

Full Length Research Paper

Participation in the greening of schoolyards in the Ankara public school system

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This research seeks to examine how schoolyards promote physical activity among children and how these environments can be improved using input from students. The study is based on a project that involved school children, teachers and principals of five public schools in Ankara. Data was collected using multiple methods including: Student surveys, interviews with teachers and principals and focus-group discussions. Results showed that schoolyards are important to children and they are perceived as places for recreation and relaxation. The evidence of this study indicates that green and well maintained schoolyards can play a significant role in promoting physical activity.

Key words: Schoolyard, physical activity, obesity, child participation, landscape design.

INTRODUCTION

The design features of schoolyards determine the way children behave, learn, play and interact with others (Moore and Wong, 1997). In a bland and largely tarmac yard, even a very active child will find it difficult to be creative and willing to participate in play. The yard should provide diversity of places and habitats for different age and gender groups so that children will have the opportunity to interact with others and to be creative (Titman, 1994). Green school grounds promote more vigorous activity, which increase the health benefits of this exercise (Bell and Dymont, 2008) and this type of energetic activity will reduce the risk of obesity (Frank and Niece, 2005).

Schoolyards serve primarily as places for children to let off steam (Evans and Pellegrini, 1997). The conventional schoolyard setting, embodies this belief, with an emphasis on wide-open areas of asphalt and concrete that promote rule-bounded and competitive play (Bell and Dymont, 2008; Armitage, 2005). In these yards, children are at all times under surveillance and control. Flat play surfaces are preferred because they have the lowest maintenance costs. Safety and supervision have been the dominating themes in these schoolyards, which are now more uninviting than ever (Barbour, 1999; Moore and Wong, 1997; Evans, 2001). On the other hand,

natural playgrounds in schools with a variety of choices for play activities allow children to play in unstructured spaces that enable innovative, creative and child-directed play to transpire (Staempfli, 2009; Evans, 2001; Fjörtoft and Sageie, 2000; Moore, 1986; Rivkin, 1995; Titman, 1994). Children also prefer views of nature to relax and enjoy (Wells and Evans, 2003; Kellert, 2002; Kahn, 1999; Taylor et al., 2002) and their performance on attention tests show better scores when looking at the natural outdoors (Wells, 2000; Tennessen and Cimprich, 1995). These children complete tasks better after playing in greener environments (Taylor et al., 2001; Arbogast et al., 2009; Moore, 1990).

Research showed that children in low-income brackets are at particular risk for obesity due to limited access to healthy food and venues for engaging in physical activity (Lopez and Hynes, 2006; Oliver and Hayes, 2005; Raine, 2004; Story, Kaphingst and French, 2006; Coleman et al., 2005; Davidson and Birch, 2001). From this perspective, schools in poor neighborhoods stand to be an important environmental intervention; green schoolyard may be an easily accessible outdoor space for children of low-income groups to be active, to play freely and to experience nature (Thomson and Philo, 2004; Koplan et al., 2005). Greener common spaces will attract people outdoors and foster stronger neighborhood social ties (Kuo, Bacaicoa and Sullivan, 1998). Another major issue is the ownership of these places by their users; as children experience ownership of a schoolyard, they are much less likely to engage in destructive or criminal behavior in

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these environments (Caldwell et al., 1999).

Environmental education programs in schools assume that giving information to children is enough to provide environmental awareness (Taylor and Kuo, 2006). However, this information should be accompanied with personal experiences in the actual environment for children to be actively involved in these programs (Bunting and Cousins, 1985; Harvey, 1989; Kellert, 2002). This will in turn, improve self-esteem and academic performance (Hoffman et al., 2007). In addition, children will be more active in schoolyard greening, and school grounds, in this sense, offer important sites for the real experience and interaction with others through which children and adults might achieve models of participation.

Research from a range of disciplines has pointed to the positive impact of outdoor school environments on the social, mental and physical dimensions of child health (Moore, 1989; Titman, 1994; Moore and Wong, 1997; Sallis et al., 2000; Ozdemir and Yilmaz, 2008). However, there is a lack of assessment of design features within schoolyards and their effects on child development and health. Few studies have directly explored the effects of renewing and regeneration of schoolyards on child health, environmental learning and play opportunities (Bradley, 1995; Malone and Tranter, 2003; Hoffman et al., 2007; Bell and Dymont, 2008; Brink and Yost, 2004; Moore and Wong, 1997; Rivkin, 1997). Research efforts regarding schoolyards mostly focus on the curriculum development, food choices and active modes of transportation to and from school. While educators have long recognized the value of modifying the design of indoor classrooms to better address various cognitive, physical, and social needs of learners, the layout of schoolyards is rarely questioned. There is enormous potential to transform these heavily used outdoor spaces into exciting learning, playing and socializing environments. We need to examine more closely the children's perceptions of environmental features in order to better design schoolyards and to promote more active behavior. Relatively little is known about the relationship between outdoor school environments and student outcomes. This study is an initial step to bridge this gap. The aim of this study is to identify strategies and landscape design principles, which are based on students' perceptions of schoolyards, to create attractive, child-friendly and sustainable school environments and to encourage increased activity in school settings.

