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Understanding Factors Related to the Development of Obesity Among Preschoolers and the Importance of Promoting Physical Activity Early in Life

Cheryl Maykel and Jessica S. Reinhardt

Abstract

It is known that most children do not engage in the recommended amount of physical activity on a daily basis and that physical activity is inversely related to overweight status. Various physical and mental health concerns have been associated with overweight status. Conversely, various physical, mental, and cognitive health benefits have been associated with increased physical activity. While there is some evidence to suggest that the trend in overweight status may be leveling off, the rate of occurrence is still high (Hales et al., 2017). In addition, young children continue to fail to meet the recommendations for daily physical activity as well as for sedentary behavior (Colley et al., 2013). It is known that overweight status and physical activity habits both tend to persist from childhood and adolescence into adulthood. Therefore, the importance of intervening to increase physical activity among young children remains of great importance to overall well-being.

Keywords: *Physical Activity, Childhood Obesity, Preschool*

Understanding Factors Related to the Development of Obesity Among Preschoolers and the Importance of Promoting Physical Activity Early in Life

Physical Activity (PA) is important at every stage of life. Human beings are designed to be active throughout the day, every day, in pursuit and maintenance of resources (Eaton & Eaton, 2003). Though our society has evolved into one in which both vocational and recreational activities are often sedentary in nature, our bodies continue to require daily activity for healthy functioning. The term “physical activity” represents all types of gross motor movement, regardless of where it occurs, what type of activity it is or even the purpose of that movement; PA is no longer defined as a distinct, purpose-driven exercise session (Physical Activity Guidelines Advisory Committee [PAGAC], 2018). It is key to recognize that there are many opportunities for increasing PA throughout the day that do not require scheduling a substantial block of time.

The rates of obesity in the U.S. have climbed from the 1999-2000 to the 2015-2016 child and adult data reported by the National Center for Health Statistics, yet there was no significant increase from the 2013-2014 to 2015-2016 data (Hales et al., 2017). This suggests that while rates remain high, the trend in overweight status may be leveling off. There appears to be no significant difference between boys and girls overall or in any age group. It is also of interest to note that the prevalence of obesity among preschool-aged children from two to five years was reported as 13.9%, among school-aged children from six to eleven years as 18.4%, and among adolescents from twelve to nineteen years as 20.6% (Hales et al., 2017). The rates show a slight increase as children age, meaning that more children and adolescents become obese than those who are obese when they are younger improving their weight status, despite the many efforts that are made to intervene on behalf of children and adolescents. Though, these numbers reflect only children who meet the threshold for obesity, and not those who would be considered overweight or at-risk for becoming overweight. There are also racial

disparities in rates of obesity among youth aged two to nineteen years, with rates among Hispanic youth reported at 25.8%, Black at 22%, White at 14.1%, and Asian at 11% (Hales et al., 2017). It is also well-known that children from families of lower socioeconomic status have a greater risk of being overweight as well (Wang & Beydoun, 2007).

There are many physical health risks for children that are associated with simply having low levels of regular PA, including an increased risk for cardiovascular disease (Tanha et al., 2011). There are also physical health concerns associated with obesity. In a nationally representative sample of youth aged 10-17, higher rates of bone, joint, and muscle problems, asthma, allergies, headaches, and ear infections were found among those who were obese (Halfon et al., 2013). Overweight status is also often comorbid with various mental health concerns (Reeves et al., 2008). Halfon and colleagues (2013) also found that rates of attention deficit/hyperactivity disorder, conduct disorder, depression, learning disability, and developmental delay were higher among children who were considered obese.

While it is difficult to accept, young children may be more susceptible to the negative self-concept, or body esteem issues related to overweight status than once believed. Body esteem has been defined as the attitudes, evaluations, and feelings that an individual has about their own body (Williams et al., 2012). Previous work indicated that body esteem was not impacted until later childhood or adolescence, however it has been found that even among five to seven-year-old boys and girls with a higher BMI (Body Mass Index), children of both sexes had lower body esteem; girls experienced more bullying, while boys perceived having more physical health problems as a result of their overweight status (Williams et al., 2012). In addition, earlier work suggested that there were racial differences in body esteem, such that overall, Black or Hispanic children were not as negatively impacted by overweight status, yet those differences in perception appear to have diminished over time (Shaw et al., 2004). It is not yet known whether obesity is a

cause of mental health problems or if it results from these issues, but it seems likely that there is a shared and complicated etiology, providing support for the needs of these youth to be addressed holistically (Kalarchian & Marcus, 2012).

