

RESEARCH ARTICLE

Differences in Children's Recess Physical Activity: Recess Activity of the Week Intervention

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ABSTRACT

BACKGROUND: The increased prevalence in recent childhood obesity rates raises concern about youth health and the role that lack of physical activity plays in this trend. A focus on how children today choose to spend their discretionary time is one approach that may yield ideas for how to reduce childhood obesity. The purpose of the present study was to examine whether 3 separate recess activities of the week (RAWs) would make a difference in children's discretionary time physical activity levels.

METHODS: Children (N = 65: 30 boys, 35 girls; 32 first and second graders; 33 third and fourth graders; 45 healthy body mass index [BMI], 20 overweight BMI) at 1 Midwest elementary school wore pedometers for each 15-minute morning recess period for 4 weeks. Following 1 no RAW (#1), a new RAW was introduced each subsequent week: #2, circuit course; #3, obstacle course; and #4, Frisbees.

RESULTS: Repeated measures factorial analysis of variance results revealed that children were significantly more active during the no RAW and circuit course week than the Frisbee week. Males were significantly more physically active than females during the obstacle course week. Older children were significantly more active during the Frisbee week than younger children. Healthy BMI children were significantly more physically active during the circuit course week than children in the overweight/obese BMI category.

CONCLUSIONS: Results imply that it is important for schools to consider demographic factors in the creation of recess opportunities to increase physical activity.

Keywords: physical fitness and sport; child and adolescent health; program planning.

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The prevalence of overweight and obese children is a growing concern in the United States. Data from the 2 most recent National Health and Nutrition Examination Survey (1976-1980 and 2003-2006) show that the pervasiveness of obesity has increased. For children aged 6 to 11 years, prevalence has increased from 6.5% to 17.0%.¹⁻³ This increase raises concern about youth health and the role that lack of physical activity may play. There is substantial evidence for the relationship between low levels of physical activity and the increase in overweight and obesity among children. For example, despite the recognized importance of a healthy weight and regular physical activity, results from the National Survey of Children's Health⁴ indicated that some children are still more likely than others to get regular exercise and maintain a healthy weight.⁵ A focus on how physically active children are during their discretionary time is 1 approach that may yield ideas for how to reduce childhood obesity.

Recess is a regularly occurring "free choice" or discretionary time period in elementary school children's days that is currently overlooked as an opportunity to help them discover enjoyable physical activities and increase their motivation to engage in more movement, thereby forming habitual physical activity patterns that potentially reduce obesity. Children today have increasingly structured lives, and recess is becoming one of the few time periods available for them to choose to be physically active on their own accord. Increased physical activity during recess would help children begin to meet the Healthy People 2010⁶ and the Surgeon General's⁷ recommendation of 30 to 60 minutes of activity on all or most days of the week. In addition, daily recess is a necessary part of the elementary school experience that allows children to develop physical competence, health-related fitness, personal and social responsibility, and enjoyment of physical activity so that they are more likely to become active for a lifetime.⁸

One line of research suggests that recess can play an important role in the learning and social development of children. Increased physical activity during recess has been shown to have the potential to improve children's productivity, concentration, and attention and behavior in the classroom, among children of both genders and those with attention deficit disorder.^{9,10} Physical activity during recess breaks has also been found to positively influence classroom management. The development of social skills, such as making choices, creating rules of play, and organizing games, as well as interactions with play partners are also benefits associated with recess.¹¹

Physical activity-based research findings suggest that recess can make a worthwhile contribution to the recommended 60 minutes of moderate to vigorous physical activity per day.¹²⁻¹⁵ Most research to date

indicates that boys are more active than girls during recess.^{12,15-18} However, findings further suggest that many children do not voluntarily engage in enough physical activity during recess to significantly increase their fitness levels.

Recent intervention research designed to increase physical activity levels at recess has revealed that multicolor playground markings¹⁹ as well as making game equipment available²⁰ are low-cost, short-term ways to boost physical activity. Another line of intervention inquiry indicated that children are more physically active during required, or structured, physical activity programs as compared with recess.²¹⁻²³ However, these findings more importantly suggest that required, or structured, programs are not beneficial for increasing or predicting physical activity levels during discretionary time such as recess. Despite the growing knowledge base on factors that potentially increase children's physical activity during the school day, gaps in understanding how to promote increased physical activity during discretionary time still exist. The purpose of the present study was to examine whether 3 different recess activities of the week (RAWs) would make a difference in children's free time or recess physical activity levels while still maintaining their autonomy.

