

School environment and its effects on physical activity

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Abstract:

School is an environment where children and adolescents spend most of their time during the day. The environment is characterized by a sedentary culture necessary for academic learning. In this article, I present research evidence showing the effects of four physical activity opportunities in this environment: school athletics, recess, classroom physical activity breaks, and physical education. Based on an analysis of research evidence on the four opportunities, I propose that the efforts to promote the opportunities should be coordinated into a concerted action to integrate a physical activity-friendly culture in the sedentary environment. Using an example of China's whole-school physical activity promotion strategy, I identify four areas for us to continue to work on: legislature-based policies, physical education as core content, creation and maintenance of physical activity traditions in schools, and integration of physical activity-friendly culture into the sedentary school environment.

Keywords: physical education | school culture | physical activity in schools

Article:

School is an environment where children and adolescents spend most of their time during the day. Because schools bear the responsibility of academic education and because it is a place where professional adults educate the young, the environment is different from any other built for work or social gatherings. In this article, I define the school environment literally, which is the physical and social space within the physical boundary of a school where students spend their school day. I define physical activity behavior as tangible bodily movement with purposes of play, exercise, and learning physical skills that takes place with opportunities provided by schools.

I will focus on three aspects in relation to school environment and its impact on children's physical activity. First, I will reiterate the primary reason why the school environment is what it is by reviewing a few seminal scholarly works from educational research. Second, I will conduct

a concise summary of research on four physical activity opportunities and the effects of each on children's physical activity within and beyond each particular opportunity. Third, I will share my thoughts on creating a physical activity culture in schools using example programs in Chinese schools. Lastly, I will reflect on the evidence and examples and discuss their implications to integrate a physical activity-friendly culture in the sedentary environment. My goal is to assist with a better understanding of physical activity opportunities in an academic-focused institutional environment for us to promote a school physical activity culture that is appealing to the children *and* consistent with the academic mission of K-12 schools.

Academic Mission and the School Environment

K-12 schooling is crucial to the development of children. Any responsible society takes institutionalized education seriously. Although the purpose of K-12 education can be multifaceted and interpreted from different perspectives (see Goodlad & McMannon, 1997), a consensus is that school is a place for children to develop the "self" through learning knowledge and skills so that the "self" will be able to serve the public as productive citizens. The school environment is created to support the academic mission of education, which is for students to be successful in academics. In a study on mission statements with a sample of 100 elementary schools in Texas (50 high performing and 50 low performing schools), Slate, Jones, Wiesman, Alexander, and Saenz (2008) found 63% of the schools directly included "learning" or "academic success" in their mission statements. Despite variations, academic mission statements are central to all high performing schools regardless of size, demographics, and socioeconomic status (Slate et al., 2008). All stakeholders in institutionalized schooling, including administrators, teachers, parents, and students, are to be held accountable for accomplishing this mission.

Consistently, the physical environment of the school is designed, built, and maintained to support this mission and the social environment of the school is planned, nurtured, and controlled to make accomplishing the mission possible. In an extensive review of findings from studies on the impact of school environments for the Design Council of UK, Higgins, Hall, Wall, Woolner, and McCaughey (2005) concluded that the comfort level of furniture and equipment in the classroom enhances pupils' learning attainment and positive attitude toward learning, that comfortable furniture helps pupils stay on task, and that most children dislike standard furniture (due to causing back ache) and prefer ergonomic furniture (i.e., soft furnishings).

With the pedagogy emphasis changed from a teacher-centered approach to a student-centered approach, the physical environment has changed also to provide more ergonomic (i.e., comfortable) furniture for students to *sit* comfortably in classrooms. A study (Knight & Noyes, 1999) reported that the child-friendly chairs of ergonomic and comfort design principles improved children on-task behavior when sitting. Other extant evidence (see Higgins et al., 2005) seems to further suggest and reinforce the idea that academic success relies in part on providing children with a comfortable sedentary environment in the school. Educators in this academic subject area seem to have held a similar consensus for a long time. In instructional methods and student behavior management textbooks one can find that both arranging seating and keeping children in seats are critically important for them to learn in schools. Classroom

research has provided ample evidence that supports sitting-centered behavioral control strategies (see Marzano, 2003).