This field study is based on our previous research which investigated students' perceptions of schoolyards and their health outcomes in five primary schools in Ankara (Ozdemir and Yilmaz, 2008). In the current study, we developed design proposals for each schoolyard based on the students' perceptions of those settings and managed the implementation process. The paper is organized in the following manner. First, we focus on the students' perceptions of their schoolyards, and then we address design issues for those yards. Later, we propose design alternatives to the children, teachers and

principals. We conclude with a discussion on the importance of schoolyards as sites to promote physical activity.

METHODOLOGY

This research stems from the notion that each schoolyard should not only be designed, built and maintained according to the physical and social characteristics of the environment and the neighborhood, but also with the direction of their primary users—the students. In order to develop the landscape designs, we first investigated the children's perceptions of schoolyards and their behavior patterns during recess. Children were asked about the positive and negative aspects of their yards by way of questionnaires. We collected additional behavioral data by observing child behavior during recess periods. We recorded congested and underutilized spaces, and patterns of play behaviors. Second, we interviewed the school teachers and principals to learn their opinions about the schoolyards. During these interviews, we asked for their ideas concerning improvement and renovation. We used scaled site plans to determine the places for their suggestions.

Based on the results of surveys and meetings with these groups, we developed designs for the schoolyards on scaled plans (Appendix A). Along with each project, we prepared perspective drawings which are illustrated before and after images of the yards (Appendix B). These drawings and images were shown to students, teachers and principals for their approval and input concerning necessary modifications prior to the final project. Each project was displayed on a visible bulletin board in each school for a period of one week. A notebook was placed next to the displayed material to allow students to write down their comments and ideas regarding the design proposals. The comments of the students in the notebooks and during the presentations along with the guidelines of teachers and principals allowed us to finalize the projects.

Settings

School selection was not random, instead it was a purposive sampling, designed to provide enough contrast in schoolyards to explore and compare differences in design, use and service. A purposeful sampling protocol was used to determine the schools for the study. From a list of schools, which was provided by The Ministry of Education, we identified schools that met the following criteria: (1) Schools with different types of educational systems and curriculum, (2) Schools that had sufficient open yard spaces where design projects could be developed, (3) Schools where children had access to open yards, (4) Schools with diversity of economic status in a variety of neighborhoods, and (5) Schools with diverse student populations. This was intended to ensure that a broad range of schools could be represented. As a result, five schools were selected for the study: 19 Mayıs Primary School, Hurin Yavuz High School, Uluğbey Anatolian Public School, Ankara Anatolian High School of Fine Arts and Çubuk Industrial High School (Figure 1).

INSTRUMENT

We visited each school to gather information and take pictures of the yards for our design surveys. During each visit, we administered a one-page questionnaire to all available students in the schools. The questionnaire included sections on students' perceptions of schoolyards, activity patterns of students during recess, their satisfaction with the schoolyards and their suggestions to improve the standards of the schoolyards. Physical activity data were gathered primarily by self-reports; direct-observations of student activities during recess aimed to support the activity data. Students



Figure 1. School locations in the Ankara city.

were asked about the frequency, duration, intensity, and type of physical activity they were involved in during recess periods in schoolyards over the last two weeks. We categorized recess activities as active and passive. The first type of activities included ball games (mostly for boys), running and jumping rope (for girls), and walking in the yard. Passive activities included eating and sitting. These classifications are based on the results of the preliminary observations of child activities during recess. In the survey, students were asked to name three activities that should be located in the yards. Responses were then weighted, with values for first, second and third choices allocated three, two and one point respectively to produce an overall hierarchical listing. Teachers and principals of each school were also interviewed.

A small group of students, pilot tested the survey instrument to provide feedback on the clarity and completeness of all items. The pilot procedure resulted in a refined format with changes. Pilot testing revealed that the survey took approximately 5 - 10 min to be completed. It was anticipated that the format of the questionnaire would be simple. Test-Retest reliability was obtained by administering the questionnaire to 20 children on two separate occasions 7 days apart; reliability scores were 0.63 and 0.68.

Hence, it can be assumed that the scale is valid, reliable and suitable for this study.

Measurements

Students were asked to indicate their weight and height on the questionnaire sheets and this allowed us to assess their nutritional status. In order to ensure reliability of self-reports, we weighed a group of students using a standard electronic scale, and their heights were measured with a wooden measuring board. Self-reported and objectively measured height and weight status were compared and it was found that self-reports were reliable. The height and weight information obtained in the surveys were used to calculate the BMI, which was computed as weight in kilograms divided by height in meters squared (kg/m^2). The standard National Center for Health Statistics (NCHS) charts of children's BMI is the recommended method to judge if a child is overweight, normal or underweight. The BMI formulas have already been calculated and are presented in the clinical growth charts (NCHS, 2000). Any values of BMI between the 5th and 85th percentiles are considered

Table 1. Classification of BMI values and scores.

	Class	Age	Underweight	Normal (5 th and 85 th percentile)	Overweight
Primary school	3 and 4	9 - 10	<14.0	14.0 - 20.0	>20
	5 and 6	11 - 12	<14.6	14.6 - 23.1	>23.1
	7 and 8	13 - 14	<15.6	15.6 - 25.4	>25.4
High school	1 and 2	15 - 16	<17.2	17.2 - 26.0	>26.0
	3 and 4	17 - 18	<18.5	18.5 - 26.5	>26.5

within the normal range for a child (Table 1).

