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Evaluating a Peer-Implemented Intervention for Increasing Physical Activity During School Recess

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Applied Behavior Analysis
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DEDICATION

I dedicate this manuscript to my parents, Jayver and Fabiola, and my brother, Andy. Thank you all for your help and support throughout this whole process.

ACKNOWLEDGMENTS

I would like to acknowledge my thesis advisor, Dr. Raymond Miltenberger, for his time, guidance, and constructive feedback throughout the thesis process. I would also like to acknowledge Heather Zerger for her guidance and assistance. Finally, I would like to acknowledge Jessica Hoofman and Elizabeth Alsina for the time and effort they put into assisting me. Thank you all for your support.

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ABSTRACT

Physical inactivity is a significant issue in the United States that has been linked to multiple health concerns. Few studies have used behavioral interventions during opportunities available in school, such as recess. There is a need for low effort and accessible interventions to increase children's physical activity during these opportunities. The purpose of the current study was to evaluate the efficacy of a peer-implemented recess intervention that uses student pairing and feedback to increase physical activity. Step count was recorded by a pedometer. Peer leaders were trained in a group using behavioral skills training. A new leader performed the task-analyzed duties each week of intervention. An ABAB reversal design was used to evaluate the efficacy of the intervention. The results were mixed across the participants, but generally this study did not achieve experimental control in an ABAB design.

INTRODUCTION

With physical inactivity being a prominent contributor to mortality rates of the general population, there is a need for programs to increase activity levels (World Health Organization, 2017). The Centers for Disease Control and Prevention (CDC) (2015a, 2015b) recommends children engage in a daily minimum of 60 min of moderate- or vigorous-intensity exercise, such as brisk walking, low resistance biking, running, or jumping rope. Engaging in such activity can help mitigate health risks associated with low physical activity levels, including obesity, heart disease, and Type 2 diabetes (CDC, 2015c).

Children spend most of their waking hours at school, with the United States average being 6.64 hours (National Center for Education Statistics, 2010). This time in school creates the opportunity, such as during recess, for children to engage in physical activity. During recess, children can complete up to 40% of their daily-recommended activity (Ridgers, Stratton, & Fairclough, 2006). Although recess presents an ideal opportunity for promoting physical activity, only 58.9% of United States school districts required and 34.2% of United States school districts recommended regularly scheduled recess for elementary school students (CDC, 2012). Based on data from the latest reports, 90% of United States elementary schools have students participating in regularly scheduled recess (CDC, 2014). However, baseline data of session-based behavioral intervention studies (Hayes & Van Camp, 2015; Hustyi, Normand, & Larson, 2011; Zerger, Miller, Valbuena, & Miltenberger, 2017) demonstrate step counts or step rates that typically fall below the moderate-to-vigorous physical activity levels needed to meet the children's recommended daily levels of physical activity. Therefore, there is a need for low

effort and accessible interventions to increase children's physical activity during these opportunities available in school.

Research has demonstrated the use of automatic recording devices to measure physical activity in school settings (Erwin, Beighle, Morgan, & Noland, 2011; Hayes & Van Camp, 2015; Hustyi et al., 2011; Kuhl, Rudrud, Witts, & Schulze, 2015; Miller, Valbuena, Zerger, & Miltenberger, in press; Reznik, Wylie-Rosett, Kim, & Ozuah, 2015; Stewart, Dennison, Kohl, & Doyle, 2004; Zerger et al., 2017). Automatic recording devices are accessible and less intrusive, as a researcher does not need to directly observe the behavior at all times. These devices have allowed for the growth of behavioral interventions involving physical activity, with pedometers and accelerometers used as data collection methods. Behavioral interventions using such recording devices have been effective in increasing physical activity across different populations and settings (Kuhl et al., 2015; Normand, 2008; Valbuena, Miltenberger, & Solley, 2015; Wack, Crosland, & Miltenberger, 2014). These interventions have been evaluated in both 24-hour monitoring (Ek, Miltenberger, & Valbuena, 2016; Kuhl et al., 2015; Miller et al., in press; Valbuena et al., 2015; Washington, Banna, & Gibson, 2014) and session-based monitoring of physical activity (Hayes & Van Camp, 2015; Hustyi et al., 2011; Zerger et al., 2017).

