



Excess Body Weight and Physical Education: Opportunities are at Hand

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Abstract: Childhood overweight and obesity concerns continue to frame much of the discussion about physical activity in schools and school-based physical education. There are multiple factors impacting childhood obesity rates. Genetics, ethnicity, guardian education level, health-care access, food costs, cultural beliefs, policy, and energy-balance inequalities have all played a role in the current state of childhood overweight and obesity. Since schools are an ideal place to interact with children and adolescents of all body compositions, multiple researchers have attempted to design, implement, and evaluate school-based physical activity interventions. Many of the interventions have produced significant results. Overweight and obesity is not physical education's problem, but it does present an opportunity for physical education to grow as an academic discipline as new interventions and curricula are developed and disseminated. This article focused on the large-scale, school-based, physical activity interventions that needs to be designed, implemented, and evaluated using rigorous standards and policymaker and educational community support.

Keywords: Physical Activity Interventions, Physical Education, Overweight, Obesity

About the Author

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overweight 80% of the time and obese 45% of the time. The most significant increase in overweight Americans during the past 30 years were in African American women, of whom 82% were overweight in 2018. Furthermore, one of the most alarming statistics is found in the increase of extreme obesity (BMI equal to or greater than 40 kg/m²) in African American women. In 2018, 17.8% of African American women had BMIs greater than or equal to 40 kg/m².

1. Introduction

The United States continues to face an evolving health care crisis as overweight and obesity rates have increased by approximately 40% in the last 20 years (Hales *et al.*, 2020). Obesity is one of the most serious health problems the U.S. is facing, and the problem is not improving. Using a body mass index (BMI) of 25 kg/m² or greater, more than 74% of Americans ages 20 and over are overweight or obese (Fryar *et al.*, 2020).

Fryar *et al.*, 2020 state the problem is even greater for various geographical regions of the United States and within ethnic minority populations. In 2018, 76% of African Americans were overweight, while 48% were obese. Hispanic Americans were

One of the reasons for the staggering increase in obesity over the past 30 years is that many adults are becoming obese during their childhood years. Anderson and Butcher claim that 52% of children who are obese between ages 3-6 are obese at age 25, compared to 12% for normal weight 3- to 6-year-olds. Fryar, Carroll, and Afful estimate that 41.5% of children and adolescents ages 2-19 are overweight. The number of obese 2- to 5-year-olds increased from 5% in 1980 to 13.4% in 2018. Additionally, the number of obese 6- to 11-year-olds increased from 6.5% to 20.3% and the number of obese 12- to 19-year-olds increased from 5% to 21.2% in the same time frame (Anderson & Butcher 2006; Fryar *et al.*, 2020).



2. Defining Obesity Using BMI

One of the primary measurements used to define obesity has been BMI. BMI is a person's weight (in kilograms) divided by height (in meters) squared. The quantifying number that is used to define overweight and obese individuals is set by the Centers for Disease Control and Prevention (CDC). For adults 20 years or older, a BMI greater than or equal to 25 kg/m² is considered overweight and a BMI greater than or equal to 30 kg/m² is considered obese (Mozlin 2005).

The use of BMI to define childhood obesity is controversial because children are still growing. As a result, the link between obesity and the correlation of a child's weight to height is not always clear. In particular, fat mass increases from 14% of body weight at birth to approximately 25% at the age of 6 months. Fat mass then decreases until the age of 6-7 years and does not rise again until puberty. Race, gender, and other genetic factors can affect when children go in and out of puberty. Therefore, it is difficult to always classify a normal or acceptable BMI for children (Maffeis, *et al.*, 1999).

While the numbers vary more for children than adults, the International Obesity Task Force has stated that BMI offers "a reasonable measure with which to assess levels of excess body fat in children and adolescents" (Fryar *et al.*, 2020). The CDC established growth charts in 2000, which were recommended by the Committee on Clinical Guidelines to define overweight children. A BMI above the 85th percentile for a child's age and gender group is considered to be at risk of being overweight, while a BMI above the 95th percentile is considered at risk of being obese (Ogden, *et al.*, 2002). For example, a 10-year-old male with a BMI of 21 kg/m² would be between the 85th and 95th percentile and be considered at risk of being overweight. The same male with a BMI of 23 kg/m² would be above the 95th percentile and be considered at risk for obesity (Centers for Disease Control and Prevention 2011a).