METHODS

Participants

Participants were 65 elementary school children ($n = 30$ males, $n = 35$ females) from a medium-sized Midwestern town. Four students moved out of the school district before the completion of the data collection, and therefore 61 students completed the study. Children represented grades 1 through 4 ($n = 32$ first and second graders; $n = 33$ third and fourth graders). Twenty children had body mass index (BMI) equal to or above the 85th percentile (overweight or obese), and 45 children had healthy BMI less than the 85th percentile. Demographic data for the school at the time of data collection indicated that 89.6% of the students were Caucasian, 6.2% were Asian/Pacific Islander, 3.9% were African American, and 0.4% were multiracial. The percentage of children at this school designated as low income (ie, come from families receiving public aid, are supported in foster homes with public funds, or are eligible to receive free or reduced-price lunch) was 24.7%. The sample of participants in the present study was representative of the school demographics.

Recess Environment

The school playground was a hardtop surface, approximately 50 feet by 60 feet. This space was primarily intended for use by the middle school students, but was being used by the elementary

students while construction was being completed on a new gymnasium for the school. The playground had 4 basketball hoops, a large swing set with 6 swings, a jungle gym, and 4 four square courts, as well as open grass space for free play. The children had access to the entire playground. Recess time was provided based on age groupings. Kindergarten through second-grade classes had a 15-minute recess period in the morning (when the pedometers were worn), and the third-through fourth-grade students took their 15-minute recess period at a different time in the morning. At any given recess period, the approximate number of children on the playground at 1 time ranged from 50 to 150 students with 1 teacher supervisor. During the study, 1 to 2 researchers were present as well.

Instrumentation

Pedometers. Yamax (San Antonio, TX) Digiwalker DW-701 pedometers were utilized to assess number of steps taken by the participants. Schneider et al.²⁴ compared the reliability and validity of 13 brands of pedometers over a 24-hour period. The Yamax Digi-Walker DW-701 was found to be in the category of the most accurate pedometers used in the study and appropriate for use with children.

Demographic Survey. Parents completed a demographic questionnaire that included questions about child age, grade, and gender during the recruitment process. Participants were recruited during the school registration period, and therefore those parents who signed consent forms at the registration were also asked to complete demographic questionnaires for their participating children. Children in first and second grades were combined to reflect younger elementary level child and those in grades third and fourth represented the older elementary level. Children were grouped in this manner to reflect overall developmental changes that occur at approximately 8 years of age.^{25,26}

Body Mass Index. Heights and weights for each of the participants were measured by 2 of the researchers. BMI percentiles were calculated on the Centers for Disease Control and Prevention BMI-for-age growth chart²⁷ to obtain BMI score and corresponding BMI-for-age percentile for each child. This calculator is considered appropriate for children and teens, aged 2 through 19 years old. Children's BMI-for-age percentile was subsequently coded into the categories of healthy weight (5th percentile up to the 85th percentile) and overweight or obese (85th percentile or greater) for subsequent analyses. No children in the present sample were underweight (<5th percentile).

Interventions

RAWs were designed to provide children with a new physical activity choice each week. Following 1 week of baseline data collection, each subsequent week a new RAW was introduced for a total of

3 unique RAWs. During each RAW, children were encouraged by the teacher supervising recess or researcher to try the activity, but had a choice as to whether they did or not. Because the purpose of the intervention was to determine if the presence of a new activity option affected children's physical activity accumulation, the RAW-related equipment was placed on the playground prior to the start of recess, and once the activity was explained, students could choose to participate or not. All activities were intended to promote self-determination of free time physical activity so children (a) could choose how they wanted to be active (ie, autonomy), (b) had opportunities to connect with other students (ie, relatedness), and (c) had opportunities to improve abilities in the physical domain (ie, competence).²⁸

No Intervention (RAW #1). Week 1 was considered a no-intervention week and coded as RAW #1. Children wore pedometers and were encouraged to play as they normally would during their morning recess period of time.

