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PEDAGOGY

In the Zone: An Investigation Into Physical Activity During Recess on Traditional Versus Zoned Playgrounds

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Abstract

Introduction: *The prevalence of childhood obesity in the United States has reached epidemic status with some states with rates as high as 20%. The most effective interventions for combating inactivity target children before inactivity develops in their adolescent years. If effective, school-aged physical activity (PA) interventions would decrease sedentary behavior and help combat childhood obesity. The main purpose of this study was to compare changes in PA of youth during recess following zoning of a traditional playground. A secondary purpose was to investigate which zones elicit the greatest levels of activity for boys and girls. A tertiary purpose is to compare observational measures of PA (SOPLAY instrument) to PA measured via pedometry.* **Method:** *PA for 364 boys and girls from two institutions were observed and recorded at recess with the System for Observing Play and Leisure Activity in Youth (SOPLAY) and pedometers. Baseline data were collected for 1 week on traditional playgrounds. After 1 week, the playgrounds were*

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zoned for specific activity, and PA was again observed and recorded. **Results:** *The average percentage of boys and girls considered to be very active increased by 10% following zoning, according to SOPLAY data. Average number of steps during recess also increased by a mean of 175 steps on zoned playgrounds versus traditional.* **Conclusion:** *Interventions, both within and outside of school, aimed at improving activity levels and changing behavior will help to quell the obesity epidemic. A zoned playground can be used as a simple and effective strategy that reduces sedentary behavior and increases activity during recess.*

Obesity is associated with an increased risk for cardiovascular disease, type 2 diabetes, and other chronic diseases (U.S. Department of Health and Human Services, 2001). Obese individuals have a higher prevalence of psychological disorders including depression, a higher prevalence of certain types of cancer, and earlier death (U.S. Department of Health and Human Services, 2001). Approximately one third of U.S. adults are currently obese (Ogden, Carroll, Kit, & Flegal, 2014), which has resulted in approximately $114 billion in medical costs annually (Tsai, Williamson, & Glick, 2011). Today's population of obese Americans developed from a baseline population of children and adolescents who are predominantly normal weight (Fox, 2004). Given that nearly one fifth of U.S. children are considered obese (Ogden et al., 2014), as many as 30% of their counterparts who are normal weight will also develop into adults who are overweight or obese (Guo & Chumlea, 1999; Roche, Guo, & Siervogel, 1993). According to the Centers for Disease Control and Prevention (CDC), the worldwide increase in childhood obesity has resulted from a milieu of behavioral changes negatively interacting with one another (Kersh, Stroup, & Taylor, 2011).

Although excess energy consumption and lacking daily energy expenditure can contribute to childhood obesity, modifications to physical activity (PA) seem more sensible than does limiting energy intake, considering a positive energy balance is necessary for proper growth and development during childhood (Butte, Christiansen, & Sørensen, 2007; Jebb & Moore, 1999).

The American Heart Association, American College of Sports Medicine, American Diabetes Association, and the CDC recommend that school-aged children (6–18) engage in at least 60 min of

moderate to vigorous PA every day, to prevent chronic diseases associated with overweight and obesity and achieve desirable health and behavioral benefits (Strong et al., 2005).

However, under half of children aged 6 to 11 are reaching the recommended 60 min/day, and as few as 8% of adolescents aged 12 to 18 achieve this goal (Troiano et al., 2008). Schools can provide the perfect environment for a controlled intervention, and it is one place where youth are present consistently and in quantity. The most effective interventions for combating inactivity target children before inactivity develops in their adolescent years (Kulinna, Brusseau, Cothran, & Tudor-Locke, 2012). If effective, PA interventions for school-aged children help decrease sedentary behavior and combat childhood obesity.