The sedentary physical environment is supported by a similarly sedentary social environment in schools that is also considered necessary for academic achievement. The cornerstone of the social environment is the belief that effective teacher-student and student-student interaction should support and reinforce the seat-based learning environment for academic achievement. This belief is shown clearly across all schools in classroom rules such as “Walk in the classroom and hallways,” “Listen to your teacher quietly,” “Stay in your seat all the time,” or “Ask permission before moving out of your seat.” Explicitly or implicitly, this belief has been accepted, endorsed, embraced, and promoted by education professionals, students, parents, and the public. Although teaching methods have changed from a teacher-centered “chalk and talk” approach to a much more student-centered problem-solving approach, the sedentary social interaction pattern in the classroom has not changed to a degree where students are encouraged to move freely in the classroom during class. Inevitably, the physical and social environment help create a sedentary school culture. Is this sedentary environment legitimately supportive to academic achievement? History of institutionalized education and the literature seem to have an affirmative answer.

However legitimate it is, the dominantly sedentary environment certainly is not built for physical activity (except the school gymnasium) and has brought negative consequences to the development of healthy lifestyles in children by severely limiting children’s in-school physical activity. For example, the National Association of Sport and Physical Education (NASPE) and American Heart Association (AHA) (2010) reported that since 2001, 44% of schools cut physical education instructional time, physical education time decreased 40 min per week on average, and recess time decreased by 50 min per week. These statistics could result from the sedentary culture of schooling. These reductions, in turn, further strengthen the sedentary school culture.

Physical Activity Opportunities in Schools

The sedentary school culture is a salient characteristic of institutionalized schooling. It is created and sustained for reasons endorsed and supported by professional educators, stakeholders in education, and the public. These reasons (e.g., for academic achievement) are legitimate and the sedentary school culture is needed, at least for now and the foreseeable future, to educate the young generations in the current institutionalized structure of education. As a parent, I acknowledge the merit of the sedentary school environment for the reasons it was created. In the meantime, I believe that we need to be creative in seeking and promoting in-school physical activity opportunities and maximize the potential of these opportunities. Research literature has identified four major opportunities in the school for students to engage in health-enhancing physical activities. These opportunities are school sports, recess, classroom breaks, and physical education.

Sports

School athletics, including both intra- and extramural sports, is one bright spot in school-based physical activity. Data from several primary sources (e.g., Centers for Disease Control and

Prevention [CDC], 2012; National Federation of State High School Associations [NFSHSA], 2012; U.S. Census Bureau, 2012) have shown consistently that 58% of children and adolescents participated in at least one sport activity or took some lessons. Data from the CDC and NFSHSA showed almost half of the high school student population is on at least one sport team in school. Survey data from the U.S. Census Bureau indicated that during the five decades from 1971 to 2011, high school girls' participation in school sports has increased from 5% relative to enrollment in 1971 to 40% in 2011, while boys' participation has stayed around 50%.

Most middle and high schools in the United States offer various athletic opportunities to students, which helps create a sport culture in schools. According to Lee, Burgeson, Fulton, and Spain (2007), about half (48%) of the nation's middle and high schools offer students intramural sports or clubs. Based on a national sample, Young et al. (2007) reported a higher percentage of middle schools (69%) that offer intramural sports and clubs. For extramural sports, a combined 83% of secondary (both middle and high) schools organize at least one sport team for competition, according to Young et al. (2007). Lee et al. (2007) separated middle and high school data and reported that 77% of middle schools and 91% of high schools offer at least one extramural sport to students. According to Lee et al., (2007) the sport offerings are broad and versatile from popular team sports (e.g., basketball, soccer, baseball/softball, football, volleyball) to individual sports (e.g., badminton, bowling, tennis, swimming, track and field, and wrestling).

School athletics provide opportunities and create an environment for students to participate in high intensity physical activities for relatively long periods of time (Leek et al., 2011). Effects of sport participation are substantial. Student participants can be active at moderate to vigorous intensity level for a prolonged time, which provides participants increased health benefits (Beets & Pitetti, 2005.). It has been documented as well that students who participate in school sports are more likely to develop positive self-esteem and confidence (Harrison & Narayan, 2003).

Sport is part of the school culture. It has profound influence on students' life in school and at home. Given that competition and winning is at the center of the sport culture, competition and sport skill development dominate many school sport programs, which makes it unlikely for school sport programs to appeal to and become accessible for all students. According to the American Alliance for Health, Physical Education, Recreation and Dance (2011), 65% of schools have some form of team-cut policies, which require participating students to meet minimum skill qualifications before they can participate. Although school sport has become a great physical activity opportunity for some students, the competitive sport culture has demonstrated limitations in promoting participation for all students (Lee et al., 2007). Many students, about 23 million, do not participate. These nonparticipants are probably the ones who need physical activity the most.