Circuit Course (RAW #2). The first RAW used during recess was a circuit course which resembled walking/fitness trails used in public recreation areas. The components of the circuit course included 4 different fitness stations: jump ropes, large playground balls, bean bags, and hula hoops. Students could choose to use the equipment in any way they chose, provided it was deemed safe (eg, if students began throwing bean bags too hard at one another, they were asked to stop the behavior and throw more softly) and that they kept the equipment in designated areas.

Obstacle Course (RAW #3). The second RAW implemented was an obstacle course that was placed on the periphery of the playground area so as to not interfere with other playground equipment or games (eg, four square, basketball). The children were told the location of the obstacle course as they came onto the playground, and large signs were placed on the playground to indicate where the equipment was placed. The components of the course included 4 different obstacles through which the students had to navigate: a zigzag balance beam, a hula hoop "tire course," poly spots, and jump ropes. This RAW provided the opportunity for children to try to get through the obstacle course, but no time or competitive elements were attached to their participation.

Frisbee (RAW #3). The final RAW incorporated the opportunity to use Frisbees in a variety of ways. A total of 30 soft Frisbees of various colors (red, green, blue, yellow, orange, and purple) were made available to the students at recess, and targets (eg, such as those used for Frisbee golf courses) were provided. Students could choose to throw Frisbees in groups of 2 or more, for total distance, at the Frisbee targets, or at any other inanimate targets on the playground (eg, a large tree at the edge of the playground).

Procedure

University institutional review board and school district approval were obtained prior to commencement of the study. Following the administrative approval, parental consent forms were distributed by researchers and administrative staff at the target school during beginning of the year registration. All children whose parents provided written consent for their study participation were given a description of the study, an opportunity to ask questions about participation, and subsequently asked for their own verbal assent by one of researchers in the presence of their homeroom teachers.

In the week immediately preceding the first week of pedometer data collection, the participant height and weight data were assessed during children's physical education classes by 2 researchers. Researchers also instructed participants on how to wear the pedometers and demonstrated proper use of the pedometers during this week. Children were instructed not to shake the pedometers and told that they would not be allowed to know their step totals until the end of the entire data collection period. Children were given the opportunity to practice and become familiar with the pedometers during the week prior to frequency of physical activity during recess data collection. Pedometers were marked with an individualized code so that data could be linked with each participant demographic data.

Participants wore sealed pedometers on their waist for 5 consecutive weekdays of 15-minute morning recess period for 4 consecutive weeks, which included the week of baseline and the 3 intervention weeks. The teachers of each class distributed the pedometers to participants each day during the subsequent 4 weeks of data collection before the children exited the school building to go to the playground for recess. Teachers, who also served as recess monitors on a rotating basis, were instructed to continue with management of

recess in the same manner as prior to study initiation. Each day children were asked to line up by class before re-entering the building, at which time the researchers collected the pedometers in plastic bins for each class. Pedometers were then unsealed, step totals (data) were recorded, reset, resealed, and placed back in a plastic bin and returned to each classroom.

Data Analysis

Pedometer data were analyzed to represent frequency, as measured by step counts, of recess physical activity with mean scores for 5 days of recess data collected each week for a total of 4 weekly mean score values for each participant. Mean weekly step counts were based on an average of at least 3 days of pedometer data per child. All analyses were performed with SPSS 16.0 (SPSS, Inc, Chicago, IL). Descriptive analyses consisted of means and standard deviations of recess physical activity as measured by step counts according to gender, elementary level, and BMI category. Repeated measures factorial analysis of variance was conducted to determine whether differences existed in the frequency of children's physical activity level during recess between the different weeks according to demographic variables.

RESULTS

Descriptive Findings

Across all 4 weeks of intervention, children (N = 65) obtained a mean of 870.67 steps (SD = 249.5) during the 15-minute morning recess period. Children's accumulation of steps ranged from a minimum of 304.8 to a maximum of 1527.6 during the 15-minute morning recess period. Overall step means and standard deviations, as well as for each separate week by gender, elementary level, and BMI/weight status are reported in Table 1. Males were more physically

Table 1. Descriptive Statistics for Overall (All 4 Weeks Combined) and Each Week of Physical Activity by Demographics (Gender, Elementary Level, and BMI)