3. Genetics and Obesity

Maffeis, *et al.*, (1999) identifies two primary causes of childhood obesity. One factor includes a person's genetic make-up. It is widely accepted that genetics can greatly affect an individual's predisposition to be overweight or obese (Loos, *et al.*, 2003; Mutch, *et al.*, 2006) However, rising obesity rates among genetically stable populations around the

world signify that environmental factors have had the greatest effect. Regardless, genetics and its effect on obesity has become a major emphasis of study, as it is an important consideration in the overall treatment and prevention of obesity and other serious diseases. More importantly, a person's body weight is regulated by many physiological factors that maintain a precise balance between energy intake and energy expenditure. Therefore, any genetic factor that raises energy intake and lowers energy expenditure, regardless of how small, can have a significant impact on bodyweight over time (Ebbeling, *et al.*, 2022).

During the past 20 years there have been technological developments that have allowed researchers to better understand the biochemistry of obesity. A clearer understanding of genetics and how it is associated with environmental factors has been critical in the overall regulation and treatment of overweight and obesity. For example, technologies used in the past 15 years have identified a rare, single dysfunctional gene that almost always leads to severe cases of obesity and metabolic syndrome. While the single gene is rare, it is a departure from a previous belief that obesity could only come from numerous genes that made minimal contributions in determining phenotype. Advances in molecular biology have spawned many new studies and new theories concerning genetics and obesity (Mutch, *et al.*, 2006).

Linkage studies have shown an association between multiple chromosomes and obese people, which could be important in early identification and treatment (Maffeis, *et al.*, 1999). In addition to chromosomes, a focus on gestational weight gain has been at the forefront of studies dealing with genetics and obesity. Whitaker and Dietz hypothesized that prenatal obesity and over-nutrition by mothers can have lifelong effects on their children (Whitaker, *et al.*, 1998). The hypothesis, which has been supported through in-depth studies, reveals that maternal obesity increases the amount of nutrients that are transferred to the unborn child. This induces permanent changes in appetite, and energy metabolism and can lead to weight problems for the remainder of a child's life (Ebbeling, *et al.*, 2022).

Furthermore, lifestyle choices and environmental factors are important determinants when calculating a person's BMI. However, there is a "synergistic relationship between genes and environment" when it comes to determining who is obese. As societies have evolved from traditional, restrictive lifestyles into industrialized nations, most

people have shown a gain in weight. However, those with a strong genetic predisposition for obesity will gain the most weight, while those with genes that resist obesity will gain very little if any weight at all. An example of the gene-environment interaction can be seen in a population such as the Pima Indians. Pima Indians living in the remote Sierra Madre Mountains of Mexico have a much lower rate of obesity and type 2 diabetes compared to those living in the "obesogenic" environment of Arizona in the southwestern part of the United States (Loos, *et al.*, 2003).

4. Dietary Changes and Caloric Imbalance

Obesity is a complex disease that includes genetic, metabolic and behavioral determinants (Hill, *et al.*, 1998). A person's susceptibility to being overweight has always been largely dependent on genetic factors inherited from biological parents. However, genetic factors that have always existed do not begin to explain the significant increases in childhood obesity over the past 30 years.

The simplified biologic explanation for why children are heavier now than in the past is due to a significant imbalance in caloric intake and energy expenditure (Nestle, *et al.*, 2000). Maintaining stable weight is a delicate balance between caloric intake and energy expenditure. Young children under the age of six appear to have an innate ability to easily maintain this balance. As children grow up, they steadily lose the ability to crave food only when energy is needed. When children enter puberty and adolescence, they begin to take external cues with regards to food and do not base hunger on energy needs (Anderson & Butcher 2006).