Recess is an ideal and appropriate time during a child's day to target improvements in their PA (Beighle, Morgan, Le Masurier, & Pangrazi, 2006; Gavarry, Giacomoni, Bernard, Seymat, & Falgairette, 2003; Guinhouya, 2012; Kulinna et al., 2012; McKenzie, Marshall, Sallis, & Conway, 2000). Literature measuring PA during recess is extensive and has uncovered several trends (Ridgers, Saint-Maurice, Welk, Siahpush, & Huberty, 2011; Ridgers, Stratton, Clark, Fairclough, & Richardson, 2006; Stratton, Ridgers, Fairclough, & Richardson, 2007). Most important, boys are consistently more physically active than girls, and PA levels decrease as children progress toward adolescence (Sallis, 2000). The age-related decrease is likely related to increased screen time and decreases in the amount of PA available to adolescents during school hours (Brownson, Boehmer, & Luke, 2005). Researchers have also investigated ways to increase activity during recess (Blaes, Ridgers, Aucouturier, Berthoin, & Baquet, 2013; D'Haese, Van Dyck, De Bourdeaudhuij, & Cardon, 2013; Howe, Freedson, Alhassan, Feldman, & Osganian, 2012; Stratton & Mullan, 2005; Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2006). The interventions used in these studies vary from providing additional gaming equipment and improved boundary markings (Blaes et al., 2013; Howe et al., 2012; Stratton & Mullan, 2005; Verstraete et al., 2006) to limiting or decreasing playground population density (D'Haese et al., 2013).

Freedom of choice is a key factor in children's development of autonomy (Grossman, n.d.). When offered choices, children have

the opportunity to practice independence and responsibility while their health and safety is guarded by options that are controlled and monitored (Grossman, n.d.).

Zoned playgrounds are designed to facilitate activity that is governed by the participating students, rather than a member of the recess staff, which provides freedom of choice. Zoning a playground involves dividing the existing recess area into distinct zones. Each zone has a specific activity associated with it and additional equipment when necessary. Sedentary behaviors are removed as an option within the newly zoned playground. When sedentary behavior is removed as an option and a multitude of physically active choices are provided, an increase in PA is expected.

An insubstantial quantity of literature exists showing improved PA at recess with structured interventions (Howe et al., 2012; Maxim, 1997; Rowe, Schuldheisz, & van der Mars, 1997); however, no study has systematically and thoroughly investigated the impact of zoned playgrounds. In addition, no study has combined objective and observational measures of PA for zoned playgrounds.

The main purpose of this study was to compare changes in PA of youth during recess following zoning of a traditional playground. A secondary purpose was to investigate which zones elicit the greatest levels of activity for boys and girls. A tertiary purpose was to compare observational measures of PA to PA measured via pedometry.

Method

Participants and School Recruitment

Three hundred sixty-four (n = 364) third, fourth, and fifth grade students from two schools participated in the study. School A was a private institution with a similar percentage of boys and girls enrolled (85 boys, 75 girls). School B was a public institution comprising 111 boys and 93 girls. All assent and consent forms were approved by the University of Missouri institutional review board.

Instruments

Pedometers. A Walk4life Neo II (Plainfield, IL, USA) pedometer was used to assess PA during recess on a randomly selected subset of students (n = 49) from both institutions. The pedometer was set to zero and clipped to the waistline of each student on the midline

of the thigh inferior to the anterior superior iliac spine. Pedometers were collected at the end of recess when the students lined up to reenter their classrooms. Students who did not accumulate at least 5 step count days pre- and postintervention were removed from the data prior to analysis (n = 7). Validity "step tests" were conducted twice per week and involved the researchers to walk 100 steps with each pedometer. Pedometers were attached to right hip and the steps were continuous and in a straight line. Pedometers not within 90% or 10 steps were replaced. The researchers used step counts to compare PA before and after the intervention and to validate the System for Observing Play and Leisure Activity in Youth (SOPLAY; McKenzie et al., 2000; Rowe et al., 1997).

System for Observing Play and Leisure Activity in Youth (SOPLAY)

All students (n = 364; including the 49 with pedometers) were observed and categorized through SOPLAY pre- and postintervention for 10 days. The system is based on momentary time sampling (McKenzie, 1991; McKenzie et al., 2000; McKenzie et al., 1991). Boys and girls were assessed separately through SOPLAY scans of target areas (zones) during recess. During the scans, the PA of each student in a zone was coded as sedentary (S; lying down, sitting, or standing), walking (W), or very active (V). These activity codes have been validated by heart rate monitoring and allow for estimation of energy expenditure rates (McKenzie et al., 2000; McKenzie et al., 1991). Trained observers conducted SOPLAY observations. Observer training followed the recommendations of SOPLAY and consisted of 2 days of training led by the principal investigator. The first day consisted of familiarization with criteria for activity classification, scanning technique (left to right, girls followed by boys), and scanning speed (1 child/s). The second day consisted of several hours of watching videos provided by the creators of SOPLAY via the Active Living Research website.[1] Observers in training watched and categorized the children in the videos and cross-checked their observations against the activity levels until they obtained three observations in a row that were within 80% of the known activity.