Research has shown that patterns of PA (Telama et al., 2005) and weight status (Eaton et al., 2012) that are in place in the early years of life tend to continue throughout adolescence and adulthood. Further, health concerns associated with a lack of adequate PA are likely to be more detrimental to overall health if they persist for longer periods of time. In addition, it is known that children, despite often enjoying PA and experiencing spontaneous bouts of energy that might indicate they would naturally engage in PA as needed, are consistently not engaging in the amount of PA that experts recommend on a daily basis (Eaton et al., 2012; Colley et al., 2013). Young children also continue to exceed the recommendations for sedentary behavior (Colley et al., 2013). Therefore, intentional efforts must be made to increase the amount of physical activity that young children engage in as part of typical daily habits in order to promote overall wellness.

Diet as a Factor in the Development of Overweight

The simplest explanation for the overweight phenomenon is that of an interplay between calories consumed and calories burned, yet we know that the problem is not as simple as increasing PA in response to a high calorie diet. There are many genetic and environmental factors related to obesity status (Thaker, 2017). Research supports that parents who are overweight or obese are more likely to have children with higher BMIs (Burke et al., 2001). Children are presumed to share the same genetic material as well as the same home environment with their parents, within which they are likely to access most of what they eat and to adopt the eating behaviors (e.g., portion, regularity of second helpings, eating times, whether or not meals are taken in front of the television, speed of eating) that have been established by the family. For

many families who have two working parents, are single parent families, or are otherwise often “on the go”, everything that goes into mealtime preparation and execution can often be superseded by the amount of time and energy available in a given day to those responsible for providing meals, as well as to the food preferences of the family.

A careful review of the foods that families of lower socioeconomic means, who are at a greater risk for becoming overweight, choose to eat on a regular basis indicates that they are choosing less healthy, calorie dense foods more often (Pechey et al., 2013). One explanation is that these foods are perceived as being less expensive (Dammann & Smith, 2009), but it is also likely because they are satisfying and easy to procure. One study showed a higher preference for fatty foods, lower preference for vegetables, and a greater likelihood of overeating on a regular basis among children from families considered to be overweight (Wardle et al., 2001). In addition, general family eating behaviors, as well as parental pressure to eat or restrictions on eating have been shown to impact both risk for underweight and risk for overweight status among children (Jansen et al., 2012).

There is some evidence to suggest that the foundation for obesity during early childhood may be set in infancy (Andersen et al., 2012). Factors such as breastfeeding and delaying the introduction of solid foods until at least four months are associated with a higher likelihood of healthy weight status among two- and four-year-old children (Moss & Yeaton, 2014). Also of interest, is that while mothers tend to perceive heavier infants as healthier, this trend might increase rates of childhood obesity, as mothers may be less likely to intervene to curb weight gain as the child grows (Byrne et al., 2016). In particular, older mothers of normal weight children were more likely to perceive of their children as being underweight and mothers who were overweight themselves were more likely to describe children classified as overweight or at-risk for overweight as being of normal weight (Byrne et al., 2016).

Physical Activity as a Factor in the Development of Overweight

Physical activity behaviors are influenced by social, cultural, and environmental factors (PAGAC, 2018). For instance, PA habits and the encouragement of either a more active or a more sedentary lifestyle also tends to begin at home (Xu et al., 2018). Families who limit screen time and are more often active together tend to promote a more active lifestyle. Conversely, families that are considered to be overweight impart a preference for sedentary activities on to their children (Wardle et al., 2001). Children tend to prefer to have their parents involved in PA with them to being alone or to having parents watch them from the sideline (Rebold et al., 2016). Further, parental engagement in PA with the child has been found to increase the amount of PA for the child (Rebold et al., 2016).

For children who live in the inner cities, there are a host of barriers related to engaging in adequate levels of PA, chief among these is having access to a safe space to play (Ginsburg, 2007). Many urban homes are limited in space for indoor gross motor activities, while leaving the home may necessitate having supervision, traveling to a park or playground, owning sporting equipment, or other logistical concerns that many suburban and rural children who are able to walk out their back door and run around are not impacted by to the same extent.