Self-monitoring, goal setting, feedback, and contingency management, have been used to promote exercise during 24-hour monitoring (Normand, 2008; Valbuena et al., 2015). Self-monitoring alone has been demonstrated as an effective intervention (VanWormer, 2004). VanWormer (2004) compared self-monitoring alone and self-monitoring with email feedback, which consisted of reviewing the step count for the week, setting a new goal, and delivering praise. During the intervention, participants were able to access their pedometers. Self-

monitoring alone increased the step count for all three participants, and the email component further increased the step count for only one of the participants.

Normand (2008) evaluated an intervention with healthy non-obese adults that involved daily step goals and feedback in the form of email responses to participant step count reports. Email feedback consisted of researchers providing a graph and commenting on the participants' data, as well as providing praise or encouragement for their results. Results demonstrated increased step totals for three of the four participants. Valbuena et al. (2015) evaluated the effects of an intervention in which the Fitbit program was presented both alone and with a behavior coach to increase daily steps of overweight adults. The intervention involved self-monitoring, goal setting, feedback, and social support. The behavior coach provided reinforcement for meeting previously set goals. The Fitbit plus coach intervention resulted in increases in step count from baseline for six of the seven participants, while the Fitbit alone resulted in increases for only three of the seven participants.

Still, other researchers have evaluated contingency management procedures for increasing physical activity. For example, Kurti and Dallery (2013) evaluated the effects of an internet-based intervention, including self-monitoring, goal setting, and feedback, with and without contingency management to increase the step counts of physically inactive adults. Data were reviewed over 5 consecutive days, and participants had to meet their goals for at least 3 days to receive their monetary consequence and establish a new goal. Both interventions were effective in increasing step count. The contingency management intervention had all participants reach 10,000 steps, while the non-contingency management intervention had four of five participants reach 10,000 steps.

Although these methods have been successful in increasing physical activity during 24-hour monitoring, few studies have used behavioral interventions during opportunities available in schools, such as regularly scheduled recess (Hayes & Van Camp, 2015; Hustyi et al., 2011; Zerger et al., 2017). Hustyi et al. (2011) examined the effects of goal setting, feedback, and reinforcement on physical activity of two obese children. The goal for each child was placed on the pedometer while it was masked. Feedback involved a check-in halfway through the 20-min session. After the session, the researcher provided reinforcement, which included a prize for meeting his or her goal, or encouragement to meet his or her goal. Results for one participant showed an overlap in results across phases, while the other participant displayed some increases in physical activity.

Hayes and Van Camp (2015) evaluated a recess intervention, consisting of self-monitoring, goal setting, feedback, and rewards, to increase step count. Researchers distributed Fitbits to six 8-year-old students. Participants received step goals they could refer to throughout recess. Initial goals were determined by their stable baseline averages and were increased by 20% thereafter. For the final phase, the students were assigned three goals at a 20%, 30%, and 40% increase of their second stable baseline averages. After the session, they received praise and tangible rewards if their goal was met and received encouragement if their goal was met or not met. The intervention increased the step counts of these children.

Zerger et al. (2017) evaluated an intervention that did not rely on rewards for increasing physical activity during recess. Zerger et al. paired students during recess and provided feedback in the form of public posting of the pairs' total step counts from the previous session. Participants were able to access their pedometer throughout the session, and graphical feedback

was provided before the beginning of each session, including an announcement of the top three winning teams. Results of the intervention demonstrated an increase in the total class step count, as well as in steps for most participants. Zerger et al. provided an accessible and low effort intervention for children in school settings.

Hayes and Van Camp (2015), Hustyi et al. (2011), and Zerger et al. (2017) demonstrated that behavioral interventions can be effective in school settings during recess. Furthermore, Zerger at al. showed that interventions can be effective even when they do not include tangible rewards, therefore suggesting that interventions can be cost effective. However, accessibility in each of these studies is limited in that researchers implemented the intervention. If teachers or students implemented these interventions, it would increase their accessibility given that research has demonstrated the effectiveness of peer-mediated interventions in schools (Chan et al., 2009; Chang & Locke, 2016; Kaya, Blake, & Chan, 2015; Watkins et al., 2014). The purpose of the current study was to evaluate the efficacy of a peer-implemented recess intervention that used student pairing and feedback to increase physical activity.