SOPLAY observations during recess occurred 5 min after the start of recess, which ensured that all students were on the playground.

[1]https://activelivingresearch.org/soplay-system-observing-play-and-leisure-activity-youth

After the first observer recorded activity levels from each zone, a second observer conducted a reliability check. Reliability checks were completed for 16 days, which exceeds the recommended minimum of 20% of the total observations (McKenzie et al., 2000). On the other days, the principal investigator categorized participants independently using SOPLAY. Two observations per recess were conducted on these days. Interrater reliability was calculated on a subset of 85% of the observations at baseline and 80% of the observations at postassessment. This was due to inclement weather, as a zoned indoor recess plan was not a part of the study design. Reliability calculations required two observers to collect SOPLAY data during a given recess observation. Reliability was calculated using percent agreement and kappa coefficient for the three SOPLAY categories.

Intervention

During the intervention, the existing playground space was divided into six activity zones (Tables 1 and 2). Activity zones were selected based on available adult facilitation, likelihood for vigorous activity (running, jumping, changing directions), student interest, and emphasis on inclusion and improvement versus winning and losing (Murray & Ramstetter, 2013). Activity zones varied slightly between schools because of playground layout and available equipment and were similar but not identical. At both schools, five zones were set up for students to utilize a variety of games and activities were designed to develop teamwork, cooperation, and leadership skills. In addition, one zone was set up with a walking track and/or balance builders.

Before postintervention data collection, the students were introduced and oriented to the activity zones (zone orientation) while attending their normally scheduled weekly physical education class. This caused minimal intrusion into the students' academic schedules and still provided them time to warm up and participate in the normal physical education activity. Orientation covered proper activity zone use and zone locations and provided time to answer student and faculty questions.

Following preintervention data collection and zone orientation, the same activity zones that the students learned about during their weekly physical education classes were implemented during recess. Students were asked to participate in the associated zone activities,

Table 1
Zone Description and Equipment for School A

Zone	Game	Description	Equipment
1	Functional Movement Obstacle Course	Students use movable obstacles to create a course between the existing jungle gym and playground structure.	Foam rods, connectors, rubber cones of various heights
2	Basketball	A research volunteer facilitates the initial team creation and the students govern the game and keep track of the score.	Colored jerseys, basketballs
3	Walking Track and Balance Corner	Chalk was used to add stretching or calisthenic exercise checkpoints to the existing walking track. The balance corner was attached to the track, and students balance on two dome cones in a large circle while attempting to bound a rubber ball between opponents' legs.	Railroad chalk, rigid dome cones
4	Soccer	A research volunteer facilitates the initial team creation and the students govern the game and keep track of the score.	2 goals, youth soccer ball
5	Kickball	A research volunteer facilitates the initial team creation and the students govern the game and keep track of the score.	4 bases, rubber kickball
6	Castle Ball	A research volunteer facilitates the initial team creation and the students govern the game and keep track of the score. Teams defend their Hula-Hoop castle against the opponents' attack, without crossing the territory line.	6 Hula-Hoops, 10–16 3-in. rubber balls