Landscape survey of schoolyards

For further assessment of schoolyards, site plans obtained from the Municipality and pictures of the outdoor school environments were taken. Total area and landscaped areas (that is, lawns, tree plantings) of all schoolyards were measured. The reliability tests of these measurements showed that both measurements on site plans and hand measurements of a selected schoolyard gave similar results. Outdoor environments and adjacent areas were assessed with respect to physical and landscape qualities. A group of reviewers-which included landscape architects and architects-rated and scored the schoolyards on photographs based on features such as size and spaciousness, material, vegetation cover, vegetation quality, and maintenance. Environments with low physical qualities scored 1. Environments with advanced features scored 2. A third score-medium landscape quality-was excluded from the assessments due to its limited effect on the outcomes.

RESULTS

Descriptive information and the physical assessment of the schoolyards were presented first, followed by the introduction of statistical tests such as ANOVA test results and regression analysis. Demographic data were displayed in percentages. T-tests were used to assess the differences between the overall mean scores of BMI values of male and female students. Analysis of variance was used to determine relationships between variables. Regression results were displayed for the correlation between BMI values and the yard size of the schools, and type of commute to school and the distance between home and school. These results, which were gathered by survey techniques, guided the design of schoolyards; the design philosophy of each yard was then presented.

Interviews

During introductory interviews with teachers and administration, many discrepancies and problems were found regarding the maintenance and improvement of physical qualities of the schoolyards. Teachers expressed their ideas concerning the landscaping of the schoolyards as a participatory process integrating students and teachers.

Similar to our previous findings (Ozdemir and Yilmaz, 2008), principals complained about the maintenance and security of the schoolyard greenery, as people in the neighborhood did not take care of the garden, but rather destroyed the environment they used. Teachers mentioned the lack of environmental sensitivity and awareness among the students; participation in environmental programs and greening practices of the schoolyards was limited. As a result, these tendencies were reasons for fencing off of the landscaped areas in order to prevent and isolate the areas; all of the selected schools had landscaped areas with trees and lawns, but were inaccessible to students.

Science and physical education teachers were more eager to use the outdoors for class activities and they requested outdoor classrooms. Some pioneering teachers, who have established environmental clubs in schools, had positive attitudes towards schoolyards, which they defined as ideal places to teach environmental awareness to students. Both the principals and teachers agreed that developing an understanding of children's environmental attitudes and behaviors by way of greening the yards, has become an essential component of the school education. According to the teachers, during various attempts to engage students in a group effort designed to improve the schoolyard, a sense of interdependency and loyalty to the school developed. Most of the students live near the school within walking distances (15 - 30 min) (82%). Of all trips made to and from school, 58% of trips were made by walking, either alone or with family members, and 42 % were made using automobile or public transportation.

Landscape characteristics of schoolyards

Schoolyards differ regarding vegetation cover, topography, form and size, type of material, density and function. Most of the vegetation is located in the unattended areas. Schools are built on type-plans with no specific landscape projects. The Ministry of Education manages the building of the schools and The Ministry of Public Works selects a type plan for each site. However, plans are usually developed for flat surfaces and these plans are hard to apply in sloped areas; the contractor

Table 2. Subject characteristics and BMI values.

Domain	Group	N	Percent	Mean	SD	t value	F Ratio	P value
BMI value	Total	1729	100	20.14	2.59			
	Underweight	224	13					
	Normal	1353	78.2					
	Overweight	152	8.8					
Gender	Female	847	49	19.73	2.54	<.0001	42.24	<.0001
	Male	882	51	20.53	2.59			
Grade	Primary 3 rd	32	1.9	16.8	2.73	1.96	15.407	<.0001
	Primary 4 th	25	1.5	17.36	2.54			
	Primary 5 th	26	1.5	18.32	2.87			
	Primary 6 th	25	1.5	18.66	3.44			
	Primary 7 th	96	5.6	19.63	2.89			
	Primary 8 th	98	5.7	20.65	2.77			
	High 1 st	452	26.1	19.98	2.59			
	High 2 nd	416	24.1	20.40	2.46			
	High 3 rd	330	19.1	20.56	2.24			
	High 4 th	229	13.2	20.51	2.29			

builds large retaining walls to accommodate building blocks on flat schoolyards.

In all cases, backyards, which are more often vegetated with lawns and trees, are deserted places and used as parking lots. However, teachers and principals complain about the control of children during their entrance into these backyards. In Hurin Yavuz High School, two large sport fields center the yard and the open yard is divided by these fields. The backyards are out of sight and children are prohibited from playing on these back spaces. In The High School of Fine Arts, teachers and the principal requested a practice site for art students in the outdoors; however, it is difficult to locate these areas in narrow spaces with no direct access to the school building. Çubuk Industrial High School has a large schoolyard with separate plots. Students build the site furniture such as bike racks, seating benches and gazebos; however, similar to the other schools, the concrete surfaces dominate the yard. Although there are vegetated areas along the perimeter of the school, they are neglected and uncared; students generally prefer to spend recess time on hard surfaces. In all the schools, there is at least one soccer field, which is suitable for boys' activities; girls' activities are usually spontaneous. The common characteristic of all yards is the lack of available seating places for children.

Descriptive results

Descriptive statistics were calculated for all continuous data points using means and standard deviations. Frequency tables were used to determine the percent of

students who actively commute to and from schools, location of residence, type of activities during recess, preferences for the outdoors or indoors during recess, frequency of schoolyard use, satisfaction with the schoolyard, and effect of schoolyard use on academic success and development. BMI values, which were treated as the dependent variable, were computed after weight and height measurements.