When investigating dietary changes for children in the past 20 years, there are several recurring trends that explain why children are consuming more calories, as well as an abundance of calories from less nutritional foods. The 1998 Continuing Survey of Food Intakes by Individuals (CSFII), which was conducted by the United States Department of Agriculture (USDA), reports that the intake of chips, crackers, popcorn and pretzels tripled from the mid-1970s to the mid-1990s. The second significant trend has been the increasing consumption of soft drinks, which roughly doubled during the 1980s and 1990s. It is estimated that the increase in energy due to soft drink consumption is equivalent to eight minutes of walking for an adult. The caloric intake of soft drinks alone accounted for the total time that the

U.S. Department of Transportation estimated children spent in active travel time to and from school on a daily basis in 2001. Lastly, the CSFII survey claims that the increase in carbohydrates was significant in the last twenty years. While the fat intake of children ages 6-11 decreased by approximately 100 kilocalories, their carbohydrate intake increased between 150-200 kilocalories (Strum, 2005).

The USDA states that children are heavy consumers of soft drinks and estimates that 56%-85% consume soda on any given day. Teenage males are the heaviest consumers with over a third drinking more than three servings a day. Of course, sugar is not the only factor affecting obesity in children. Children are consuming too many calories from fat. For example, less than one-third of females aged 14-18 met the federally recommended guidelines of consuming less than 30% of kilocalories from fat. Other age groups, such as 9- to 13-year-old males, are even worse, as only 14% of this group met the total fat recommendation. Minority and lower socio-economic children often have some of the worst diets of all children. For instance, only 7% of African American children limit their total intake of fat to 30% or less of food energy and 5% limit their saturated fat intake to 10% of food energy (Butte, *et al.*, 2007).

There is little debate that another primary reason children are heavier today is due to the access, commercialization, and ease of foods at restaurants, fast food establishments and convenience stores. Americans spend about half of their food budget and consume approximately one third of their daily energy on meals and drinks consumed outside the home. There are more than 170,000 fast food restaurants and 3 million soft drink machines to ensure that one is near just about every business, school. Or hospital in the United States (Nestle, *et al.*, 2000). Fast food chains have become so successful that they now make up 40% of all retail sales. This in turn has created a homogenous food supply that is not only high in fat and sugar but is quick and convenient too (Schlosser, *et al.*, 2001). Fast food consumption is contributing to greater energy intake because of its lack of nutritional value.

The rise in consumption of fast food has culminated into a national health crisis that appears to only be getting worse. Part of the economic success of fast food is that it has provided convenience for faster paced Americans and dual income families. French, Story, and Jeffery point out that only 21% of American women were in the workforce in 1900. During that

time, women spent an average of 44 hours a week preparing meals (French, *et al.*, 2001). By 1950 the number of women in the workforce had increased to 29% and the average woman spent less than 20 hours a week preparing meals. This change in lifestyle has impacted how Americans eat. In 1999, 70% of married women with children under 18 were in the work force and spent less than 10 hours per week preparing meals and doing. Americans have become so addicted to fast food that the average person eats three hamburgers a week and four servings of French fries. Fast food has become a way of life for many American children.

5. Family and Rising Food Costs

Dining out in a fast-food nation is part of the reason why children continue to get heavier every year. However, fast food may be a secondary cause compared to family and community eating and grocery shopping habits. Data suggest that family and community may have the greatest impact on a child's food consumption (Ricciuto, *et al.*, 2006). The USDA's CSFII indicates that adolescents eat 68% of their meals and 78% of their snacks at home (Story, *et al.*, 2002). Food choices and food availability in the home are most likely determined by parents/guardians. Household income and parent/guardian education level can have a significant impact on the foods that families purchase. Families with college educated parents/guardians purchase and consume more fruits and vegetables than those without college degrees (Ricciuto, *et al.*, 2006). Conversely, lower income families who do not have college degrees are more likely to eat greater amounts of potatoes, processed meat products, visible fats, soft drinks, sugar, full-fat dairy products, chips, white bread, and sugar (Deshmukh-Taskar, *et al.*, 2007).