Table 2
Zone Description and Equipment for School B

Zone	Game	Description	Equipment
1	Basketball	A research volunteer facilitates the initial team creation and the students govern the game and keep track of the score.	Colored jerseys, basketballs
2	Knock-Out Hopscotch-In	Students line up at the free throw line. The first two student shoot the ball at the basket. If the second shooter makes the shot before the first shooter, the first shooter is knocked out and must hopscotch while dribbling to get back in line. When a shot is made or a player is knocked out, the ball is passed to the next person in line and they can being shooting.	3 basketballs
3	Balance Corner and 4-Corner Switch	The balance corner was attached to the track, and students balance on two dome cones in a large circle while attempting to bounce a rubber ball between opponents' legs. In 4-corner switch, students line up at the corner of a square chalked out on the ground. Four students go to the corners of the square and another goes to the middle. The middle student yells "switch" and all five students must find a new corner to stand in. The student who does not get to a new corner quickly enough goes to the end of the line and the new student goes to the middle. Any disputes, use 1 game of rock, paper, scissors to decide a victor.	Railroad chalk, rigid dome cones
4	Imagination Free Play	Students create their own games using their imaginations.	
5	Functional Movement Obstacle Course	Students use movable obstacles to create a course between the existing jungle gym and playground structure	Foam rods, connectors, rubber cones of various heights
6	Drop That Cookie!	"Cookies" are left on the ground in this zone and the first students to pick them up begin the game. Students with a "cookie" are chased by those who did not. If tagged, the student with the "cookie" must drop it and another student can then pick it up. After a 5-second grace period, the new chase begins.	At least 3 mini rubber cones

but had the liberty to change zones at any time during recess. Each zoned activity was clearly indicated on a dry erase board in addition to color-coded signs positioned at the zone boundaries. In zones with concrete or asphalt surfaces, railroad chalk was used for zone marking. When necessary, zone implementation was carried out by the research volunteers and recess supervisory staff while the principal investigator conducted SOPLAY observations.

Students' recess activity was observed and measured via SOPLAY and pedometry simultaneously for 10 days after zoning. Because of the potential for activity zones to improve PA through novelty alone, observations from the first five days of the intervention served as a familiarization period. Data collected during the last 5 days of the intervention period were compared to data from the initial 5 days of baseline observations.

Statistical Analysis

A paired samples *t* test compared pre- and postintervention step counts. Subjects who did not produce step data for at least five days prior to and during the intervention were removed from analysis. The SOPLAY data from each observation day prior to and following zoning were combined, and the percentage of students participating in low or no activity (S, W) versus those categorized as active (V) was calculated. The researchers used McNemar's test to identify significant changes in children observed in low or no activity (S,W) compared to very active (V) children before and after zoning. For the McNemar analysis, the average number of students observed in low and no activity (S,W) were a combined average and coded as 0, and the number of students observed as very active (V) was coded as 1. Data from both schools were analyzed together. Statistical analyses were carried out in IBM SPSS statistics software (Chicago, IL).

Results

Playground Zones

Zones (Z; Table 1 and 2) were analyzed separately by school. At School A, Z1 consistently produced the highest number of children categorized as V, with the lowest number in Z5. At School B, Z6 was the most active and Z2 the least active. The zones that produced the highest number of V children differed for boys and girls at both institutions. At School A, Z1 was the most active for girls and Z2 was

the most active for boys. Z4 and Z6 proved the most active zones at School B for girls and boys, respectively.

Step Counts

Paired samples *t* tests were conducted for students wearing pedometers. Seven students did not record 5 days of traditional playground (TP) and 5 days of zoned playground (ZP) step counts. Therefore, step count data were analyzed for 42 students (21 boys, 21 girls). There was a statistically significant ($p < .05$) increase in steps on ZP (1,676 ± 547 steps) compared to TP (1,502 ± 452; Figure 1).