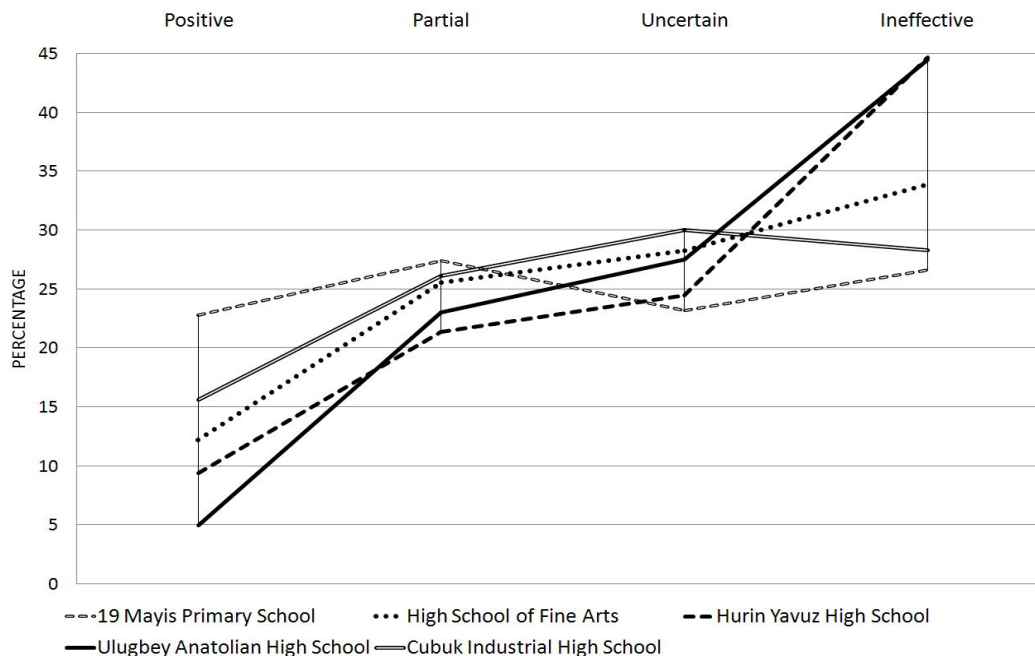
A total of 1729 questionnaires were administered in five schools. Of 1729 children, 847 (49%) were girls and 882 (51%) were boys. 302 primary school and 1427 high school students were surveyed.

Application of NCHS standard cut-offs identified 152 students (8.8%) as overweight; however, most of the students (78.2%, N = 1353) had normal BMI values. Male students had significantly higher mean BMI values (20.53) than female students (19.73). Using a *t*-test for independent samples, revealed significant differences between both the overall mean BMI scores of male and female students, and students in different grades (Table 2).

Most of the students live near the school within walking distances (15 - 30 min) (82%). Of all trips made to and from school, 58% of trips were made by walking, either alone or with family members, and 42% were made using automobile or public transportation). Among students living near the school (in the same district), most (93.3%, N = 545) walk to and from school. Most of the students (81.2%, N = 255) who live farther away from school, commute to school with a vehicle. Regression analysis showed that as the distance from home to school increases, more students use vehicles rather than walking ($r = 0.56, p < 0.05$).

Table 3. Relationship between yard scores and BMI values.

Domain	Group	N	Mean	SD	df	F Ratio	P value
Yard score	Score 1	743	19.98	2.86	1727	3.932	0.0475
	Score 2	986	20.25	2.37			

**Figure 2.** Students' responses to the question whether schoolyard have any effect on development and academic success.

Although the students (69%, N = 1180) prefer to spend their recess time in the schoolyard, a considerable number of students prefer staying indoors during recess (31%, N = 538). Students made comments regarding the distance between their classrooms and the yard; the complaints stressed the short recess periods and so a lack of available time to play outside. More than half of students (57.3%, N = 981) use the yard at least once a day.

Regardless of gender, most of the students (74%, N = 1259) prefer active behavior during recess periods, such as playing games and walking. Although seating places are lacking in yards, 16% of students (N = 281) prefer to sit and watch others during recess. As expected, more boys (23.7%, N = 207) play ball games than girls (7.8%, N = 65).

Although there is a tendency toward the definition of the schoolyard as adequate for activities among students (55%, N = 928), almost half of the students (45%, N = 762) define the schoolyard as inadequate, in terms of size, playing and other recess activities. More boys (60.3%, N = 523) define the yards as adequate than girls (49%, N = 410). Since all schoolyards have sport facilities

for ball games, it is reasonable for boys to define yards as adequate for their most common activities.

Nevertheless, most of the students (66%, N=1134) are not satisfied with the schoolyard. Boys (42%, N=367) are more satisfied with the schoolyard than girls (27%, N = 228). Among students who are not satisfied with the schoolyard, a significant number of them (39%, N = 593) cited the lack of trees and greenery in the schoolyard as the cause of their dissatisfaction. Twenty five percent of students (N = 381) complained about the limited size of the yards and 28% of them commented on the lack of available sport facilities. As expected, more boys made comments on the sports fields than girls, and girls are more often dissatisfied with the limited sizes of the schoolyards.