.

METHOD

Participants and Setting

Fourteen students, six boys and eight girls, ages 9 to 12, attending a private Montessori school with pre-K to elementary grades in a large Southern U.S. city, participated in the study. The peer leaders, two boys and five girls, were ages 11 to 12. These students were all in one classroom, and there was a total of 21 students in the class. The participants' parents signed consent forms for their children's participation in the study. The consent forms reviewed the peer implementer's role and the time commitment both in training and implementation. The participants also provided verbal assent for participation in the study and for participation as peer implementers, or leaders, during the study. There have been three other physical activity studies at this school in a number of classes, so some of these participants may have participated in another study.

All sessions of this study took place during the regular recess time in the school's playground area, 3 days per week depending on their recess availability that day week due to other activities or weather allowance. Participants were not limited to a specific area of the playground or to the use of specific equipment. The playground area included a field, a picnic table, and equipment (e.g., soccer balls, bouncy balls, pool noodles, etc.). Typical recess activities included interacting with the materials provided (e.g., playing soccer, using the bouncy balls, swinging pool noodles at each other). Researchers made note of what equipment or activities were or were not available.

Materials

Participants were provided a pedometer (Model: Yamax DigiWalker SW-200) to be worn during each session to record their steps. This model was chosen based on its accuracy and reliability in structured and free-living conditions (Schneider, Crouter, & Bassett, 2004; Schneider, Crouter, Lukajic, & Bassett, 2003). These pedometers were worn at the hip on the participant's waist, belt, or clipped onto their pocket. Researchers provided folders containing data sheets for the leaders to record the individual step counts, team totals, and team rankings; a calculator to calculate the team totals; paper with a ready-made graph template for the team totals; and markers to create the graph. Researchers provided pictures of pedometers for training purposes.

Target Behavior and Data Collection

Step count was defined as the number of steps recorded by the pedometer during each session. Step counts were translated to steps per minute (rate) due to possible variability in session length and participant absence. Researchers recorded the session length and the number of steps recorded by participants' pedometers. Additionally, during intervention, researchers selected two participants each week to record the participants' step counts and team totals. The pedometers were reset before the next session began. Treatment integrity and social validity data were collected as well as the type of feedback given to the leaders during training. In addition to the treatment integrity of the training and the implementation, the researcher collected data on the length of the training sessions and the length of the leaders' daily implementation of the procedures.

Researchers calculated the team total by summing the step counts of the participants in assigned pairs. Individual mean rate was calculated by dividing each participant's step count by the session time. Class mean rate was calculated by dividing the sum of the individual rates by the number of participants in the session.

Interobserver Agreement

Two independent observers recorded the step count from the pedometer of each participant. Agreement was determined by both observers recording the same participant step count, team total, session time, mean rate for each participant, and class mean rate. These agreements were calculated by dividing the lower value by the higher value and multiplying by 100. The second observer recorded steps through in-person observation or by reviewing pictures of the participants' pedometers. Leaders were prompted if they wrote different results than the pedometer data to yield correct public posting results. Interobserver agreement between researchers was calculated for 35% of sessions with 100% agreement.

Social Validity

Following the completion of the study, participants completed a social validity questionnaire (see Appendix A) developed by the researcher. The participant questionnaire included seven statements to be rated on a 5-point scale (1 = strongly disagree to 5 = strongly agree). This questionnaire collected the participants' rating of how much they enjoyed participating, how much effort was involved, and how much they believe they benefitted from participating in the study. Following completion of the study, the leaders completed a separate questionnaire (see Appendix B), developed by the researcher, that also addressed how much they enjoyed being a leader, how much effort was involved, and the likelihood of continuing as a

leader. The two teachers completed a social validity questionnaire (see Appendix C), developed by the researcher, that addressed how much they enjoyed their class participating, how much effort was involved, and how much they believe their students benefitted.

