have become companions of children

A new method of gaming known as “exergaming” has been created to support physical activity in children and encourage children to play outside. Since 82% of children in the United States play video games on a regular basis, companies are trying to counteract the sedentary nature of their video games (Jukes, 2004). Gaming systems such as Xbox Kinect and Wii have created games that are more than just a sedentary activity. “According to a study done by the American College of Sports Medicine, “exergaming” uses twice the amount of energy as video gaming” (Hatch, 2011). This should not replace exercise in a child’s life but can support the change from a sedentary lifestyle to one that is physically active.

21st Century Changes in Education Affecting Motor Development

Education is an ever growing field that is constantly changing to help students succeed in their lives. Technology had become more present. Classrooms have rapidly switched from blackboards and whiteboards to smartboards and various kinds of interactive boards. Children have begun to focus more on tests rather than play. Students now have more resources and access to knowledge. We have more skills to enhance learning and more opportunities for students of all backgrounds. 21st century children are being prepared to go into a technologically advanced world.

One of the main differences seen is in testing. “Many schools are attempting to increase instructional time in an effort to improve standards-based test scores and often decreasing or eliminating physical activity breaks in the school day” (“The Association”, 2010). Schools have become focused on academic achievement now more than ever. Standardized test scores, GPA, classroom scores and other formal assessments fall under the category of academic achievement.

Classrooms are more technologically advanced. Technology is the biggest change ever seen in a classroom. However, technology has its merits and disadvantages. On one hand, technology allows us to explore the world in ways many children in the classroom have never been able to. It can provide different methods of teaching to all learners and serve as a resource for children to use. On the other hand too much of it can be distracting and have a negative effect on learning because students are looking up answers instead of thinking through a solution. We can learn in ways we never have before. But, like all things, technology is best used in moderation.

Definitions of Physical Activity in Schools:

The North Carolina State Board of Education passed a policy in 2003 titled “Healthy Active Children.” In this policy it defines physical activity as: “A moderate intensity level and for a duration sufficient to provide a significant health benefit to students” (Mahar, 2003). Physical activity can take on many forms throughout the school day. It does not just come in the form of a gym class. These are activities able to accommodate all students in all locations of the school. Physical activity can take the form of Physical Education classes, classroom based physical activity, extracurricular physical activity and recess/free play. All of these forms may vary in

their approaches however their main goal is to get children to move to enhance their academic learning while focusing on fine and gross motor skills.

The most common activity referenced is Physical Education. 64% of K-12 students do not participate in a daily physical education program (CDC, 2019). However, the United States public schools all require some form of it in the school curriculum. Defined by the National Association for Sport and Physical Education (NASPE): “is a curricular area offered in K-12 schools that provides students with instruction on physical activity, health-related fitness, physical competence and cognitive understanding of physical activity. Enabling students to adopt a healthy and physically active lifestyle” (“The Association,” 2019). It is considered an academic course because of the importance it plays in a child’s life. Physical education classes mainly work on gross motor movements and have a sequential curriculum in order to help children grow.

Physical activity can take place in the classroom through 5-20 minute breaks that “require little or no teacher preparation, special equipment or resources”(“The Association,” 2019). According to the Center for Disease Control and Prevention, incorporating 5-20 minute movement breaks throughout the school day has been proven to enhance academic growth and achievement. These breaks can help a child refocus and enhance their learning. Another common form is through recess/free play. This is a time of unstructured or structured free play during the school day. Attending recess on a regular basis can benefit academic behaviors and performance, boost social development and contribute positively to the overall physical development of a child. It supports physical activity and the health benefits that come with it (“The Association,” 2019). Often times after the school day is over, schools host extracurricular activities. The

extracurricular physical activity encourage children to be more physically active. They have been shown to have a positive impact on academic performance.

Having various forms of physical activity throughout the day will help contribute to the overall performance of a child. These activities help support gross and fine motor skill development. Fine motor skills are small muscle movement skills. They include actions such as holding a pencil. Gross motor skills involve the large muscles of the legs, arms and torsos. These include actions such as jumping or running (Anderson, 2010). Gross motor skills are often focused on in Physical Education classes. Including movement in many forms throughout the school day will contribute positively to learning and the overall environment of the school.

Negative implications

With only approximately 6 hours in a school day, there is so much that needs to be accomplished. There has been a trend of declining physical activity because of the amount of time needed to study and prepare to meet requirements of the curriculum. “The growing emphasis on standards assessment and accountability in schools has led to a reduction in outdoor and active physical play. In many schools, play has been eliminated to make room for quieter academic learning” (Chaput, 2012, pg. 3). Physical activity was believed to be taking up too much time in the classroom and had to be eliminated in order to make more time for core subjects.