	Overall (4 weeks) mean step count \pm SD	Week #1 mean step count \pm SD	Week #2 mean step count \pm SD	Week #3 mean step count \pm SD	Week #4 mean step count \pm SD
Overall	870.67 \pm 249.5	961.9 \pm 311.4	930.5 \pm 360.5	869.8 \pm 8	764.5 \pm 335.6
Gender					
Males (n = 35)	909.6 \pm 257.4	994.3 \pm 298.2	983.1 \pm 387.1	944.5 \pm 339.2	734.1 \pm 364.9
Females (n = 30)	825 \pm 236.1	908.2 \pm 321.9	880.3 \pm 330.5	733.3 \pm 274.0	776 \pm 321
Elementary level					
Younger (first and second grade) (n = 32)	819 \pm 205.3	869.8 \pm 270.8	917 \pm 363.4	877.6 \pm 319.3	627.8 \pm 288.4
Older (third and fourth grade) (n = 33)	920 \pm 280.3	1033 \pm 327.5	951.7 \pm 366.4	817.4 \pm 335	878.3 \pm 351.9
BMI (weight status)					
Healthy (n = 30)	912 \pm 249.9	940.7 \pm 348.8	1073.8 \pm 375.8	880.8 \pm 331	761.4 \pm 329.8
Overweight (n = 20)	810 \pm 258.2	908.7 \pm 285	982.5 \pm 374	856.6 \pm 350	728.5 \pm 374

BMI, body mass index.

active than females across all 4 weeks. During all 4 weeks older children were more physically active than their younger counterparts. Overall, physical activity was higher among children with a healthy BMI (<85%) as compared with overweight or obese children (BMI > 85%).

Comparison of Physical Activity Levels by RAW

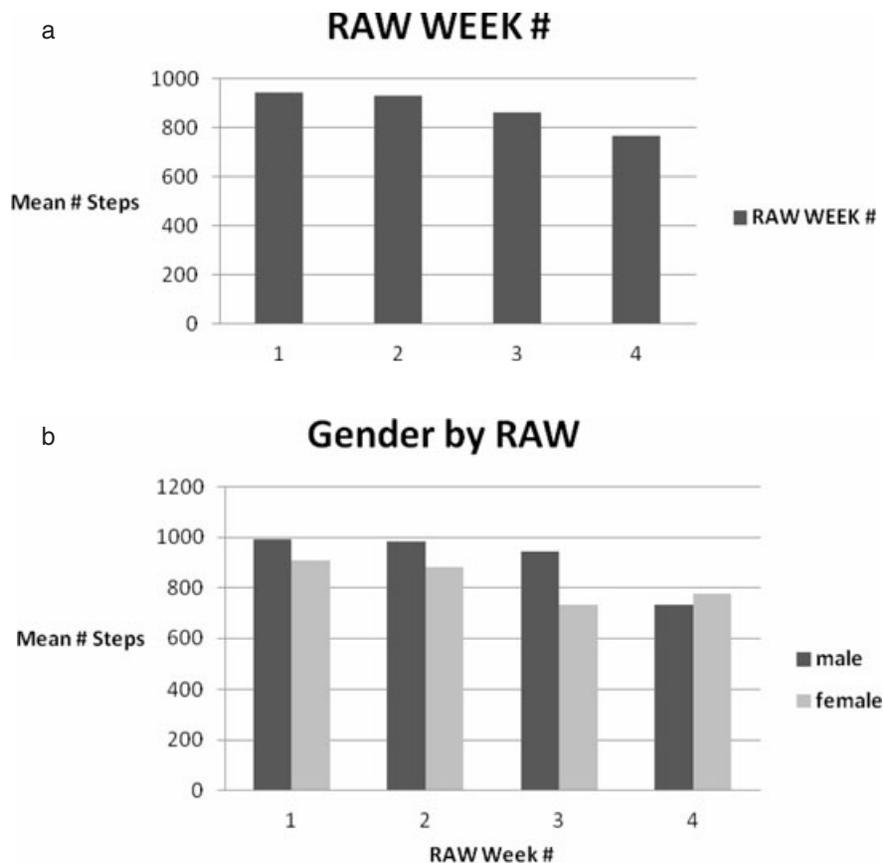
No significant interaction effects among demographic variables and mean step counts across the weeks of various recess activities (RAWs) were found. However, 4 separate significant main effects were found. A significant main effect was found ($F(3,59) = 6.9, p = .000$) across weeks or particular intervention/RAW. Children were significantly more active as measured by mean step counts during the no-intervention week (RAW #1) and circuit course week (RAW #2) than the Frisbee (RAW #4). A significant main effect also emerged for gender ($F(1,63) = 7.45, p = .008$). Male children were significantly more physically active than females during the obstacle course week (RAW #3). As indicated by another main effect for elementary level ($F(1,62) = 4.68, p = .034$), third- and fourth-grade children were significantly