6. Effects of Race and Community

In addition to a family's education and household income, a person's community can have a significant impact on how one perceives and actually participates in healthful eating. Researchers at the University of Colorado conducted a study in 2004 that found the most predominant factor affecting a child's diet is the neighborhood where he/she is raised. The research revealed that neighborhoods consisting of high percentages of African American residents were much more likely to "exhibit a high prevalence of obesity" (Boardman, *et al.*, 2005). The significant relationship between race and place can be explained

in part by the access to healthcare. In general, lower socio-economic status (SES) neighborhoods, which often contain African American and Hispanic residents, have a poor healthcare infrastructure. In many lower SES neighborhoods, there is little thought about preventive healthcare such as healthy eating. In most instances, residents in lower SES neighborhoods do not have affordable access to healthcare and often do not establish a relationship with a doctor until something serious occurs that forces them to a hospital. Many children growing up in lower SES neighborhoods are exposed to greater dependencies on drugs, alcohol, and tobacco which lead to behavioral traits that translate into less concern about one's future health. Overall, children from low SES neighborhoods have a greater chance of developing diseases, due to poor dietary choices and a general lack of value for health care (Boardman, *et al.*, 2005).

It is important to understand basic cultural differences when examining food consumption habits. Many African American and Hispanic women prefer larger body sizes, which may in turn affect one's motivation to eat healthy. The acceptance of elevated weight among Hispanic and African American individuals often decreases the perceived dangers of obesity. For example, a study of undergraduate female college students recently revealed that compared to Caucasians, African American females reported higher body masses and higher desired body masses. Many responded that this is what they felt males desired and were attracted to in a partner. Furthering the evidence of this cultural perception, the above data did not hold true when an African American female spent most of her life in a predominantly Caucasian setting (Boardman, *et al.*, 2005). Many of these cultural beliefs are learned early in life and often lead to less healthier eating and exercising habits as teenagers.

Culturally preferred foods can also be to blame for increased obesity rates within the African American and Hispanic populations. Food types coupled with the cultural perceptions as previously mentioned may lead to an increased BMI. Although the traditional, African American, high calorie diet was a way to sustain people performing heavy physical labor, it now produces too many calories for the average African American leading a sedentary lifestyle. The traditional African American diet is high in saturated fats, calories, and protein. It has typically included pork, chicken, beef, and vegetables/potatoes seasoned with meat fats (Airhihenbuwa *et al.*, 1996).

Studies have also indicated that minority children consume unhealthy food more frequently and in greater quantities (Delva, *et al.*, 2007; Hastert *et al.*, 2005). UCLA's Center for Health Policy Research found that African American adolescents in California consume twice as much soda as Caucasians, while Latino adolescents consume 50% more than Caucasians. More than half of the African Americans, Latinos, and Asians surveyed consumed fast food on a daily basis compared to 38% of Caucasians. African American females reported having greater fat consumption while eating fast food than that of Caucasians. Consequently, the faster food the 2 million surveyed 12- to 17-year-olds ate, the less likely they were to consume at least 5 servings of fruits and vegetables per day (Hastert *et al.*, 2005).

The Department of Health and Human Services reported that most adults and a large percentage of youth fail to meet public health guidelines for physical activity (U.S. Department of Health and Human Services, 1996). Among U.S. adults, physical activity is lower in African Americans than Caucasians. The same trend exists among high school students, in which 31.9% of African American students met current guidelines for participating in moderate physical activity, compared to 42.6% of Caucasian students (Eaton *et al.*, 2012). Dowda *et al.*, (2004) found that one of the reasons for this trend was that African American females reported to participate in fewer leisure time activities than Caucasian females. Their research revealed that African American females had significantly less sports equipment in their home and that a large proportion of the females did not feel safe walking in their neighborhoods. Additionally, they found that African American females had lower self-efficacy and attitudes regarding physical activity.

Finally, obesity and its relationship to race is complex and difficult to explain. Some researchers suggest that physical inactivity is more a product of social class and education levels than race. Marshall *et al.*, (2007) found in a study involving over 11,000 adults, that the education level of individuals was the primary factor in determining the amount of time spent performing sedentary activities. More specifically, they discovered that racial/ethnic groups within the same education level had similar levels of inactivity. Race appeared to only be a factor because of the higher percentage of minorities who had had lower paying jobs and less education.