Recess

Recess is another opportunity for physical activity in school. It is a regularly scheduled, unstructured time during the school day for students to take a break from class work. But most states and schools do not have consistent policies about providing active recess to all students; only three states have strong laws on active recess (Slater, Nicholson, Chriqui, Turner, & Chaloupka, 2012). The current situation does not seem encouraging. Since 2001, 40% of United

States schools have eliminated or reduced recess time to make more time for academics. According to the Center for Public Education (2008), on average American children have lost 50 min recess time a week. A recess gap has been reported as showing that urban schools with high enrollment of students with minority ethnic or low socioeconomic backgrounds provide minimal or no recess to their students (Parsad & Lewis, 2006).

Due to lack of surveillance programs, the overall effects of recess on children's physical activity remain unknown. Limited data, however, show positive effects of recess on children's physical activity time and amount, especially for young children. Ridgers, Stratton, and Fairclough (2005) reported that children can receive up to 25 min physical activity time during each recess. Erwin, Abel, Beighle, Noland, Worley, and Riggs (2012) found that in recess children can accumulate 14–44% of total steps taken during a school day. Most schools, however, have not fully embraced recess from the physical activity perspective and often equip the recess areas poorly. Willenberg et al. (2010) have documented an urgent need to increase recess space and provide better equipment to afford adequate physical activity opportunities at recess.

Similar to school sport, recess is part of the school culture that is characterized by voluntary participation. Recess time is unstructured in most schools and is perceived by students and faculty as “free play” time. The challenge is, because it is 100% voluntary participation and invokes the free-play perception, girls and low-skilled children are likely to choose not to participate (Ridgers, Salmon, Parrish, Stanley, & Okely, 2012). In addition children in urban, low socioeconomic, and low-performing schools do not receive much recess time (Parsad & Lewis, 2006; Slater et al., 2012). Although recess presents a considerable time for children to be physically active, the unstructured culture and environment may not be conducive to some children, especially girls and those with low physical skills or competence.

Classroom Activity

Classroom activity breaks have been around for centuries, but using them to increase children's physical activity is a creative and relatively new idea. It is the idea to use break time between classes and time between assignments in a lesson to engage students in light-to-moderate intensity physical activities. The idea to use the breaks between lessons as well as during a lesson is becoming a strategy to increase children's in-school physical activity. Depending on schedule configurations, classroom breaks can help children accumulate as many as 19 min of moderate-vigorous intensity physical activity daily (Bassett et al., 2013). Currently there are more than a dozen intervention programs around. An exemplary program is *Take 10!* (see Kibbe et al., 2011), which provides 10 min of physical activity for children during or between lessons. Another exemplary program is *Texas I Can!*, which seeks opportunities to help classroom teachers modify their lesson plans to include physical activities in their lesson assignments (Bartholomew & Jowers, 2011). The third is *Jammin' Minute*, a classroom-based physical activity awareness program that is applied to elementary schools that do not offer physical education (Robert Wood Johnson Foundation Center to Prevent Childhood Obesity, 2012). The program attempts to raise school teachers' and staff's awareness about the importance of providing physical activity to children and to serve as a physical activity-to-physical education bridge program until physical education is included in the school curriculum. What is notable is that classroom physical activity breaks also show positive impacts on academic learning behaviors such as attention and

on-task behavior (8–20%, Mahar, 2011); some studies even show positive impact on grades (Donnelly & Lambourne, 2011).

Although the literature has shown that classroom physical activity breaks benefit children in many ways, the evidence is primarily from studies in elementary schools. Speculatively, promoting classroom physical activity breaks in elementary school can be readily accepted by elementary school classroom teachers, administrators, and staff, because they all understand that young children tend to have a short cognitive attention span and frequent breaks from intensive cognitive work will enhance their learning effectiveness (Woolfolk, 1998). Research evidence is needed for secondary schools, especially for the preadolescence population whose physical activity behavior declines drastically (Fryar, Carroll, & Ogden, 2012) and whose education is dictated by in-depth learning that requires prolonged and comfortable sitting for concentrated cognitive engagement without interruption.

Physical Education

Different from any other physical activity opportunities, physical education is the only opportunity in the school environment to provide physical activity with knowledge, skills, and structure for *all* children for an extended time that is devoted solely to physical activity experiences. It is the opportunity for children to be active under the guidance of professional teachers who are trained in kinesiology. Because physical education is a formal course of study, it has the opportunity or potential to provide children with a sufficient portion of recommended moderate-to-vigorous intensity physical activity.