Since No Child Left Behind (NCLB) was passed in 2001, “The average total time for recess prior to NCLB was 184 minutes per week, after passage of NCLB dropped to 144 minutes, a 40 minute decrease. For Physical Education it dropped from 115 minutes per week to

75 minutes, also a 40 minute decrease” (Instructional, 2008, pg. 23). This additional time taken from physical activity was used in the classroom to give more time to focusing on curriculum. Schools became concerned that they would not be able to teach all necessary information to the child. Despite this concern, research demonstrates that when additional time is spent on physical activity around 15% to 20% of the school day, learning is not interfered with negatively (Grey, 2011). Yes, physical activity may take up time in the school day, but it has only been shown to support learning and the curriculum.

Motor Development Necessary for Education

Motor development necessary for academic achievement. For a student to be able to read, they must be able to hold their body stable, static and upright. They must be able to look at small targets and move their eyes horizontally across a page. They then have to be able to shift downward slightly and quickly back to the opposite side. This skill requires that the child be able to cross the midline of their body. Crossing midline begins to develop as early on, as when a baby first reaches across their body to roll over. (Hannaford, 2013, pg.31) This is one example of the impact that successful achievement of early developmental stages has on academic achievement later on. If a child is lacking these fundamental skills they may have more difficulties in the classroom.

Writing requires the skills necessary to read, plus the motor task of using a pencil. The child needs to have bilateral use and strength in their upper extremities. They must have hand-eye coordination. Their eyes must also have the ability to follow their hands. They also require enough trunk stability and endurance to keep their proximal body still while moving only their distal fingers. There is a clear linear relationship between these functions and a child’s

writing ability (Meyer, 2017).. These movements are part of the developmental stages of early childhood. Early motor stimulation necessary for optimal school success.

Correlation between physical activity and learning

There is a correlation between physical activity and academic learning in the areas of cognition, memory function, concentration and mood. Physical activity aids in cognition since it helps nerve cells multiply. This creates new connections for learning (Cotman, 2006). It has been proven that daily physical movements integrated into the curriculum increases academic scores (Meyer, 2017). Daily physical movements can be incorporated in various forms of physical activity. It has been found effective to vary the form of activity such as: physical education classes, classroom breaks, free play and recess.

The brain's short and long term memory may improve by using more than one method of information (Cotman, 2002). By adding a movement activity to a lesson, the brain can process additional information via additional pathways. For example, if a lesson is verbally presented by the teacher standing in the front of the room, information is processed via verbal and visual pathways only. However, if the component of movement is added to the lesson, information is processed via vestibular pathways in addition to verbal and visual pathways. Multisensory lessons incorporating time for movement can assist all learners, especially those who are kinesthetic learners.

As John J. Ratey, MD Harvard Medical School in a *User's Guide to the Brain*, states: “. movement is crucial to every other brain function, including memory, emotion, language, and learning. Our “higher” brain functions have evolved from movement and still depend on it.” Movement is effective in improving the function of our brains. For example at Cheshire Texas

Public School a double-blind study was performed on 538 sixth grade students. The findings show that experimental students who performed a half hour of daily movement activities exhibited a much higher level of academic success with less test anxiety than those who were the control students (Bredal, 2000). Despite a childhaving deficits in physical activity, children can make significant gains by incorporating movement into their lives. Movement has shown to be highly effective in improving our brain functioning.

The United States Department of Health and Human Services conducted 50 studies all showing associations between physical activity and academic performance (“The Association,” 2010). Their studies included academic performance, representing the measures of academic achievement, behavior and cognitive skills within each child. No study conducted showed a negative association between them. Studies show that levels of physical activity contribute to the overall student in many areas. Collectively this shows that physical activity will not take away from academic performance but has the capability to positively impact the classroom.

A correlation between physical activity and concentration has also been established. In a study, some children increased their on task behavior by 20% following in class physical activity (Mahar, 2006). In a study done by Dr. Kerby on a class of 26 fourth grade students both in the general population as well as students with special needs found that “incorporating motor breaks into the afternoon routine significantly decreased the students’ off task behaviors. Perceptions of their abilities to focus and remain on-task in the afternoons increased due to the motor breaks” (Kerby, 2009). The implementation of motor breaks impacted the students abilities to stay focused and on task for a longer duration of time. Students need these breaks as it has been shown that elementary school aged children’s attention attention is not fully developed (Betts,

2006). They have not yet fully achieved sustained attention, the ability to stay focused over long periods of time. These breaks are shown to improve academic scores as well as the ability to stay focused.