7. Sedentary Lifestyles

The USDA found in a study, that included 980 children, that 43% of 12- to 17-year-olds participated in moderate exercise on a daily basis and 20% exercised vigorously once a week (Butte, *et al.*, 2007). This is particularly dangerous because many children are nowhere near meeting the federally recommended 60 minutes of daily exercise (Council on Sports Medicine and Fitness and Council on School Health, 2006). Children have become much more sedentary as they spend greater numbers of hours watching television, playing video games and using computers. In 1965, the average American spent approximately 10.4 hours a week watching television. By 1985 that number had increased to 15.1 hours per week (French, *et al.*, 2001). Viner and Cole (2005) estimate that children today spend nearly double the time in sedentary activities as they watch an average of 2.5 hours of television a day and a total of 5 to 6 hours a day watching television and using a computer. Additional cross-sectional studies have revealed that children ages 9-12 spend 3.4-4.4 hours daily watching television and 2.4-3.0 hours using a computer. Time spent on both activities varied depending on if it was being recorded on a weekday or weekend. The study also found that the same children spent an average of 7 hours a day performing sedentary activities including watching television, using a computer or video game, doing homework and taking naps (Arluk *et al.*, 2003). Children spend more time watching television, playing video games and using a computer than anything else except sleeping (Fitzgibbon & Stolley 2004). The problem worsens as television viewing is thought to promote weight gain not only by replacing physical activity but by increasing food intake as well. Children appear to consume greater amounts of high calorie foods while watching television. This could be partly due to food advertisement, in which U.S. children view about 10 advertisements per hour of television exposure (Ebbeling, *et al.*, 2022).

The average child spends much more time inside engaged in sedentary activities than ever before. Hu *et al.*, (2003) found in cross-sectional and longitudinal studies that viewing 4 or more hours of TV a day has a positive relationship with higher BMIs in children. While this relationship has been downplayed in other studies, they all conclude that increased sedentary behaviors along with a mother's BMI and eating habits are the main affects that can predict childhood obesity (Arluk *et al.*, 2003).

8. Health Concerns Associated with Childhood Obesity

The close association of obesity to chronic disease will continue to place a major strain on the U.S. health-care system. It is estimated that 300,000 deaths a year or 1,000 deaths a day can be attributed to poor eating and lack of physical activity. This is only second to smoking as a leading cause of death in the U.S. (Hill, *et al.*, 1998). Children who become obese are at risk of being overweight or obese throughout their adult lives. It is rare that an obese child does not become an obese adult (Goran, 2001). Obese children add new fat cells and have up to five times more fat cells than children who maintain normal weight. Unfortunately for children, the number of cells cannot be decreased, and weight loss can only happen if drastic measures to reduce fat cells are taken. For most obese children, this makes it nearly impossible for them to maintain normal weights throughout adulthood (Goran, 2001).

Obese children face many significant health problems, including serious orthopedic conditions. Doctors continue to report an increase in the number of children who develop Blount's Disease, which is an outward bowing of the tibia and femur bones due to constant downward pressure of excessive weight. This condition increases high joint pressure, which over years can create major orthopedic complications, such as herniated discs, chronic back pain, and osteoarthritis (Mozlin 2005).

One of the greatest health concerns associated with the childhood obesity epidemic is the rise in metabolic syndrome. While the exact definition of what constitutes metabolic syndrome for children is debated in the health community, it is generally associated with a constellation of risk factors including, obesity, impaired glucose metabolism, high blood pressure, and elevated lipids in the blood that can lead to cardiovascular disease (De Ferranti 2007).

One of the primary risk factors affecting overweight children is an inability to balance glucose, thus being insulin resistant (known as Insulin Resistance Syndrome). As documented in the Bogalusa Heart study, which involved more than 9,100 children ages 5-17, an overweight child was 12.6 times more likely to be insulin resistant than children of normal weight (Freedman *et al.*, 1999).

The rate of diabetes has increased across all ages by 45% since 1987. Ninety to 95% of the 20.8 million cases of diabetes in the United States are

classified as type II diabetes, which until recently has been considered an adult-onset condition. While increased age is still a primary risk factor in developing type II diabetes, obesity has been cited as the primary reason for the dramatic rise in cases for both adults and children. The number of pediatric diabetes cases is an important area of study because about 215,000 children and adolescents have diabetes in the U.S. (Centers for Disease Control and Prevention, 2011b).