When we asked students to describe the effect of schoolyard on development and academic success, most of the students (37.9%, N = 636) perceived the schoolyard as ineffective in connection to these issues. On the other hand, a considerable number of students (35.5%, N = 596) defined the schoolyards as completely or partially effective on development and academic performance (Figure 2).

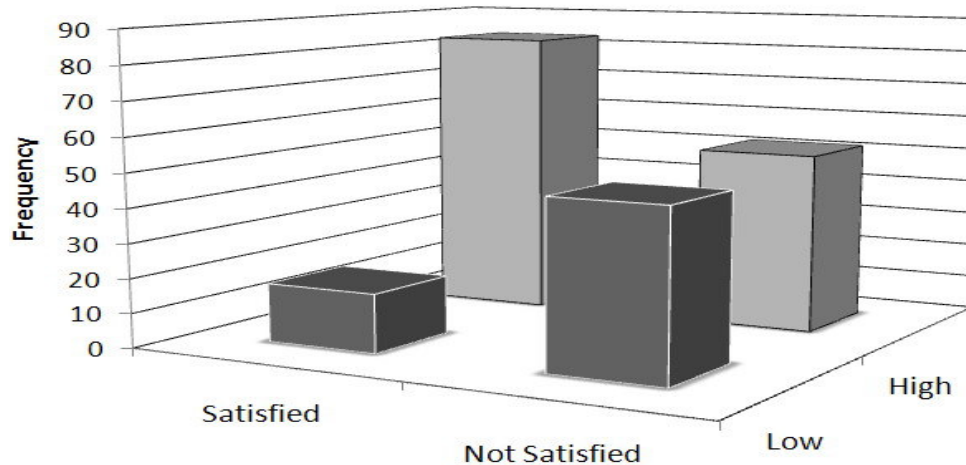


Figure 3. Student satisfaction of schoolyards among scored yards.

As expected, most of the students from schools with low quality schoolyards reported that they were not satisfied with those yards (48%, $N = 471$), which is not consistent with our previous findings (Ozdemir and Yilmaz, 2008). There are more frequent responses of satisfaction from students in schools with a high landscape score (83%, $N = 619$) (Figure 3) and this association is statistically significant ($F = 201.3$, $df = 1710$, $p < 0.0001$). There is also a statistical significant relationship between the size of yards and the satisfaction responses ($F = 68.51$, $df = 1707$, $p < 0.0001$). As expected, students from schools with larger schoolyards are more satisfied with those yards.

One-way ANOVA tests showed that more students in high quality schoolyards find the yards adequate for their activities (38%, $N = 647$). More students find low quality schoolyards less adequate for their activities (26.4%, $N = 450$). This finding is statistically significant ($F = 148.55$, $df = 1695$, $p < 0.0001$).

Results indicated that students who walk to and from their schools have a lower mean BMI values (19.97) than students who commute to and from the schools by vehicle (20.37), and this association is statistically significant ($F = 9.93$, $p = 0.0017$).

Children were asked to select three choices from the given list of features and rank them in order from one to three. Features were listed randomly and children were free to select three of them in order. According to the grading of selections, seating areas were the most desired feature in three schools: Uluğbey, Hurin Yavuz and 19 Mayıs. Most of The Fine Arts students preferred lawn areas. In Çubuk High School, outdoor class is highly preferred by most of the students. The design of schoolyards varied according to these expectations and we included almost all these features in the designs.

Statistical tests revealed a significant relationship between the type of activities during recess and BMI values ($F = 3.45$, $p = 0.0057$). Passive students who

generally prefer to sit and watch others (20.59) in the yard and eat during recess (20.60) have higher BMI values than active students—those who walk (20.03) and play ball and jump rope (20.00). All these values, however, are within the normal range.

One-way ANOVA tests revealed that there is a statistically significant relationship between landscape features of the schoolyards and BMI values of students ($F = 3.93$, $df = 1727$, $p = 0.0475$) (Table 3). Despite the expectations, students from schools with advanced landscape features had higher BMI values (20.25) than students from schools with less advanced landscape features (19.98). These values, however, are within the normal range of BMI values.

Figure 4 shows the mean BMI values of students across schools. With the exception of Uluğbey High School, students in school with smaller yard had lower BMI values and this relationship is statistically significant ($F(4,1724) = 14.30$; $p < 0.0001$). This finding is not consistent with our previous study (Ozdemir and Yilmaz, 2008) in which we have found an opposite relationship. These values, however, are in the normal range of BMI values.

DISCUSSION

The results of this study suggest that children's perceptions of certain aspects of school environments may be significantly associated with their participation in different intensities of physical activity. Our measurements and definition of schoolyards with landscape surveys were related to the BMI values and students' perceptions of and preferences for outdoor school environments.

The major critical factor which emerged from this investigation was the necessity for spacious and accessible schoolyards for students' play and learning.