Overweight status might result in compound effects that cause it to become a barrier to engaging in more PA. For example, reduced movement in the early years may impede the child's motor development, which could then impact physical abilities and fitness, or at least preference for PAs later in childhood. One study demonstrated that children who were considered overweight at five years old were at increased risk for deficient total and gross motor abilities at age 10 when compared to their peers (Cheng et al., 2016).

Benefits of Physical Activity

Various health benefits of physical activity have been identified in the literature, including direct benefits to physical health, cognitive

ability, including executive functioning and classroom engagement, as well as mental well-being. Most of the documented benefits from PA are from moderate-vigorous PA (MVPA; PAGAC, 2018). The 2008 PAGAC indicated there was insufficient evidence on the amount of PA that would be appropriate to recommend. The current guidelines, however, recommend a minimum of three hours per day, though this would include light, moderate and vigorous intensity activities for children aged three to five (PAGAC, 2018). If children within this age range sleep between ten and fifteen hours per day, this recommendation would mean that children should spend a significant proportion of their day in motion.

Physical Benefits

There are many benefits of PA to physical health. MVPA has been associated with reductions in several health-related conditions including: excessive weight gain, a reduced risk of developing various types of cancers and reduced mortality from some types of cancers (PAGAC, 2018). Those engaging in more MVPA have also been reported to have improved sleep quality. This was found among the general population, as well as those with insomnia or sleep apnea (PAGAC, 2018). Improved sleep quality is determined by less time falling asleep, more time in bed sleeping, more time in deep sleep, less fatigue while performing daily tasks and a reduced frequency of using medications to aid in sleep (PAGAC, 2018). Each of these physical health benefits is linked to a variety of other aspects of functioning and overall well-being.

Specifically, among children, substantial evidence for the physical health benefits of PA for six to seventeen-year-olds includes improved weight status, bone health, and cardiovascular risk status (PAGAC, 2018). Preschool-aged children who are more physically active have been shown to have a healthier weight status and greater bone strength (PAGAC, 2018). Both of these characteristics have been shown to persist into later life (PAGAC, 2018).

Some school-based programs involving students in PA have been developed to target physical health outcomes, including the

promotion of overall health among students (Hollar et al., 2010). The Happy 10 program was developed to combat obesity and has been shown to have a positive impact on student BMI (Liu et al., 2007). Other programs were designed to target both weight status and academic achievement and have found success in both domains. The Physical Activity Across the Curriculum program (PAAC; Donnelly et al., 2009) promoted the integration of multiple 10-minute breaks for PA throughout each school day. The Healthier Options for Public Schoolchildren (HOPS; Hollar et al., 2010), in addition to other components, increased the structure of PAs during recess, integrated PAs into the curriculum, and involved teacher encouragement to increase the amount of PA students engaged in.

Cognitive Benefits

In addition to the physical health benefits of physical activity, MPVA has been linked with improved cognition in children (PAGAC, 2018). The cognitive benefits of MVPA are mainly related to executive functioning, including attention, but also to memory, processing speed and overall academic performance (PAGAC, 2018). PA has also been shown to reduce ADHD symptoms, including oppositional behavior (Chang, 2012). A meta-analysis by Sibley and Etnier (2003) provides strong support for a relationship between PA and cognition in general populations of children. The research, which included 44 studies, provides insight into the general benefits of physical activity, as well as key outcome moderators (i.e., experimental design, age, activity, and types of cognition). Results demonstrated a significant and positive impact on cognition in children in general with an overall effect size of 0.32, with solid effects among elementary-aged children and middle schoolers (0.40 and 0.48 respectively).

Knowledge of the benefits of PA on executive functioning has become widespread in recent years, though research support for this relationship has been amassing for decades. For instance, Allen (1980) demonstrated the success of a six-week jogging program among 12 boys with behavioral disorders, showing a 50%

reduction in disruptive behaviors. In an early meta-analysis, Allison and colleagues (1995) explored the effects of chronic PA on disruptive behavior and provided support for its use as a method of changing behavior in children.

Since these early studies, there have been a number of others conducted in recent years that have also provided support for the use of PA specifically to improve time-on-task among elementary school children. Increased engagement, often measured by time-on-task, is also logically linked to academic achievement (Shapiro, 2011), which could partially explain the relationship between improved cognition resulting from PA and the improved academic achievement that has been associated with increased levels of PA; it may be the case that improvements in cognition result in increased engagement which then positively impacts achievement. Further research is needed in order to understand the processes involved in this group of findings.