Hypertension is another serious cardiac risk factor that has increased along with the childhood obesity rate. Freedman *et al.*, (1999) found in the Bogalusa Heart Study that overweight children were 4.5 times as likely to have high systolic blood pressure. More importantly, hypertension in children has long been undetected and under-diagnosed because the maturation process makes it difficult to measure and many doctors do not always suspect such problems in young patients. The obesity-hypertension relationship is alarming because of the propensity for it to lead to cardiovascular disease and premature death. Furthermore, research indicates that childhood hypertension can have long lasting health effects, even if one is not overweight or hypertensive as an adult (Freedman *et al.*, 1999).

Finally, many health-care providers are increasingly concerned about the growing number of overweight and obese children being diagnosed with hyperlipidemia (i.e., high blood cholesterol and/or triglycerides). Overweight children are at greater risk for this condition and a propensity to have high cholesterol. In a study involving 2,096 participants with a mean age of 9.03 years, researchers found that there was a relationship between elevated cholesterol levels,

Low-density lipoproteins (LDLs), and increased BMIs ($p = 0.000$ and $p = 0.012$, respectively). There is strong evidence that elevated levels of total cholesterol and LDLs lead to heart attacks and strokes. While these potentially life ending problems do not typically happen in young people, it is believed that the pathological basis for these conditions begins early in childhood (Derinoz, 2007).

Metabolic syndrome, insulin resistance, and orthopedic complications are only part of the overall health problems associated with obesity. Yeater states that other physical and psychological conditions, such as gallstones, sleep apnea, colon cancer, depression, and low self-esteem have been on the rise and taking a toll on overweight children (Yeater (2000). Mozlin

(2005) found that 28.7% of overweight adolescents were diagnosed with metabolic syndrome, in which they had 3 of 5 risk factors for cardiovascular disease. Over 50% of overweight children had at least 2 of the 5 risk factors.

9. Prevention and Treatment

Prevention and treatment of obesity ultimately require eating less and exercising more. This sounds like a relatively simple solution to the problem but has proven to be difficult to achieve over long periods of time. Recent studies by the U.S. National Institutes of Health claim that adults can expect to lose 10% of their overall weight while participating in weight loss programs. This is a relatively small amount compared to the excessive rates of obesity. Moreover, most adults can expect to regain at least half of the lost weight within the first five years of starting a weight loss regimen. The problem is even more complicated for children as they have less maturity and face more constant peer pressure. For this reason, most children do not participate in traditional, adult weight loss programs. Most children are dependent on family and school-based approaches, as well as a growing trend in pharmacological and surgical treatments (Ebbeling, *et al.*, 2002).

There are many studies and approaches being sought in the medical and psychological arenas to prevent and cure the obesity epidemic. However, a logical solution for many parents, doctors, and government officials is to involve schools in preventing the current trend in childhood obesity. Children spend a large proportion of their waking hours in more than 98,800 schools in the U.S. (Chen, 2011). Because of this, federal, state, and local governments and school boards have begun to implement new policies with regards to school lunch programs, vending machines, and physical education courses.

10. Public Policy and Physical Education

At the beginning of the 2011-2012 school year, there was currently only one federal mandate related to physical education. The mandate, which was part of the Child Nutrition and WIC Reauthorization Act of 2004, requires school districts to create a wellness plan that promotes healthy eating and more physical activity for all students. The measure has prompted thousands of school districts to take a closer and more proactive role in dealing with childhood obesity. However, unlike the federal No Child Left Behind Act (NCLB) of 2001, the wellness mandate is not carefully

monitored and provides few provisions for any type of sanctions. There is little federal enforcement of the mandate, and the Congressional measure does not call for any specific nutritional programs schools must implement or what types of food they can serve. Furthermore, the act does not require mandatory physical education or data collection of an individual student's activity level at school (Buchanan, 2005).