Determining consistent effects of physical education on student physical activity is difficult due to the decentralized approach to curriculum policy in the U.S. schools. Data from research studies present a complex picture that speaks to large discrepancies due to inconsistency of physical education programs and curricular offerings. For example, Pate, Mitchell, Byun, and Dowda (2011) found that some physical education lessons provided as little as 9% of class time for children to be active at the moderate-to-vigorous intensity levels. Other studies show that physical education can provide much higher active time to children. For example, Fairclough and Stratton (2005) found that in gender separated classes, girls can spend as much as 53% of lesson time being active at the moderate-to-vigorous intensity levels. Dudley, Okely, Cotton, Pearson, and Caputi (2012) reported that Australian seventh graders are active at the moderate-to-vigorous intensity levels 58% of lesson time in physical education. Chen, Sun, Zhu, and Ennis (2012) found that the intensity levels vary depending on the content and lesson length, with 45–60 min long lessons offering the most opportunities for children to be active at moderate-intensity levels (MET between 3–4) throughout the lesson. They also reported that on average, middle school students expended 62–264 calories in lessons with lengths between 30–90 min. These studies highlighted, on the one hand, that physical education can provide a large amount of time for children to be physically active at the health-enhancing intensity levels; on the other hand, they highlighted that the benefits depend largely on the content and schedule of the programs.

Physical education is one of the best loved courses in schools. Students are motivated for physical education (Chen, Chen, & Zhu, 2012). A curriculum intervention study shows that a well-designed fitness education curriculum can increase students' knowledge about benefits and

exercise principles by 20% (Sun, Chen, Zhu, & Ennis, 2012), boosting their knowledge learned in health and conventional physical education. A more recent study (Zhu & Chen, 2013) shows that physical skills learned in PE are the only predictor for after-school participation. In light of the findings from studies on school athletics, recess, and classroom breaks, this finding is particularly important in that physical education seems to be the physical activity opportunity that contributes to children's after-school behavior change.

It is worth mentioning that physical education is facing unprecedented challenges in schools. Because it is not designated as a core content area in schools, physical education has been facing the threat of being cut or eliminated from the school curriculum. Although it is the most loved content, it is also considered by students as content providing little educational value due to its overemphasis on sport, game, and play (Goodlad, 2004). It is reported that since 2000, 44% of U.S. schools have cut back time and resources for physical education (NASPE & AHA, 2010). Jenkinson and Benson (2010) concluded that physical education is facing unprecedented barriers at the institutional, teacher, and student levels.

Promoting a Physical Activity-Friendly School Culture

At the present time, the four physical activity opportunities seem to be separate entities in school operations and research. Each is operating in a different school context where coaches, teachers, or school staff are responsible to create an environment for children to participate in the physical activity they prescribe. Although these independent operations enhance their respective in-school physical activity opportunities, the lack of coordination and concerted collective association makes it difficult to develop and sustain the opportunities, especially when the sedentary school culture is what schools are designed for with a purpose for academic success. To further promote children's physical activity in schools, I believe it is necessary for physical activity professionals to coordinate their effort to work together to create a physical activity-friendly culture that acknowledges that the sedentary school environment is necessary for children to be successful in academic learning.

To create a physical activity-friendly school culture, we need to build a consensus about the interactive influence between the school environment and child behavior. The domain learning theory (Alexander & Murphy, 1999) postulates that in learning children act according to what they know and are capable of doing in the domain. In physical activity, the concept of domain can be represented by difference in physical activities. For example, Dodds, Griffin, and Placek (2001) argued that fitness exercises and soccer are two distinct domains. In developing a health-enhancing physically active behavior, children need to actually participate in activities designed to enhance health. They also need to develop both cognitive and physical competence for them to be able to understand the meaning of participation and to physically participate. Children's motivation for participation in physical activity can also be domain-specific. They tend to get motivated for some activities based on their expectancy for success, and others based on perceived values they receive (Chen, Martin, Ennis, & Sun, 2008).

For the physically active friendly culture to get hold in the school-wide sedentary culture, it is necessary to emphasize what schooling values the most: knowledge and positive behavior change. The four physical activity opportunities, as uncoordinated as they are now, need not be

random acts. They should be coordinated to develop children's knowledge about and competence for health-enhancing activity and to provide opportunities for them to apply the knowledge and competence to elicit, reinforce, and help sustain the physically active behavior. In other words, we should not only expect children to just do physical activity, but teach them to do it scientifically correct. A coordinated effort will afford us to teach children the knowledge and skills needed, and provide multiple in-school opportunities for them to apply the knowledge and skills to become purposefully active.