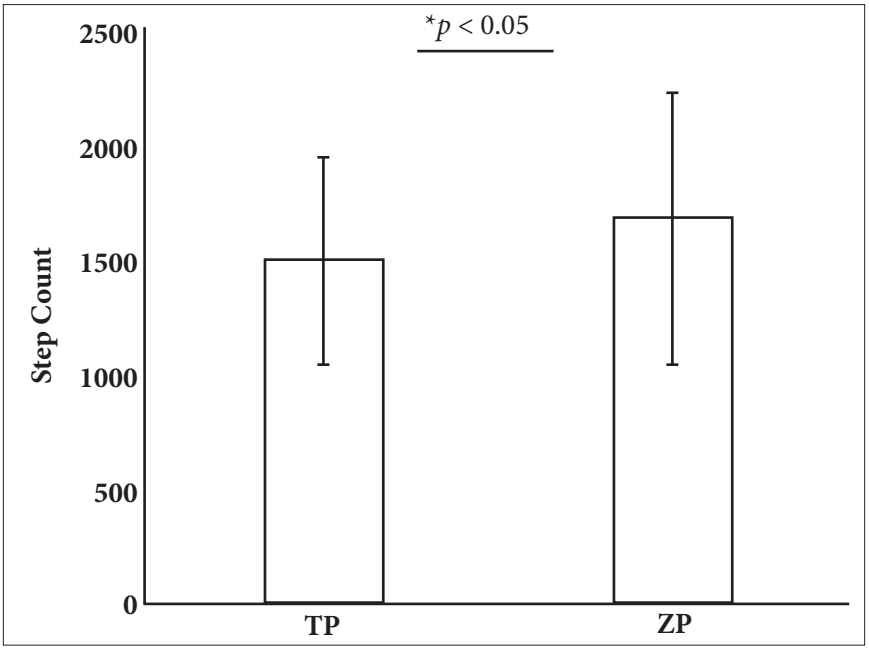

Figure 1. Comparison of step counts between traditional and zoned playgrounds. Significant differences were found between average number of steps achieved on TP (1,502 ± 452) compared to ZP (1,676 ± 547 steps).

Paired samples *t* tests compared TP and ZP differences in step counts for boys and girls separately. Mean step counts for boys and girls increased following zoning. The girls showed a 42-step increase on ZP (1,435 ± 459) versus TP (1,393 ± 451), which was not significant ($p > .05$). The boys displayed a statistically significant ($p < .05$) mean increase of 307 steps on ZP (1,917 ± 531) compared to TP (1,610 ± 436; Figure 2).

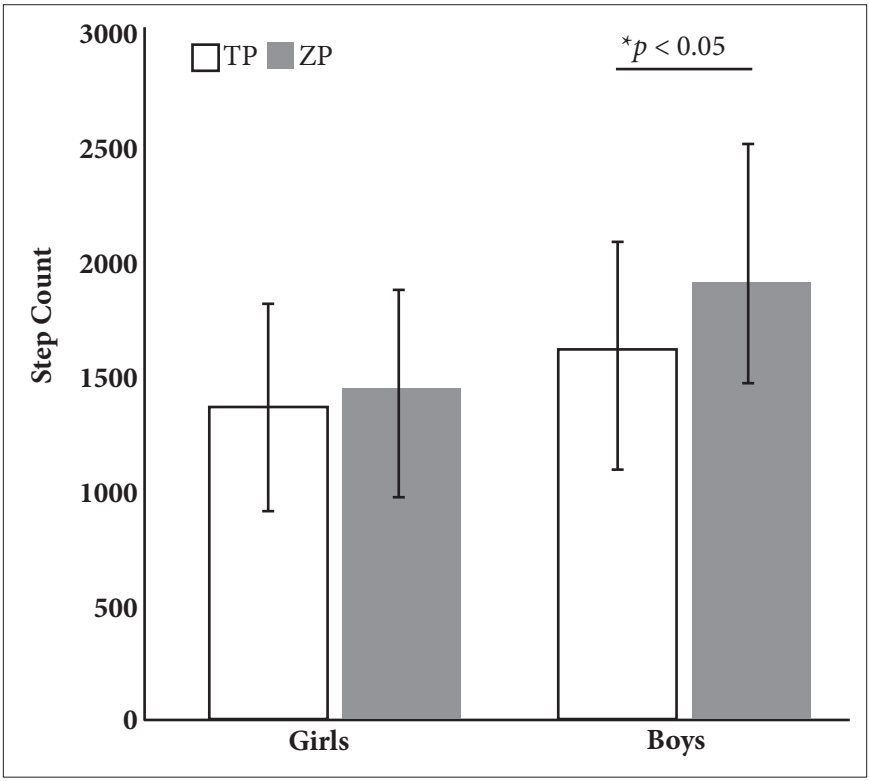

Figure 2. Comparison of average steps accumulated between boys and girls on traditional and zoned playgrounds.

SOPLAY

SOPLAY counts before and after playground zoning were compared. Changes in the percentage of students participating in S or W versus V were analyzed for significance. On TP, 79.4% of observed students participated in S or W and 20.6% participated in V during recess. On ZP, 30.6% of students were observed participating in V, with the number of students observed in S or W decreasing to 69.4%. The 10% increase in very active behavior on ZP was statistically significant ($p = .0001$; Figure 3).