Treatment Integrity

The leaders of the week were directly observed to determine treatment integrity. Treatment integrity was calculated by dividing the number of completed steps by the number of total steps in the recess task analysis (see Appendix D) and multiplying by 100. This task analysis described the leaders' session duties. Feedback was provided to the leaders during intervention if fidelity was lower than full completion of the task analyzed steps, and researchers noted what feedback was given and the frequency of the feedback across the leaders.

Procedure

An ABAB reversal design was used to determine the efficacy of the intervention. Participants were instructed to wear the pedometers throughout all recess sessions. Researchers stayed during recess to observe the sessions and monitor any possible tampering with the pedometers (e.g., unmasking pedometers, shaking pedometers, etc.).

Baseline. Participants wore pedometers sealed with black tape, so they were not be able to access their step count during this phase. Researchers assigned both the participants and the pedometers a number. Before the start of recess, the researchers instructed the participants to take the pedometer with their corresponding number from a stand where the pedometers were clipped. The researchers instructed the participants to keep their pedometers closed throughout the entire session, including before and after the session. The participants lined up for recess before being instructed to go outside. When recess ended, the participants returned to the

classroom and placed the pedometers back on the stand. After the researchers collected the pedometer data, they reset the pedometers for the following day.

Student training. The researchers used behavioral skills training, consisting of instruction, modeling, rehearsal and feedback as described by Himle, Miltenberger, Gatheridge, and Flessner (2004), to train the identified leaders to conduct their session duties. The researcher asked for volunteers to serve as leaders. Of those volunteers, the teachers nominated seven leaders and the researcher completed training with those participants to teach the leader duties. At first, four participants' numbers were selected, by pulling numbers from a hat, and these participants were trained as a group. Training took place at the school between the last baseline session and the first intervention session for the first group of leaders and throughout the intervention for the remaining leaders as needed and present that day. Training involved researchers describing and then modeling the leader's before-recess and after-recess duties, outlined in the task analysis. During training, researchers emphasized to leaders that they were not to give feedback to individual classmates during the intervention. When modeling the after-recess duties, the researcher had pictures of pedometers to practice taking data and making the graph. The researcher modeled where to write the individual data, how to calculate and where to place the team totals, and how to rank the team totals from highest to lowest on the data sheets provided. After modeling data collection, the researcher modeled how to graph the data. Graphing involved using the ranked list of teams to create a bar graph. The y-axis was created in 100 step increments, team numbers were listed on the x-axis, and the step count of each team was listed above each corresponding team bar.

Following researcher instruction and modeling, the leaders had the opportunity to rehearse the session duties according to the treatment integrity task analysis. The leaders rehearsed until they performed all of the steps on the task analysis correctly. This training procedure was repeated for training new leaders. If the participants could not learn the leader skills, they would be excused from being a leader. No one failed to learn the skills in the time period provided.

Intervention. Participants' step count from the first baseline phase were totaled and averaged by the researcher to calculate each participant's mean step count. Based on the mean rate, the participants were ranked from 1 to 14, 1 being the lowest step count and 14 being the highest step count. The participants were placed into pairs, also referred to as teams, by matching the participant with the lowest mean step count to one with the highest mean step count. For example, participant 1 was matched with participant 14, participant 2 was matched with participant 13, and so on until all of the participants were paired. After the second baseline phase, the participants had new pairs for the second intervention phase based on their second baseline step counts. This pairing was done through the same ranking procedure completed after the first baseline. This pairing procedure was implemented every two weeks of intervention and adjusted according to the mean rate of the previous three intervention sessions.

Each week of the intervention, two participants were the implementers and were labeled as the leaders of the week. These leaders were from separate teams. In the event of an absence during the week of intervention, researchers randomly selected another trained leader, by pulling a number from a bag, to be the implementer for that time of absence. If no other students wanted to be leader or no other leaders from a different team were available, there was one leader for that day. The leaders' session duties included instruction, pedometer hand out and collection,

pedometer recording, and public posting. The leaders were provided a checklist for self-monitoring of their session duties (see Appendix E).

During the introduction of new teams, the leaders announced the teams and showed the class a table with team members' names and team numbers (Appendix F). The leaders told the other participants that they had access to their pedometer's step count throughout recess and were competing against the other teams to see which team can get the highest step count. The leaders told the participants that they can look at their own and their partner's pedometers and praise or urge their partner to get more steps. The leaders told the participants they may do the same with other participants' pedometers. The leaders instructed each team to collect their pedometers from the stand and clip the pedometers on their pocket or belt before going out to recess. The leaders prompted the students to look at the board to see the leaders from the day before and instruct each team to try and get as many steps as they can.