There is no current federal legislation that requires students to take physical education in school (National Association for Sport and Physical Education & American Heart Association, 2010). Consequently, the CDC's 2001 Youth Risk Behavior Surveillance System (YRBSS) found that nearly half (45%) of children in grades 9-12 did not participate in team sports or in a physical education class. Even more significant is that after the ninth grade, the number of students enrolled in physical education drops from 74% to 31% for grade 12 (Strum, 2005). The amount of time a student is required to attend physical education is left up to each individual state. The Shape of the Nation Report found that 84% of states mandated physical education for elementary school students, 78% required it for middle school students, and 90% for high school students. However, only three states mandated the recommended 150 minutes of physical education per week for elementary school children and only three states mandated the recommended 225 minutes of physical education per week for middle and high school students (Buchanan, 2005; National Association for Sport and Physical Education & American Heart Association, 2010).

Many advocates, with one being NASPE, have praised the hundreds of millions of dollars in grants that have been provided through NCLB. However, advocates for increasing physical education standards believe NCLB has had an overall negative impact on physical education programs. NCLB defines core academic subjects as English, reading, language arts, mathematics, science, foreign languages, civics, government, economics, arts, history and geography. Advocates believe NCLB has unintentionally created a situation where "non-core" subjects, such as physical education are being left behind in standards and funding (Cook, 2005). Under current federal legislation, no school is required to assess students in physical education classes nor are they required to have "highly qualified" teachers in the physical education classroom. Conversely, every school is required to assess students in core subject areas and ensure there are "highly qualified" teachers that have

been extensively trained in their subject area(s). Schools at all grade levels are highly motivated to prepare students for core subject assessments as school funding and reputations are at stake. As a result, schools place more resources in "core" areas by providing smaller teacher-to-student ratios, tutoring, and remediation, all which take more time and money away from "non-core" subjects like physical education.

It is unclear if physical education will be incorporated into NCLB requirements through the bill's reauthorization. There are many legislators and advocacy groups that are working to make this happen, but it is uncertain where federal policy is headed. For now, legislation regarding physical education standards has been left to each state. State legislators have been busy for the last several years taking a stance on obesity and physical education classes have been at the heart of the debate. As of 2010, there have been over 100 state-level bills proposed across U.S. that require more stringent physical education standards. Many of the bills being proposed have to do with increasing state standards to match national standards (National Association for Sport and Physical Education & American Heart Association. (2010).

11. Current Activity Levels in Physical Education Classes

There have been numerous reports to suggest that students spend relatively small amounts of time in physical education class engaged in moderate or vigorous physical activity (Lacy, *et al.*, 1991; Simons-Morton, *et al.*, 1993; Wang, 2005). McKenzie, Marshall, Sallis, and Conway state that there has been little research done in the area of student engagement in physical activity in middle school physical education (McKenzie, *et al.*, 2000). They found in a study of 126 teachers in 24 schools that middle school boys were more active than girls in physical education class. The study also found that fitness-based lessons, including dance, aerobics, and running produced the greatest amount of physical activity for all students. Daily physical education produced a weekly total of 25 minutes of vigorous physical activity and 83 minutes of moderate-to-vigorous physical activity for the average middle school student.

In a large study conducted in 335 Texas elementary schools, researchers found that after dressing out and taking roll, 86% of the class time remained for student involvement in physical activity. Students spent 8.6% of the time in moderate-to-

vigorous physical activity and 68.1% of the time in a sedentary state (Simons-Morton, *et al.*, 1993).

Wang, Pereira, and Mota 2005 found that students 12 years of age were engaged in moderate physical activity for 27.9 minutes and 15.7 minutes in vigorous physical in 90-minute classes. Students in a 45-minute class spent an average of 14.4 minutes in moderate physical activity and 6.7 minutes in vigorous physical activity. Students averaged 43.3 minutes of moderate physical activity in a week and 23.4 minutes of vigorous physical activity. An average of 31% of the time was used for changing clothes, taking attendance, and getting ready for physical activities.

Multiple studies indicate that students spend anywhere from 50-68% of physical education class time in a sedentary state (Simons-Morton, *et al.*, (1993); McKenzie, *et al.*, 2000). Given this fact and knowledge that students receive minimal absolute minutes in PE per week due to a multitude of previously stated reasons, PE scholars, researchers and curriculum specialists have been working to remedy the problem.