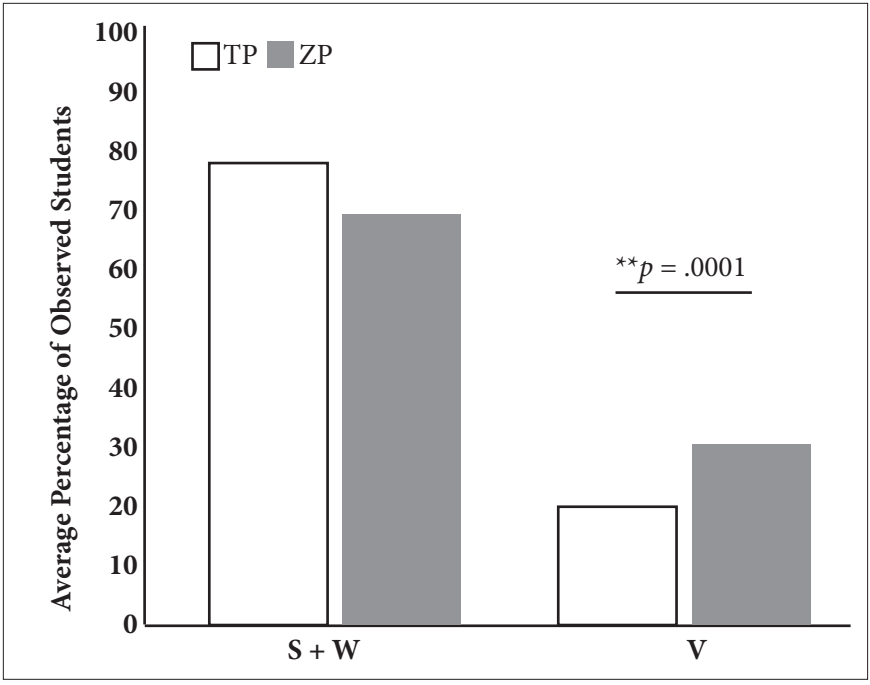

Figure 3. Comparison of SOPLAY counts on traditional versus zoned playgrounds.

When girls were analyzed separately, 83.8% were categorized for S and W on TP with 16.2% observed as V. Girls participating in very active behavior on ZP increased to 27.1%. The 10.9% change in girls' activity during recess was statistically significant (p = .0001). Boys were more active than girls with 75.4% of boys participating in S or W on TP, and 24.6% participated in V. On ZP, the percentage of boys participating in V increased significantly by 9.3% (p = .0001; Figure 4).

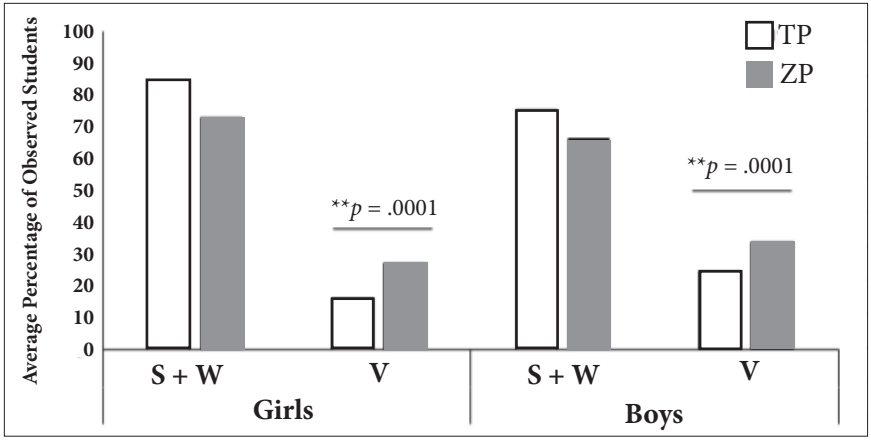

Figure 4. Comparison of SOPLAY counts between girls and boys on traditional and zoned playgrounds.

SOPLAY Reliability

Interobserver reliability estimates were calculated and agreement between observers for all SOPLAY observations were tested. Observer agreement was also tested for boys and girls separately. Kappa coefficients measured agreement between two testers, with a score over .80 indicating a substantial agreement (Shrout, 1998). There was a strong agreement between observers (Kappa .85, $p < .05$). A strong agreement between observers remained when observations for boys and girls were investigated separately (Girls: Kappa .93, $p < .05$; Boys: Kappa .92, $p < .05$).