more active than first- and second-grade children during the no-intervention week (RAW #1) and Frisbee week (RAW #4) ($F(1,62) = 9.7, p = .003$). Finally, children with a healthy BMI were significantly more physically active during the circuit course week (RAW #2) than children with a BMI in the overweight or obese category ($F(1,47) = 4.54, p = .038$). See Figure 1 for depictions of main effects for step counts by RAW, gender, elementary level, and BMI category.

DISCUSSION

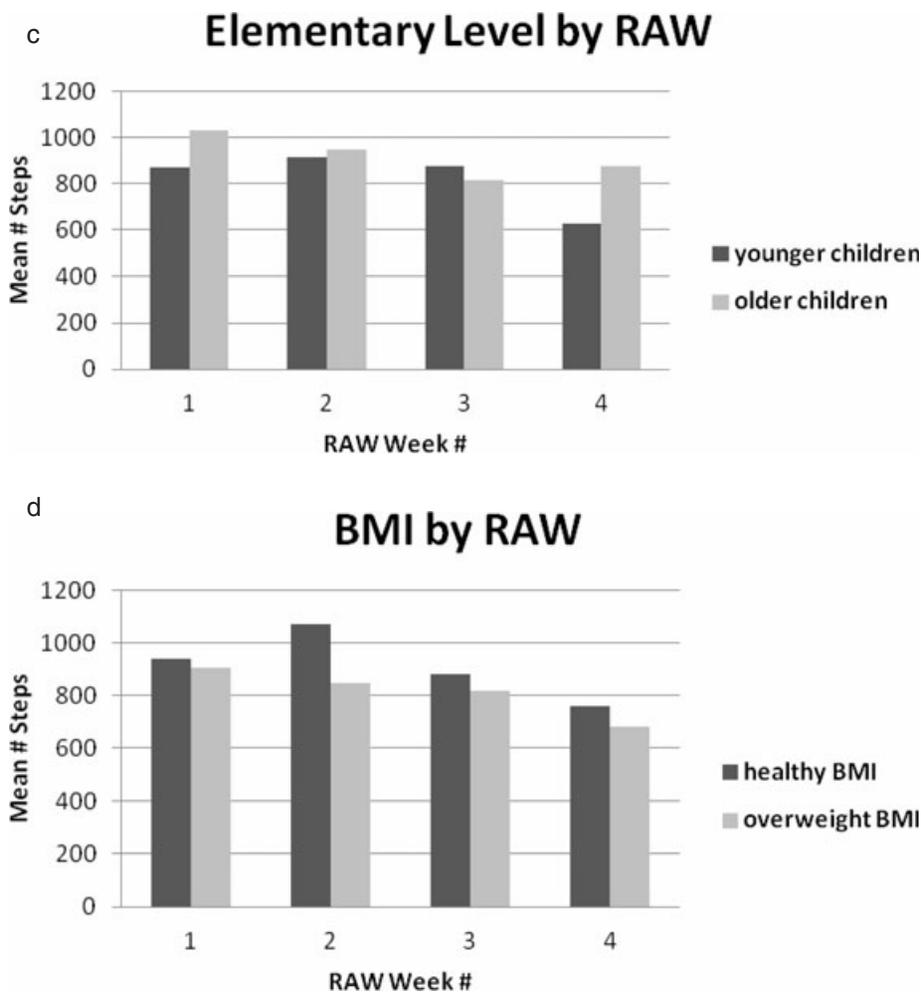
The purpose of the present study was to examine whether 3 different RAWs would make a difference in children's free time physical activity levels while still maintaining children's autonomy. To our knowledge, this is the first study to investigate how the availability of specific recess physical activity choices that rotated on a weekly basis impacted children's level of physical activity. This unique approach not only provided children with a new physical activity choice each week at recess but also it allowed students to choose to participate or not. Furthermore, the findings of this study expand the knowledge about recess physical

Figure 1. Mean Step Counts for (a) Week of RAW, (b) Gender by Week, (c) Elementary Level by Week, and (d) BMI by Week



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Figure 1. (Continued from previous page)



activity levels according to additional demographics such as BMI and elementary grade level.