The leaders were the first to enter to the classroom from recess. The leaders instructed the teams to put their pedometers on the stands when inside for the researcher and the leader to collect the pedometer data. The researchers took a picture of the pedometers for reliability if another researcher was unable to be present. The leaders performed the remaining leader duties of the task analysis using the data sheets and graphing materials provided. First, they wrote the step totals by the corresponding pedometer number on a data sheet (Appendix G). Second, the leaders summed the steps for each team and wrote them on the data sheet (Appendix G). Third, the leaders ranked order the teams from highest to lowest steps on the rank order sheet (Appendix H). Fourth, the leaders took the team data and created a bar graph of all of the teams' total step counts of that session from most to least steps and write the total above each bar

(Appendix I). After completing the bar graph before the next recess session, the leaders shared the graph, announced the top three teams with the highest totals from the previous recess, and placed the graph in an area where all participants could access it (i.e., propped on the window by the recess exit door). The leaders reset the pedometers before the next session began. Researchers, as well as the participants and the teacher, were instructed not to provide tangible rewards for the top three teams with the highest step count.

RESULTS

Pedometer Data

Figure 1 displays the class' mean step count. Session results were included if there were at least four of the seven teams out during recess. During the first baseline phase, the participants took an average of 73 steps per min with a range of 65 to 80. During the first intervention phase, the participants took an average of 81 steps per min with a range of 71 to 92. During the second baseline phase, participants took an average of 70 steps per min with a range of 65 to 74. During the second intervention phase, participants took an average of 74 steps per min with a range of 56 to 91. The results indicate a higher mean for the first intervention phase compared to both baseline phases. However, the second intervention phase displays a decreasing trend and a mean at baseline levels. There is an ABA effect, but the second intervention mean did not return to previous intervention levels and remained near the initial baseline phase.

Individual participant data are displayed in figures 2 and 3 as steps per minute across baseline and intervention sessions. Participants 1, 3, 5, 8, 10, and 11 demonstrate an ABA effect, either a slight or moderate effect, with the mean of both baseline phases being lower than the intervention phase, but no return to previous intervention level with the introduction of the second intervention phase or a mean similar to the original baseline mean. This showed the intervention initially had an effect from the first baseline and decreased for the second baseline, but the second intervention overlaps the baseline phases. Participant 7 showed an AB effect with the return to baseline and second intervention phase. Participants 2 and 12 demonstrate a BAB effect with the mean of intervention levels being higher than that of baseline. This means that

from the intervention, baseline decreased, and the second intervention brought the mean near to previous intervention levels, though this means there was little or no initial intervention effect or overall effect compared to their original baseline. Participants 4, 6, 9, 13 and 14 did not show an effect throughout the phases. This means that there was no intervention effect or there were decreases during the intervention.

Treatment Integrity

Data were collected on the leader's implementation of their duties. Overall, the leaders had an average of 94% (range, 75% to 100%) treatment integrity for the intervention phases. One session, number 24, had the lowest integrity with the class being released to recess after the graph announcement without further peer leader instructions. The most common feedback was prompting to review a pedometer for a correction in the number written and possibly in a team total number if already calculated.

Social Validity

The following social validity results report the average score (and range of scores) from each item on the social validity questionnaires (1 = strongly disagree, 2= disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Social validity scores obtained from participants from the 13 questions are as followed: I enjoyed participating in this study = 4.14 (2-5); I feel that I was more active when on a team than not on a team = 2.64 (2-4); I liked working in teams during recess = 3.57 (3-5); I enjoyed seeing our team totals before recess = 3.86 (1-5); it was easy to be a part of this study = 4.14 (3-5); I think being on a team made me want to get more steps at recess = 2.93 (1-5); seeing the graph of the team totals made me want to get more steps during recess = 3.36 (1-5); I liked being in a competition against my classmates 3.43 (1-5); I would have tried to get

more steps if rewards were given to 1st, 2nd, and 3rd place teams = 3.93 (1-5); I would have tried to get more steps if we were not in teams, but if I did this myself (not on a team) and just saw a graph of my steps = 3.07 (1-5); I would rather choose my partner than be given a partner = 3.57 (1-5); having a partner made me want to get more steps during recess = 3.07 (1-5). These results suggest that participants enjoyed the study and found it easy to be in. They were favorable towards seeing their team totals. However, they were not as favorable towards their teams and their activity while on a team. In reviewing the range, there is variety in opinion among the students in regards to the study and possible modifications. However, the majority of students (9 of 14) would rather have their teacher implement the intervention.