Discussion

The primary purpose of this study was to investigate changes in PA during recess that may occur after zoning of a traditional playground. A secondary purpose was to determine which zones elicit the greatest levels of activity. A tertiary purpose was to compare an observational measure of PA (SOPLAY instrument) to PA measured via pedometry. Third, fourth, and fifth grade students were selected as the primary population of interest because PA decreases once students reach age 9 (Nader, Bradley, Houts, McRitchie, & O'Brien, 2008; Troiano et al., 2008). The researchers incorporated two schools to achieve adequate power to detect differences. This population is similar but larger than populations in previous recess research using

SOPLAY (Saint-Maurice, Welk, Silva, Siahpush, & Huberty, 2011). Observing playgrounds at two smaller schools versus one large school improved accuracy of data collection while also expanding the generalizability of the findings.

We found that ZP were very effective at increasing activity during recess (Figure 5). Most important, the intervention improved activity without removing freedom of choice from the students, which is vital in developing effective decision-making skills (Maxim, 1997). Past interventions that improved students' moderate to vigorous PA during recess often removed much of the students' ability to choose activities for themselves (Howe et al., 2012). In the youth and activity literature, the lack of student choice is rarely recognized as a limitation or study design flaw. Offering choice and increasing activity during a discretionary period is different. Our design and results clearly show that ZP increased activity while maintaining student choice.

Physical Activity on Zoned Playgrounds

The number and length of recess periods per school day is highly variable between schools. To compare this study to previous research, we extrapolated step counts of third and fourth graders during a single recess period (20 min; Erwin, Beighle, Noland, Worley, & Riggs, 2012; Tran, Clark, & Racette, 2013) to match our 25-min recess.

Following zoning, student activity during recess increased whether assessed via SOPLAY or pedometry for boy and girls. Both tools used to measure PA during recess uncovered trends similar to those in previous studies, with boys being more active than girls on TP and ZP (Ridgers et al., 2011; Ridgers et al., 2006; Sallis, 2000; Stratton et al., 2007). According to our observational measure (SOPLAY), children participating in very active behavior (V) increased on ZP versus TP by 10% (Figure 2). This is similar to the 9.6% increase in vigorous PA assessed by accelerometer following ZP reported by Huberty et al. (2011). The current data indicate that SOPLAY is a valid and reliable tool that researchers can use to assess PA of youth. Our SOPLAY findings are similar to those in previous SOPLAY research (Beets, Huberty, & Beighle, 2013; Saint-Maurice et al., 2011).

Even though boys were still more active than girls on ZP, girls underwent a larger increase in very active behavior (V) during recess

(Figure 4). Given that girls are habitually less active than boys, the fact that their activity increased similarly to that of the boys on ZP is encouraging. Step count data were in agreement with the observed SOPLAY data, showing a significant increase in average steps taken during recess. Students increased their steps by an average of 175 steps/recess on ZP compared to TP, again supporting that ZP is an effective intervention that should be considered as a means to increase youth activity (Figure 2).

Erwin et al. (2012) found that boys averaged 2,113 steps and girls averaged 1,523 steps during TP recess compared to 1,917 and 1,435 steps accumulated during ZP for the boys and girls, respectively, in our study. However, it is important to point out that in the Erwin study, students recorded their own daily step counts. A preferred method is to blind participants to step counts (Brusseau & Kulinna, 2014; Tran et al., 2013). The design flaw could have resulted in significantly elevated step counts. The children likely may have altered behavior to please the researcher or for competitive reasons. Tran et al. (2013) found that boys accumulated 1,601 steps during recess, with girls only achieving 1,220 steps. Boys and girls from the current study exceeded these averages following zoning, but not before. There is a large variability in the amount of activity that youth accumulate on different playgrounds and under different circumstances. Nevertheless, the current data show similar step counts to previous research, indicating validity of the pedometer data.