An Example of Physical Activity-Friendly Culture

There are several salient unique characteristics of Chinese schools' physical activity culture that, in my opinion, represent a coordinated effort because all school physical activity opportunities are scheduled officially by law or government mandates. Physical education standards are developed by the central government's Department of Education and are designated as core content with high-stakes examinations (Ding, Li, & Wu, 2014). To keep the "Health First" goal (Chinese Ministry of Education, 2011), physical education focuses on physical skills, fitness development, and knowledge of exercise principles and skill development. All are tested in high-stakes examinations for graduation and entrance to the next level of education. In Chinese schools, physical education serves as the cornerstone for all physical activity programs including athletics, intramurals, daily calisthenics exercise, and after-class hour physical activities. As core content, physical education is taught by certified physical education specialists who have completed at least four years of college training in kinesiology and physical education.

Other than physical education, there are several daily scheduled physical activity opportunities that are mandated for all schools. First, since the early 1950s, Chinese central government has required all schools to offer a 30 min all-school calisthenics period each morning. During this time, all school staff and students are expected to come out to the school courtyard to participate. The calisthenics consist of 8–10 exercises. Physical education teachers will direct and model each exercise on a stage in the center of the school courtyard. This calisthenics period has been a ritual in all schools across the country. As early as 1979, Lee and Nii (1979) reported this tradition after they visited several Chinese middle schools after the Cultural Revolution. Figure 1 shows the calisthenics ritual, which the reader can find to be quite similar to a photo taken by Lee and Nii in 1979. Second, all schools are required to offer a 60 min in-school physical activity period after school hours. During this time, homeroom teachers must organize students to come out of the classroom and participate in a variety of physical activities. Physical education teachers are responsible for providing exercises and coordinating equipment and space. Third, in each semester there is a mini Olympics, in which all children are required to participate in at least one event. All classes are canceled on this day to ensure full participation. Many homeroom teachers tie their classes' daily 60 min activity period to the mini Olympic events and use the time for students to practice their events. With the mini Olympics as a goal, the daily physical activity hour becomes meaningful for students and the teacher.

The example seems to suggest that creating a physical activity-friendly culture needs policy support. Chinese schools are known for their ultra-focus on academic achievement and test scores. To defy the negative impact of the academic-only culture in schools, the central government issued two important mandates in the past few years. One is the guidelines (law) for

schools to commit to improving student physical fitness (Chinese Communist Party Central Committee & State Council of the Chinese Government, 2007) and the second is the publication of the new standards for physical education and in-school physical activity (Chinese Ministry of Education, 2011). The law and government mandate-based guidelines are different in nature than those guidelines in the United States based on professional organizations' recommendations in that they do carry administrative power over school policy and practice. These mandates provide a framework for accountabilities for physical activity in the entire school environment.



Figure 1. Daily all-school calisthenics period. Photo by Ang Chen (2013).

Summary and Reflection

Schools are places for children to learn. The learning, especially academic learning, involves extensive sedentary time. Current school culture is centered on reinforcing the culture to ensure academic success of the students. Physical activity opportunities do exist in this general sedentary environment and they are promoted in various degrees to enhance students' participation. It appears that the four opportunities, athletics, recess, classroom physical activity breaks, and physical education, are studied as separate entities and promoted independently from one another. A concerted effort appears to be needed to coordinate the opportunities to create a physical activity-friendly school culture.

The Chinese example seems to suggest that to be successful there is a need to keep effective traditions as well as create new practices, and that all programs should be coordinated to work toward a common goal: providing knowledge and skills for a physically active life and providing space and time for students to apply the knowledge and skills during the school hours. To coordinate efforts to create such a physical activity-friendly culture, I believe there are four areas we need to continue to work on. First, we need to acknowledge the need to develop a centralized approach to policy making to create a space in school for a physical activity culture. School policies that are based on legislature mandates are needed to coordinate all efforts to promote a physical activity-friendly school culture. Second, physical education must be core content for it to be the cornerstone for the physical activity-friendly culture to work. In addition to providing moderate-to-vigorous physical activities, physical education needs to extend students' scientific knowledge about exercise, healthy lifestyles, and benefits. Although we have had some setbacks

in the United States since 2001, physical education is still a subject in almost all schools. It is hopeful that there are opportunities to revitalize physical education. Third, not all traditions are bad. Some we should have kept and some new traditions can be created. But these traditions must be for ALL students, not for the talented few. Learning from other countries may help us in this regard. Lastly, it is critically important for us to acknowledge the importance of the sedentary school environment and develop strategies to promote the physical activity-friendly culture within the environment.

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