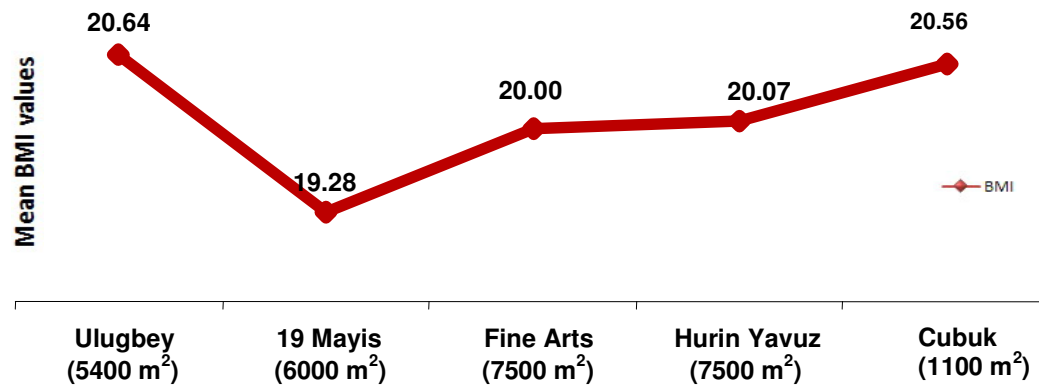


Figure 4. Variation of BMI values among schools with different yard sizes.

Almost all students complained about the lack of adequate space for playing due to the crowded schoolyard during all recess time and the scarcity of seating places for interaction. In Turkey, compulsory primary education was raised from five to eight years; however, school conditions are inadequate to accommodate the various age groups in one location. Currently, first and eight graders play on the same field and bullying is a major concern for small children during recess. We observe differences in play habits among young and older children, and designing play spaces for various age groups might be a solution in a crowded schoolyard. Greening has the potential to arrange play groups and activities. This will allow opportunities to diversify and to provide possibilities for non-competitive, open-ended play and to foster cooperative behavior.

Another major finding is the relationship between type of activities and BMI values, both during recess and during commute to school. Students who are more active have lower BMI values than those who are passive. Although measured BMI values are in the normal range, we may conclude that active students are more physically fit than passive students.

As opposed to our previous research (Ozdemir and Yilmaz, 2008), most of the students in high quality schoolyards are satisfied with those yards. There is consistency among experts' definitions and students' perceptions of schoolyards. Experts define low quality yards as spaces with limited landscape features, since they prefer dense greenery and fewer hard surfaces with separated play zones. A significant number of students cited the lack of trees and greenery in the schoolyard as the cause of their dissatisfaction. Although some schools have vegetated areas, they are out-reach from children. This limiting factor affects children's perception of available green spaces in their schoolyards. The size of the yards also contributes to child satisfaction; more students express satisfaction with larger yards. Children may find diverse opportunities for play and relaxation in

open and large schoolyards with a larger area per student.

The sizes of the available schoolyards have a significant relationship to the BMI values. Despite the expectations, students in schools with larger yards have higher BMI values. This result supports the assumption that the size factor alone does not contribute to child's health; other factors such as available play areas and the type and diversity of accessible green spaces contribute to child health. Rather than measuring the actual size, we should consider the available and usable spaces of yards such as accessible vegetated areas and sports facilities.

Schoolyards in general were somewhat influential on academic success and development. However, most of students found the yard ineffective in this aspect. Based on student responses, we received mixed signals with almost equal responses showing effectiveness and ineffectiveness. Simply asking this question directly will not allow us to judge the effectiveness of schoolyards on academic performance and development. We need to compare test scores and grades of students from schools with both low and high quality yards.

Students are satisfied with high quality yards and results indicated that students in schools with high quality yards have lower BMI values. Additionally, students are eager to play in natural playgrounds, which offer many psychological and health benefits. The immediate outcomes of contacts with nature in the schoolyard include enjoyment, relaxation and lowered stress levels. Children need to have access to nature, and nature schoolyards have restorative effects on children. The research results indicated that physical well-being is affected by such contacts.

Design of schoolyards

The results of our research directed us to develop design guidelines for each schoolyard. Rather than proposing

ground-breaking and expensive design solutions, we proposed easy-to-build and use structures. Essentially, the main focus of these schoolyard projects is to convert barren expanses of asphalt into stimulating natural spaces for learning and playing. After questionnaire and interview sessions, we began site analysis and inventory with selected students who were members of the schools' environment clubs. During small excursions with these children, we took pictures of the yards and the students were given the opportunity to improve their initial ideas which were obtained during our discussions. On a schematic board, students defined the functions and activities as areas of action, sports, playing, ceremony, entrance, seating, eating, educational activities, parking and vegetation. We identified the conditions of existing plants and lawns with the children. Students selected native plants from a list to create attractive and in some places edible gardens. These plants were easy to maintain, adaptable to the Central Anatolian climate and fast growing. We took care to select plants that are not harmful to young children and located in vegetated areas that are easily accessible.

The children's creative suggestions along with the decisions of the principals and teachers expanded the scope of the projects. Requests varied across classes; small children were on the playgrounds more often; older students requested more seating areas for socializing and group studies. Students' responses to rank order question were the most influential in our designs. We placed seating walls, gazebos, benches and logs, which aimed to provide social interaction with other students. Principals requested attractive ceremony areas to improve the prestige of their schools. Outdoor class rooms were placed in specific corners. Physical education teachers requested fitness paths.

Our projects highlighted the value of spaces that accommodate a range of quiet and active, competitive and cooperative, rule-bound and open-ended play activities, where all students of different gender and ages would benefit from this diversity. Instead of being faced with the limited choice of ball games on conventional school grounds, children playing on green school grounds can engage in different kinds of play that attract physical strengths and personal interests. Our designs proposed greener and natural looking schoolyards that define a variety of places to run, climb, hide and socialize. Movable and natural materials were placed so that children could create their own play activities. Proposed vegetable gardens invited children to be more aware of the food cycle and plant propagation and to become more active through gardening activities. Additionally, these gardens will promote greater awareness of and appreciation for healthy foods. Our designs included spaces for children to get involved in exploring rocks and insects, looking at plants, bug watching, plant propagation and other natural experiences through gardening efforts.