Physical activity also has a significant impact on a child's mood. In as little as 15 minutes of exercise, children can elevate their mood (Williamson, 2001). Following exercise, children feel successful and exhibit a higher self esteem (Tremblay, 2000). A child is available to learn when they exhibit a positive mood.

When to use gross motor movement in classroom

When a teacher understands the ways in which children's abilities develop, they achieve a better understanding of children and how to approach and teach them. This often results in incorporating movement throughout the educational day. Movement can be used during breaks to refocus the students, as lesson enrichment to reinforce content material and during transitions between classroom activities or moving within the school building. Movement can also simply be used for the purpose of movement.

Movement during breaks for the purpose of refocusing the students requires rules and structure in order for them to be successful. If a teacher sets a time frame, reviews the concept of personal space and practices methods for redirection, such as clapping or a sound or gesture, these movement breaks can be quick and the students can immediately get back to work. Simple movement breaks aid in the development of various muscles that are necessary for the task being addressed in the classroom. For example, hand pushes before a writing task, whereby the students place their palms together and push as hard as they can, aids in developing the muscles necessary for writing. When students stand and draw large "lazy eights" in the air, during a

movement break, they are improving their ability to cross midline and visually track, in addition to refocusing.

According to the Center for Disease Control and Prevention, incorporating 5-20 minute movement breaks throughout the school day has been proven to enhance academic growth and achievement. However, only 11% of districts require these breaks throughout the school day. ("Classroom," 2019). Adding these activities will not take away from classroom learning time. Schools often fear that being physically active will take away from time learning academic skills and test preparation. But can only help improve these by leading to improving behavior, attention, engagement in learning and increased academic performance. These movement breaks should not replace recess and physical education classes, they should be added in addition to.

Movement can easily be incorporated during transitions between activities within the classroom and when moving through the school building. This time can be utilized for additional movement opportunities. The teacher must take into careful consideration where the students are coming from, and where they are going. For example, are the students walking back from recess, are they walking to a testing room, are they going home on the bus? Other considerations may be: is it rainy, sunny, or snowing? Is it September or June? Activities need to be structured and expectations identified if the goal is calming, focusing or arousal. A simple idea is to establish a secret password that leads to an activity such as standing on one foot for five seconds or hopping five times. Next, the teacher establishes when the students will use the secret password such as when the exit the classroom or retrieve their folder. This not only aids in physical development, it grows listening and attention skills and body in space awareness. A transition in the hallway may include wall push ups where the students line up against a wall when they leave the

classroom, face the wall and perform 10 wall push ups. These aid to organize their bodies and walk calmly through the hall.

Practical Applications to the Classroom

Movement can easily be incorporated throughout the classroom day. The idea is to start simple. When a child raise their hand to answer a question, the teacher must encourage an erect trunk with an arm raised straight up overhead. A half raised hand with their elbow resting on the desk is not acceptable. This small bit of movement can be made fun and motivational if the students raise objects such as spoons labeled yes and no, or plastic plates that they write their answers with dry erase markers on. To challenge the students even more, they can be encouraged to write their responses on copy paper and hold it overhead with two hands.

Movement can be incorporated into math lessons by having students use their arms to represent geometric shapes. They can skip jump by 2's, 3's and 5's. Mean, median and mode can be taught using data gained from having the students perform sit-ups and push-ups and combining their results.

Gross motor can be incorporated into literature and language arts. Books such as "Hand, Hand, Fingers, Thumb" by Al Perkins encourages students to act act the movements of the monkeys in the book. Students can stand and air write vocabulary words. Even Haikus and poems can be interpreted with movement.

Movement can be incorporated into science lessons. During the weather portion of calendar time, students can stomp for thunder, clap for lightening, tip toe for clouds and sway back and forth for wind. In higher grades, the life cycle of a frog or butterfly can replace the numbers on a hopscotch board.

Movement can even be added to history lessons. Imagining how motivating it would be for students to hop for dots and jump for dashes when sending Civil War communication in Morse Code? Even something as simple as students clipping index cards with dates to a rope timeline hung across the front of the room, encourages movement. Movement can creatively be inserted into any lesson in a classroom.

Conclusion:

Key points from the articles listed in the bibliography were analyzed and compared in the narrative above. The overwhelming consensus is that yes, movement is a necessary component in the successful education of a child. I could not locate an article that disputed this theory or described any negative implications that movement could have on the learning process. They all correlate to the fact that, in order for a child to learn successfully in a classroom, they must demonstrate adequate gross motor development. Modern children tend to have limited movement experiences secondary to advances in technology and limited time spent in unstructured play. When teachers incorporate gross motor movement throughout the entire school day, students can learn optimally. A quote from Maria Montessori sums it all up: “Watching a child makes it obvious that the development of the mind comes from movement.”

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