Social validity scores obtained from peer leaders indicate less favorable results toward their role as peer leader. The average scores (and ranges) are as followed: I enjoyed being a leader in this study = 2.29 (2-3), I enjoyed making our team total graphs after recess = 2.14 (1-4); it was easy to be a leader = 2.86 (1-4); I would be a leader again in the future = 1.57 (1-2). One student added to the social validity questionnaire that, although he or she enjoyed being a peer leader, the student did not enjoy making the graphs due to how much time it took in the usual school routine and the time of day when the student had to complete the task.

Social validity scores obtained from the two teachers indicate generally favorable results toward the study. The average scores are as followed: I enjoyed my students participating in this study = 3.5; it was easy for the class to be a part of this study = 4; I feel that my students were more active when on a team than not on a team = 3.5. These results indicate the teachers found it easy for their class to be in the study, were agreeable about their students participating, and felt their students may or may not have been more active when on teams.

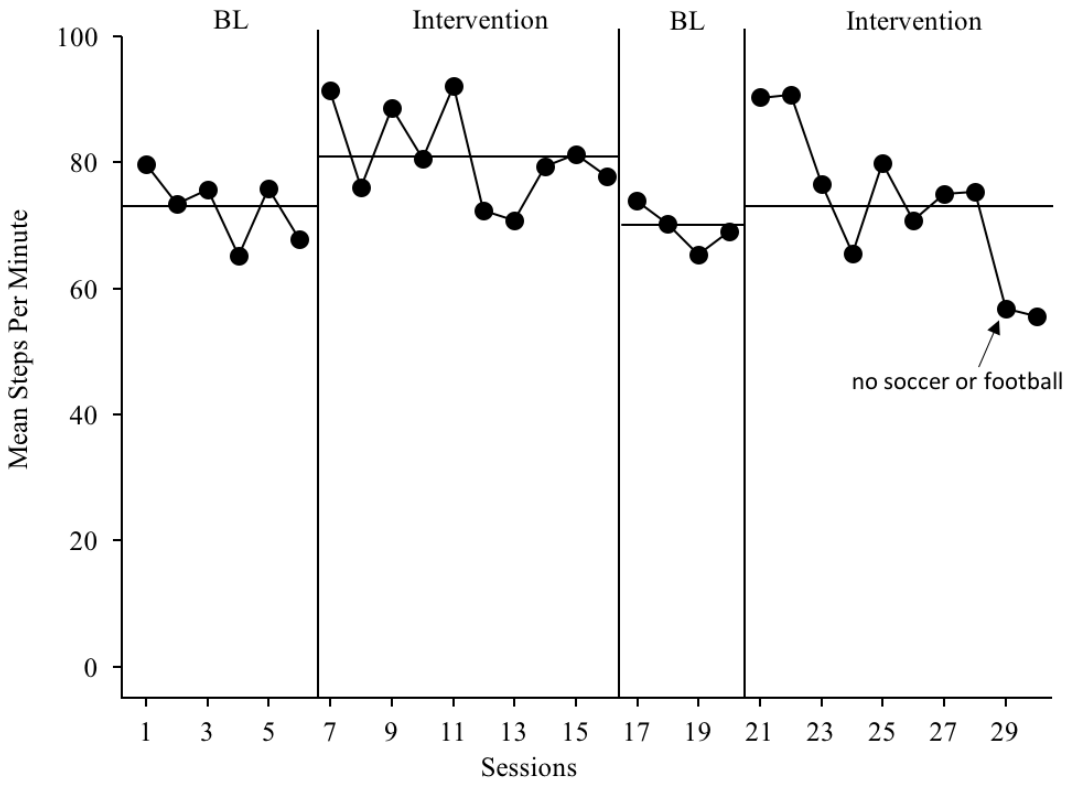

Figure 1. Class mean steps per minute during recess.