We found gender differences regarding the satisfaction of the schoolyards; boys are more satisfied than girls. Schoolyards are built for more male-centered activities such as ball games; inclusion of more play areas for girls is a necessity. After regular observations during recess, we identified specific areas where girls prefer to be and play in groups with other girls. According to these observations, new pavement and seating options along with fencing solutions were proposed to define separate spaces for each gender.

Presentations

After the completion of preliminary design drawings, we presented the new look of each schoolyard to the students, teachers and principals for their final comments and approval. While a moderator was presenting the results, he asked questions to the groups in order to learn more about their design proposals. A researcher coded the meeting agenda for further analysis that guided us to update the projects.

In all cases, children and teachers favored the outcomes which were defined as reflecting their ideas and comments. We discussed technical issues with teachers and principals such as the size of outdoor classrooms, placement of additional sport facilities, the number of seating areas and the density of plantings. Although children requested additional sport fields in the backyards, the administration was against the landscaping of those spaces, which children needed to be kept away from for security reasons. Practice sites were placed in The School of Fine Arts and Industrial High School. Students in the environment clubs volunteered to maintain the landscaped areas in collaboration with school staff. We proposed a one-year plan to train and supervise students, staff and teachers with environmental lectures and courses which aim to develop sustainable maintenance program for the sites.

Final approval and path to implementation

Landscape architects, along with teachers, students and the principals, developed the vision for natural, attractive and child-friendly schoolyards. Designers and participants then asked the community and corporate and public partners to help realize these dreams to come true. After the initial presentations, designs were revised based on additional proposals. Final projects were prepared with approximate cost calculations including lists of materials and plants; the projects were then presented to the mayors and city managers who are responsible for providing support and funds for implementation. Municipalities provided labor, material and equipments for implementation, and The Ministry of Environment provided large trees and other plants listed

in the projects. At the current time, plans are ready to apply on plots.

Conclusions and policy implications

The examination of physical environments to explain and promote physical activity is an important yet under-investigated area of research inquiry. This study, which included the process of students' participation in the design and implementation of a planned landscape, aims to improve the quality and attractiveness of outdoor school environments. Our proposals, which are based on the suggestions and ideals of children, teachers and principals, have an impact on the sustainability of the yards; projects are easy to handle, apply and maintain. Once they are applied, schools in collaboration with local municipalities will be able to easily improve yards with limited budgets.

School environment is an obvious setting for establishing healthy habits. In Turkey, obesity is now being regarded as one of the most frequent chronic illness of the school age. The Ministry of Health promotes goals for physical activity and healthy nutrition for schools with a number of programs; however, these programs are not well distributed across the nation. For each school, a wellness program, both for the physical setting and students' health, must be developed for implementation. When a health program is established, the school's physical environment is not being considered as a component in influencing children's activity behaviors. Since children spend considerable time outdoors during school time, schoolyards should be included in school-based health promotion initiatives.

Currently, local municipalities are voluntarily responsible for the maintenance of schoolyards which are built with no specific rules and design guidelines. Recess time is short and administration is eager to control children while outside; small and monitored yards are the best according to principals. Although teachers and principals have some idea of how useful schoolyards affect the health of the child, they have limited experience and knowledge on how to alter and use the yards for this benefit. The health benefits of schoolyards, including their potential to promote physical activity and better nutrition, should be officially recognized by the ministries, school boards and schools, which should in turn support and promote the schoolyard greening processes. Universities and research centers should include more child-centered research activities to promote environmental awareness and to coordinate research, design and implementation.

Schools generally work to increase student scores on tests and children are under increasing pressure to get higher scores on standardized tests. This brings about a lack of physical activity among students and a dramatic rise of obesity. Since physical activity is a key determinant of weight status, schools should take a leadership

role in ensuring that young people engage in adequate amounts of physical activity each day and schoolyards should provide adequate opportunities for this. The school setting, therefore, should offer multiple opportunities for students to enjoy physical activity outside of physical education classes. Some schools in collaboration with The Ministry of Health have programs; however, they lack programs to provide physical activity among students. Research efforts, such as ours, should be integrated into these programs for more diverse solutions to health problems. We should develop sustainable implementation programs, and local municipalities should take the active role in the process of project application.

Green schoolyards will promote more hands-on experiences for children; they will learn about nutrition through direct experience in vegetable gardens. Unfortunately, schools fail to provide curriculum that includes these types of experiences; the priority is given to indoor, text-centered learning. Teachers have no training in teaching outdoors; consequently, they lack the confidence and motivation to do so. Building greener schoolyards is not the only solution; we need to develop curriculum that provides clear direction and examples of how to use schoolyards for experiential learning and train teachers in teaching outdoors.