Pedometer research has previously reported that children averaged 1090¹² and 1250²⁹ steps in a 15-minute recess. Children in the present study averaged fewer (870.67) steps in a 15-minute recess. This difference may be due to the fact that the current investigation, unlike previous research mentioned above, did not include fifth graders who tend to be more active than younger children. Consistent with previous research, the present study found that boys were more active than girls; however—unlike previous findings—this difference was not significant. Current findings may suggest that RAW choices closed the gap between boys and girls physical activity levels at recess or that a difference among boys and girls physical activity levels is difficult to detect in children grades 1 to 4.

Interpretation of the comparison of RAWs revealed that children took significantly more steps during the no-intervention week (RAW #1) than the Frisbee

week (RAW #4) as well as more steps during the circuit course week (RAW #2) than the Frisbee week (RAW #4). This finding suggests that perhaps because Frisbee is a complex skill, it might have required more than a week's exposure for increased physical activity to be evidenced. Additionally, the use of pedometry as the mode of assessment may have fallen short in measuring the upper body-based physical activity necessitated by throwing a Frisbee. Due to these unique aspects of the Frisbee week (RAW #4), it is logical that children accrued more steps during the weeks where they experienced no intervention (RAW #1) or the opportunity to engage in a circuit course (RAW #2). Examination of RAWs by gender revealed that male children were significantly more physically active than females during the obstacle course week (RAW #3). This finding implies that males and females may not necessarily be attracted to the same activities as variability in steps by week was apparent. The obstacle course was a challenge and opportunity for moderate to vigorous physical

activity which elicited more steps from boys than girls. Although not significantly different, girls took more steps than boys during the Frisbee week, which provided for opportunities to throw for distance and at targets while working with a partner. This less vigorous and more social RAW elicited more steps from girls than their male peers.

Unlike most previous research, this study examined RAWs by elementary grade level. Grades 1 and 2 were combined to represent the younger elementary level, and grades 3 and 4 represented the older elementary grade level. Overall, children in grades 3 and 4 were more active than their younger counterparts. This may imply that the RAWs were not developmentally appropriate (eg, size of hoops, balls) and therefore created limited opportunity for younger children to increase physical activity levels (eg, Frisbee might not be attractive because it is too difficult, hula hoops too big). This rationale is supported by children in grades 3 and 4 not only being more active overall but also by the fact that they were also significantly more active during the Frisbee week. Additionally, children in grades 3 and 4 were significantly more active during the no-intervention week than first- and second-grade children. This too suggests that the characteristics of the playground and perhaps even regularly available equipment did not meet younger children's needs. Children in first and second grades may not have achieved the skills needed to engage in choices available at recess (eg, playing a game of basketball).

Interestingly, although not significantly different, children in grades 1 and 2 were more active during RAW #3 (the obstacle course). Perhaps the obstacle course captured and maintained the interest of younger children because the skills were not too complex; therefore they experienced a certain degree of success as compared with Frisbee or actually hula hooping in the circuit course. It may also be important to point out that the obstacle course was presented as a challenge with the goal being to get through the course. As a result, the object of the activity was made clearer giving the obstacle course more overall structure than other RAWs and thus perhaps more enticing to children in first and second grades.

Consistent with predictions, healthy weight children were more active than children in the overweight/obese category. This result serves as evidence for the belief that heavier children choose to be less active in their discretionary time. Healthy weight children were significantly more active during RAW #2, the circuit course. Although not significant, heavier children were more active during the no-intervention week (RAW #1) as compared with other weeks. These findings suggest that RAW choices may not have created opportunities for overweight children to make appropriate physical activity choices.

Limitations of the present study should be mentioned. First, only step counts were acquired due to the particular model of pedometers used. While the pedometers used were considered valid and reliable for use with children, much of the current research uses objective measures of physical activity that allow for retrieval of activity time (eg, accelerometry) and other indicators of physical activity (eg, direct observation) unfortunately not acquired in the present study. Second, each RAW was only available for 1 week and then it was removed as an option for participation during subsequent weeks (eg, circuit course was available during the second week but not available during the third or fourth week of intervention). The limited time that each RAW was available might not have been enough time to generate interest among various subgroups of children (eg, Frisbee might have needed to be available for more weeks to interest younger children) and ultimately create higher levels of physical activity. Last, in the present study data were not gathered on which children actually chose to participate in any particular RAW. Future research could easily measure children's choice, or lack thereof, to participate in each RAW, and subsequently better understand the effects on physical activity levels.