12. Methods of Teaching Physical Education

Healthy People 2010, which was produced by the U.S. Department of Health and

Human Services (2000a) in recommended that physical education classes spend at least 50% of class time engaged in moderate-to-vigorous physical activities. Furthermore, the *School Health Index* recommended that all elementary school students receive 150 minutes and middle and high school students receive 225 minutes of structured physical education per week (Health and Human Services 2000b). Around the same time these two reports were published, the amount of published research on school-based physical activity interventions was increasing. Yet today, a majority of physical education programs continue to take a traditional multi-activity approach to teaching physical education. The traditional method is comprised primarily of team-oriented sports such as basketball, soccer, volleyball, and flag football (Cook, 2005; Ennis 1996). The traditional curriculum teaches students the appropriate skills and rules to popular sports followed with guided practice and games (Lowry *et al.*, 2001). Usually, students will spend one to two class periods watching the teacher demonstrate the skills of the game followed with guided practice. Students are then

divided into teams, provided equipment, and instructed to play the game for several days or weeks. Often students will conclude a unit with a written or physical assessment to determine if they have learned the necessary skills and rules for the game (Mohr, 2006).

Popular team sports have been used in traditional multi-activity physical education for decades because the sports are popular within American culture. Professional team sports and the athletes that compete professionally are highly regarded in American culture, which is why many physical educators try to emulate such activities (Tannehill, 1993). Additionally, a multi-activity approach is taken with the idea that students will eventually find a sport they are good at and will be interested in playing later in life (Mohr, *et al.*, 2006).

As an attempt to improve physical activity time, fitness levels, health-related knowledge, and body composition in school-based PE students, there has been a gradual growth in the number of school-based physical activity interventions designed, implemented, and evaluated in the literature over the last 20 years. Sports, Play, and Active Recreation for Kids (SPARK) (Sallis, *et al.*, 1997), Child and Adolescent Trial for Cardiovascular Health (CATCH) (Luepker, *et al.*, 1996), *Science, PE, & Me!* (Ennis, *et al.*, 2012), Cardiovascular Health in Children and Youth Study (CHIC II) (McMurray, *et al.*, 2002) Class of 1989 Study (Kelder, *et al.*, 1993), Middle School Physical Activity and Nutrition (M-SPAN) (Sallis, *et al.*, 2003), Trial for Adolescent Activity Girls (TAAG) (McKenzie, Planet Health (Gortmaker, *et al.*, 1999), Active Winners (Pate, *et al.*, 2003) Project FAB (Jamner, *et al.*, 2004) New Moves (Neumark-Sztainer *et al.*, 2003), and Lifestyle Education for Activity Program (LEAP) (Dishman, *et al.*, 2004) are interventions that suggest that physical education programs and schools can have a positive impact on students given the current marginalized state of PE. It is the interventions, like the ones above, that provide research evidence that physical education and physical activity belongs in schools. These evidences provide valuable information to policy-makers, administrators, physical education teacher education programs, and current PE teachers, that given appropriate professional development, a well-developed PE curriculum/intervention, administrator support, and teacher resources, that school-based physical activity interventions can and will have a significant impact on students.

13. Conclusions

At this time, given the current status of overweight, obesity, and school-based PE in the United States, PE is neither the solution nor the problem. As alluded to earlier, there are several factors affecting overweight and obesity rates. Many of the factors are loosely connected, if at all, to school-based PE. However, school-based PE programs continue to be presented with an opportunity. Not an opportunity to solve America's overweight and/or obesity problem, but an opportunity to move away from the margins of education.

Even with the work that has been done to date, additional large-scale, school-based PA interventions need to be developed, implemented, and evaluated. Policymakers, PE teachers, and administrators need to be a part of the intervention-design process from the beginning. Current and new school-based PA interventions need to evaluate implementation fidelity, as little fidelity data have been collected on PA interventions to date. Physical education teacher education programs need to disseminate intervention results to pre-service teachers before they become teaching professionals.

Most trends related to education display slow increases or decreases over time. Any PE-related trend (i.e., decrease in instructional time, decrease in PA time, overweight/obesity) deemed necessary of change will be as slow to change as the initial trend. As PE faces this opportunity, will the opportunity present itself long enough for PE to begin to change the negative trends?.

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Yes

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