Several studies involving elementary students have demonstrated a positive effect of PA on engagement in the classroom. One study showing improvements in this area among third graders involved MVPA as part of physically active classroom lessons (the Texas I-CAN! program; Grieco et al., 2009). While the students of higher BMI categories had lower rates of time-on-task following inactive lessons, there were no significant differences in rates between groups after the active lessons (Grieco et al., 2009). In another study among four classes of third and fourth grade students, higher time-on-task rates were found overall following PA, with the greatest benefits derived by students who had the lowest rates before the intervention (Mahar et al., 2006). Nicholson and colleagues (2011) found that with four third-grade boys with autism spectrum diagnoses who participated in a brief jogging intervention, each showed a significantly higher academic engaged time within an hour of PA (Nicholson et al., 2011). Yet another study demonstrated that the effects of one 10-minute break for PA resulted in improved time-on-task among third graders for at least 45 minutes following the active break (Maykel et al., 2018). This research supports the use of

brief breaks for PA in the classroom to improve engagement for all students, particularly those who might typically have the most difficulty in this area, and that the benefits are likely to far outweigh the time taken away from class lessons. More research is needed in this area, however, and particularly in order to determine potential effects on very young children.

Mental Health Benefits

The mental health benefits of PA are compelling. There is substantial evidence to support that regularly engaging in MVPA reduces trait anxiety, or persistent characteristic anxiety among those with and without a diagnosed anxiety disorder (PAGAC, 2018). Further, immediate feelings of anxiety, also referred to as state anxiety, are reduced following individual episodes of MVPA (PAGAC, 2018). MVPA has also been shown to reduce the risk for developing major depression, and to reduce the symptoms of depression among individuals both with and without clinical levels of depression (PAGAC, 2018). In addition to these reductions in negative symptoms, individuals who engage in more MVPA have reported improved overall quality of life (PAGAC, 2018).

Research that pertains specifically to children indicates that six- to seventeen-year-olds who engaged in higher levels of PA were also found to have fewer symptoms of depression (PAGAC, 2018). A meta-analysis conducted by Ahn and Fedewa (2011) also found increased PA to be associated with reductions in symptoms of depression, anxiety and other forms of emotional distress in children and adolescents. Similar outcomes were noted for children of typical weight, as well as those classified as overweight or obese, and the results were consistent with prior research indicating that more vigorous PA yielded greater results (Ahn & Fedewa, 2011).

Discussion & Implications for Future Research

Research questions related to the role that PA plays on physical, cognitive, and mental health functioning in preschoolers remain largely unanswered due to a lack of quality research with children

in this age group. A 2019 meta-analysis of PA interventions across childhood found no intervention nor observational studies that were completed with preschool-aged children (Rodriguez-Allyon et al., 2019.) Therefore, we are forced to extrapolate from research conducted with adults, adolescents and older children, while suspecting that there are unique differences between groups that should be taken into consideration. Further, given that movement related behaviors begin in early childhood and track into later childhood and adulthood (Biddle et al., 2010), it will be important to conduct research specifically with young children to learn how best to intervene early in life.

Intentional, adult-led physical activities have proven to be an important component in the overall amount of MVPA that young children engage in at childcare centers (Bower et al., 2008). Childcare providers should be educated on the guidelines for preschooler physical activity, as well as on the importance of making an intentional effort to meet these guidelines (Lanigan, 2014). There is also considerable evidence to support that sedentary behaviors, eating habits and food choices, and habits related to PA begin at home. Best practice puts forth that a child's stakeholders (school, family, community) should partner across settings (Lines et al., 2011), as programs that include both educators and families are likely to see the greatest results among young children.

School-based PA programs have shown an increase in popularity with the number of studies used in systematic reviews more than doubling from the 1980s to the 1990s, and from there, four times as many articles in the 2000s (Demetriou & Höner, 2012). Programs and practices that involve integrating PA into regular classroom routines can be beneficial to cognition, engagement and achievement, while also simply increasing the amount of PA that children are involved in each day. It is prudent to review the existing literature on physical activity in preschool to inform future research, practice and policy.

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