Conclusions

Consistent with the extant research on children's physical activity during discretionary time, findings from this study indicate that recess can be a valuable opportunity that contributes to children meeting daily physical activity recommendations.^{12,30} Results imply that it is important for schools to consider factors such as elementary level, BMI, and gender in the creation of recess physical activity opportunities. As suggested in the results, any one RAW did not create conditions for increased physical activity for all children. For example, male children were significantly more active than females during the obstacle course week. Children in grades 3 and 4 were significantly more active during the Frisbee week than younger children. Children with a healthy BMI were significantly more physically active during the circuit course week than children with a BMI in the at-risk for overweight category. Therefore, a one size fits all approach to promoting physical activity during recess must be avoided. Instead, children should be provided opportunities to make developmentally appropriate choices about the nature and type of their own physical activity behavior. Most people, when given a chance, will make appropriate skill-level choices and in turn experience a heightened sense of autonomy.³¹ These findings set the foundation for future investigations focused on children's activity choices during discretionary time at school.

IMPLICATIONS FOR SCHOOL HEALTH

Because schools are increasingly encouraged to provide opportunities throughout the day for children to engage in physical activity, such as through physical education, recess, and classroom-based physical activity breaks, it is important for school health practitioners to understand “what works” to increase children’s physical activity. Given the prevalence of childhood obesity and overweight in the United States, exploring alternative options for increasing children’s physical activity should be a focal point for all educational professionals. Schools may potentially impact the health of children by providing quality recess opportunities designed to increase physical activity levels. The present study can be used to inform these school-based health promotion practices.

Educational professionals in the role of decision making must remain committed to the inclusion of recess time during the school day for all elementary students in order to allow them the opportunity for free time play and physical activity. Evidence from the present study demonstrated that regardless of the RAW, children accumulated physical activity that they would not have accumulated had they not been allowed to go outside to participate in recess (averaging 870.67 steps per 15-minute recess period). Furthermore, when providing the opportunity for children to have recess, the conditions need to be those that actually promote increased physical activity. Our data suggest that children will be more physically active during recess if given choices that accommodate their individual differences, activities, and equipment that are appropriate for gender, age, and weight status preference, and allowed increased time to experiment with the challenges presented by novel activities. Results from this study serve as an important guide for school health practitioners to design intervention programs that enhance children’s motivation to be physically active during recess, while still maintaining children’s autonomy, and thereby help reduce the steadily rising childhood obesity trend.

Human Subjects Approval Statement

This study was approved by the University of Northern Colorado and Southern Illinois University Carbondale institutional review boards.

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- Seminole Tribe of Florida, 6300 Stirling Road, Hollywood, FL 33024

Gold Endowment Partner

- College of Public Health, University of South Florida, 13201 Bruce B. Downs Blvd., MDC 56, Tampa, FL 33612
- Dept. of Applied Health Science, Indiana University, HPER 116, Bloomington, IN 47405
- GOJO Hand Hygiene Program, GOJO Industries, PO Box 991, Akron, OH 44309-0991
- School Kids Healthcare, 1711 Paramount Court, Waukesha, WI 53186
- Teenvillage.org
- The Prevention Researcher, 66 Club Road, Suite 370, Eugene, OR 97401

Silver Endowment Partner

- American Cancer Society, 3709 West Jetton Ave., Tampa, FL 33629
- The SPARK Programs, 438 Camino Del Rio South, Suite 110, San Diego, CA 92108

Sustaining Partner

- College of Health and Social Services, New Mexico State University, PO Box 30001, MSC 3446, Las Cruces, NM 88003
- National Association of State School Nurse Consultants (NASSNC); www.nassnc.org
- Susan Spalt, Carrboro, NC

Century Partner

- Risse Brothers, 1710 N. Hercules Ave., Clearwater, FL 33765

AMERICAN SCHOOL HEALTH ASSOCIATION

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