Zone Activity

Saint-Maurice et al. (2011) used SOPLAY to address a common shortcoming of studies investigating PA. This shortcoming was information about the conditions or settings (i.e., supervision and/or availability of equipment) that may encourage youth to be more or less active at recess. SOPLAY was used in the current study for similar reasons and allowed identification of zones that produced the most activity, measured as the number of children observed being very active (V) in each zone. After identifying which zones were the most active, we found several commonalities among zones. When active girls and boys were added together, the most activity occurred in zones that did not have teams and allowed room for creative strategy. The most active zones at Schools A and B were similar in layout and included a combination of open spaces and obstacles.

Zone activity for boys and girls was then analyzed separately. The playground zones that facilitated the greatest amount of activity differed for boys and girls, regardless of school. Girls at School A were similar to girls at School B in terms of the zones that encouraged the most activity. Although the activity zones were adjusted from one school to the next, girls at both schools preferred similar activities. Z1 and Z4 at Schools A and B involved the girls being the most active while participating in less structured activities in terms of teams and rules, with more freedom to alter the space and adapt their own rules and team dynamics. Both zones also contained one or more permanent play structures to incorporate (i.e., climbing structures, monkey bars, tunnels, slides, and bridges). For boys attending School A, the basketball zone resulted in the most activity. The boys attending School B also had a basketball zone, and it had the second highest observed activity level. However, the most activity for boys at School B was a zone called Drop That Cookie, which is explained in Table 2. Despite boys from Schools A and B being most active in different zones, both zones had a lot of similarities. Both games had competitive aspects and allowed for physical contact. The conclusion might be drawn that boys are most active in zones that allow for more contact/roughhousing with a distinct and well-understood set of rules to minimize arguments or disputes.

These data indicate a clear difference between boys and girls in the zones that facilitate the most activity. A majority of boys were most active in zones with more structured games that allow for traditional teamwork and physical contact, whereas most girls shied away from this type of activity. Girls were most active in zones with less structure and with freedom to adapt and adjust the games they play. It is important for future application of ZP that several activities that meet the description of the aforementioned environments are provided.

Indoor Recess on Zoned Playgrounds

One of the leading problems schools face is how to handle recess when the weather does not permit outdoor activity. It is imperative, not only to subject compliance, but also to general success of the intervention, that zones are implemented consistently. Skipping recess because of inclement weather should not be an option. An indoor recess plan can help youth master the different zones and

improve activity on the playground when students can play outside. Unfortunately, schools in this study did not include indoor recess. Plans for an indoor recess that facilitates activity, rather than limiting it, could greatly affect daily PA levels. With planning and organization, many of the outdoor recess zones can be used indoors on a smaller scale. Future studies should include comparisons of indoor zoning versus outside zoning recess.

Limitations

This study suffers from several limitations. A small shortcoming to this study is that the number of students who wore pedometers was small (n = 42). Being able to collect quantitative data on all students would have strengthened our conclusions. Nevertheless, enough statistical power was present for us to detect differences and evaluate the SOPLAY tool.

A second limitation is in how the SOPLAY was administered. The tool is designed to investigate the intensity of activity within different activity areas. It is not designed to follow a particular student over time. Therefore, it is impossible for us to know if the increased percentage of active children observed during recess on ZP occurred in a linear fashion. In other words, we could not assess if children from the sedentary category (S) were moving into the walking category (W) and those previously observed in walking behavior were moving into the very active category (V). Nor does it address if the change in student activity following ZP was more sporadic. Having pedometers and/or accelerometers on students before and after zoning and using a repeated measures statistical design would have resulted in stronger data.

Additionally, we did not compare disciplinary action before and after zoning. Previous research shows improved behavior and decreases in disciplinary action with more activity (Murray & Ramstetter, 2013). This is true during recess itself and throughout the school day. We theorize that the increased activity with zoning may have resulted in improved student behavior and less disciplinary action needed. Future research should investigate disciplinary issues before and after zoning as an increase in improved behavior could result in an additional advantage to utilizing ZP.

Conclusion

ZP can be used as a simple and effective strategy to reduce sedentary behavior and increase activity during recess. Schools should consider zoning playgrounds and offer zones that cater to boys and girls. They should also develop an indoor recess plan for implementing some or all of the zones during times of inclement weather. Zoning takes effort, communication, and time, but appears to make a difference in youth activity levels. Interventions, both within and outside of school, aimed at improving activity levels and changing behavior will help to quell the obesity epidemic. Future research might examine the effects of playground zoning on academic performance, injuries during recess, and improved behavior.

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