This study along with the design projects underline the potential of greening initiatives to foster positive social interactions, and to promote more physical activity at schools. Schools should be designed and built by an interdisciplinary team of experts. However, policies lack the system of designing school plans appropriate to school conditions, student characteristics, curriculum and the location in terms of topography, climate and neighborhood. The application of type-plans of school buildings on designated zoning plans, which usually allow irregular plots for schools, causes many long-term problems. Our study, in this sense, is an exploration of a series of solutions, which should guide the preliminary stages of school building. Each school should have its own design approach to renew and sustain the schoolyard. Design approaches should be supervised by an expert in the field-preferably by a landscape architect.

We need to fully understand the benefits of green schoolyards on student health and active behavior. More research that investigates student, parent, teacher and administrator perceptions of schoolyards is needed. We also need to monitor and measure children's activities on schoolyards before and after the implementation of green elements.

Limitations

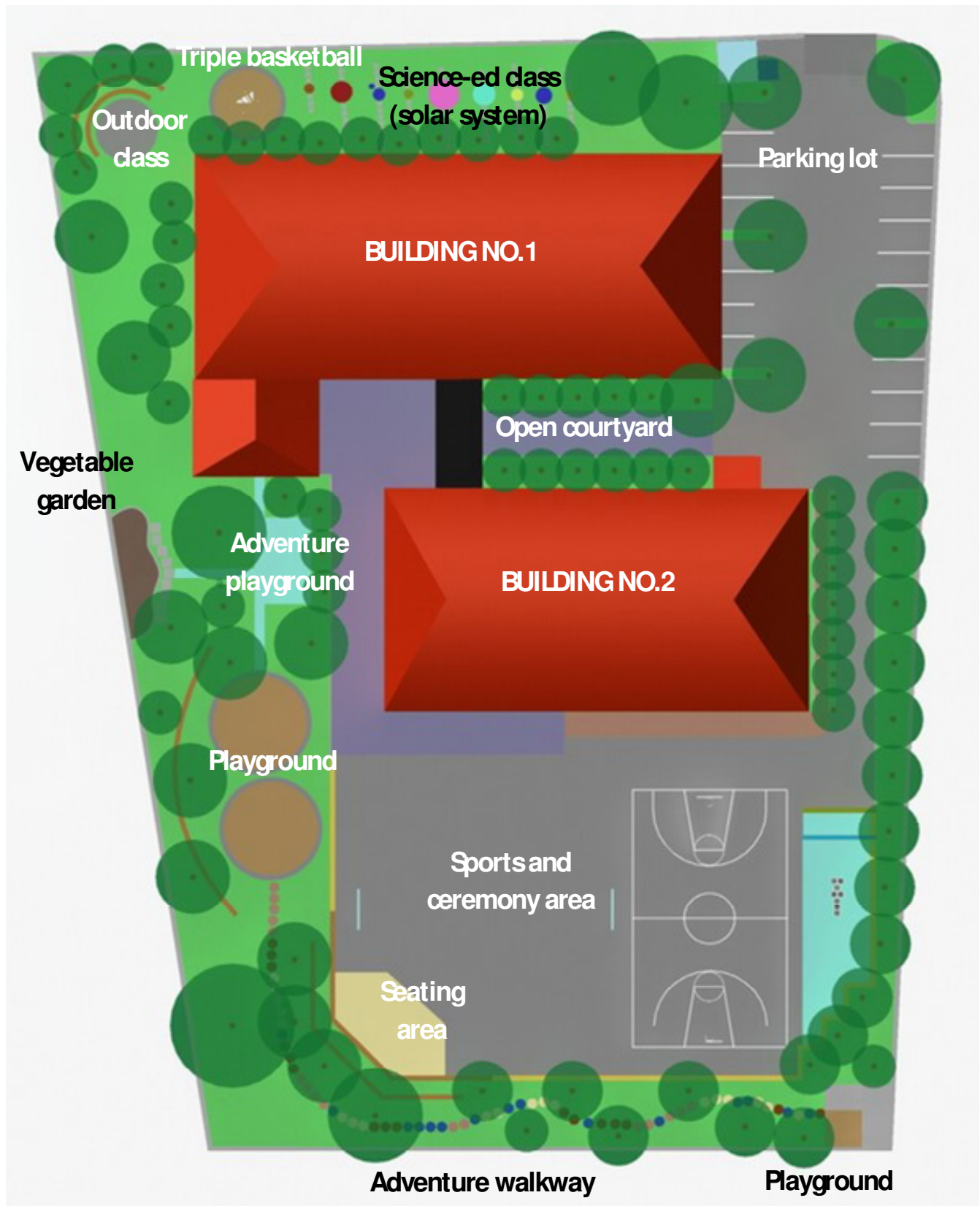
Our sample included a purposeful selection of schools from varying and diverse geographical locations within the city. As such, our sample did not comprise a random sample of students in each school, we tend to include all

available students. The study included self-reported physical activity measures, and type of commute to and from school, which may not be as reliable as objective measurements. The intention and the frequency of the activities during recess periods were not objectively measured. Students' verbal descriptions of outdoor environments and the type of physical activities were the basic data for the analysis. The accuracy of these responses would naturally be influenced by several environmental and personal factors. While the results are not necessarily generalizable to all settings, this study has important implications for city planners, and decision-makers involved in the construction and management of school environments.

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APPENDIX



Appendix A. Sample of a schoolyard renovation project—19 Mayıs primary school.



Seating area in The Hurin Yavuz High School



Jogging path and playground in The 19 Mayıs Primary School



Seating area in The Ulugbey High School

Appendix B. Before and after images of schoolyards.