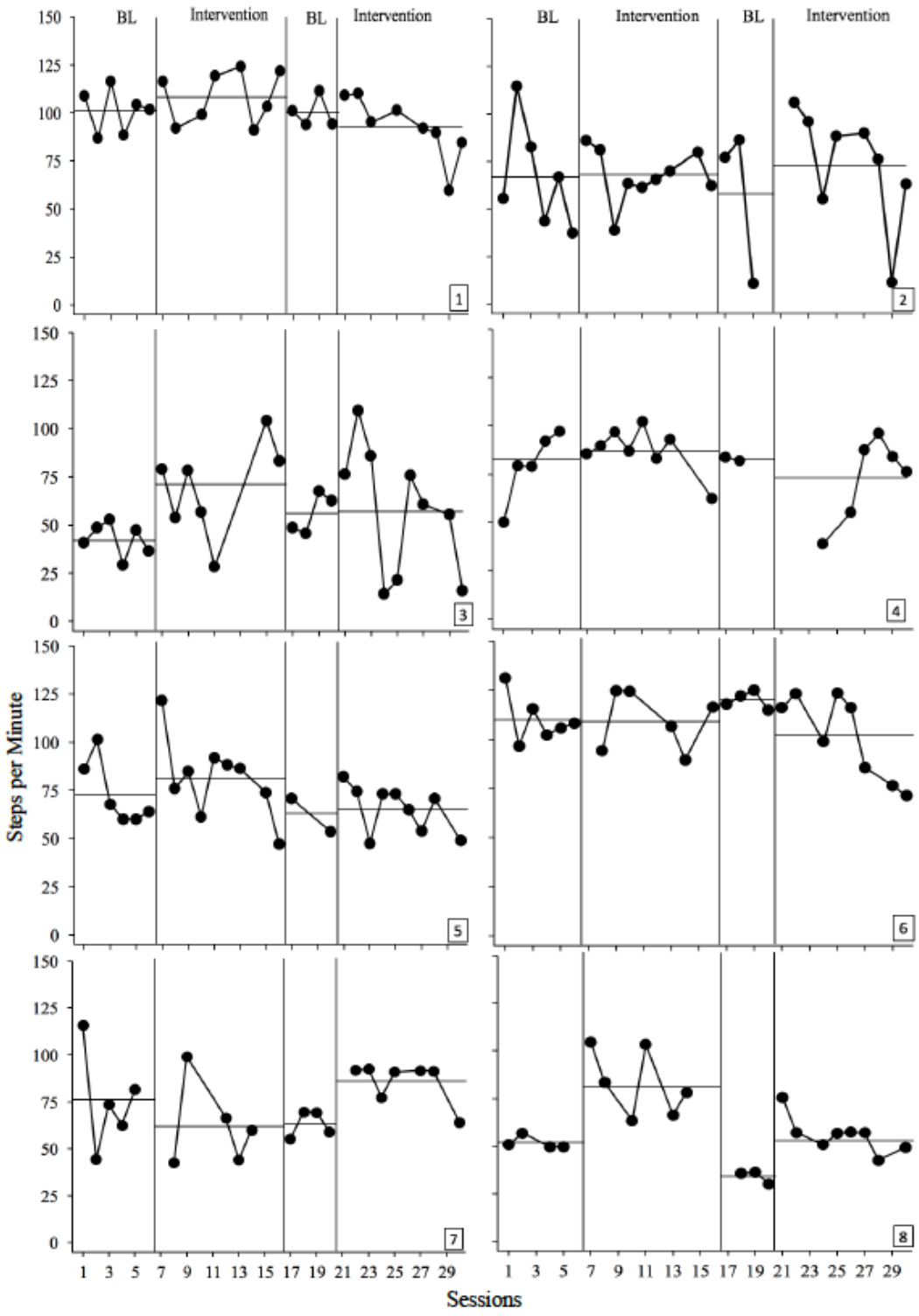

Figure 2. Mean steps per minute across participants 1-8.

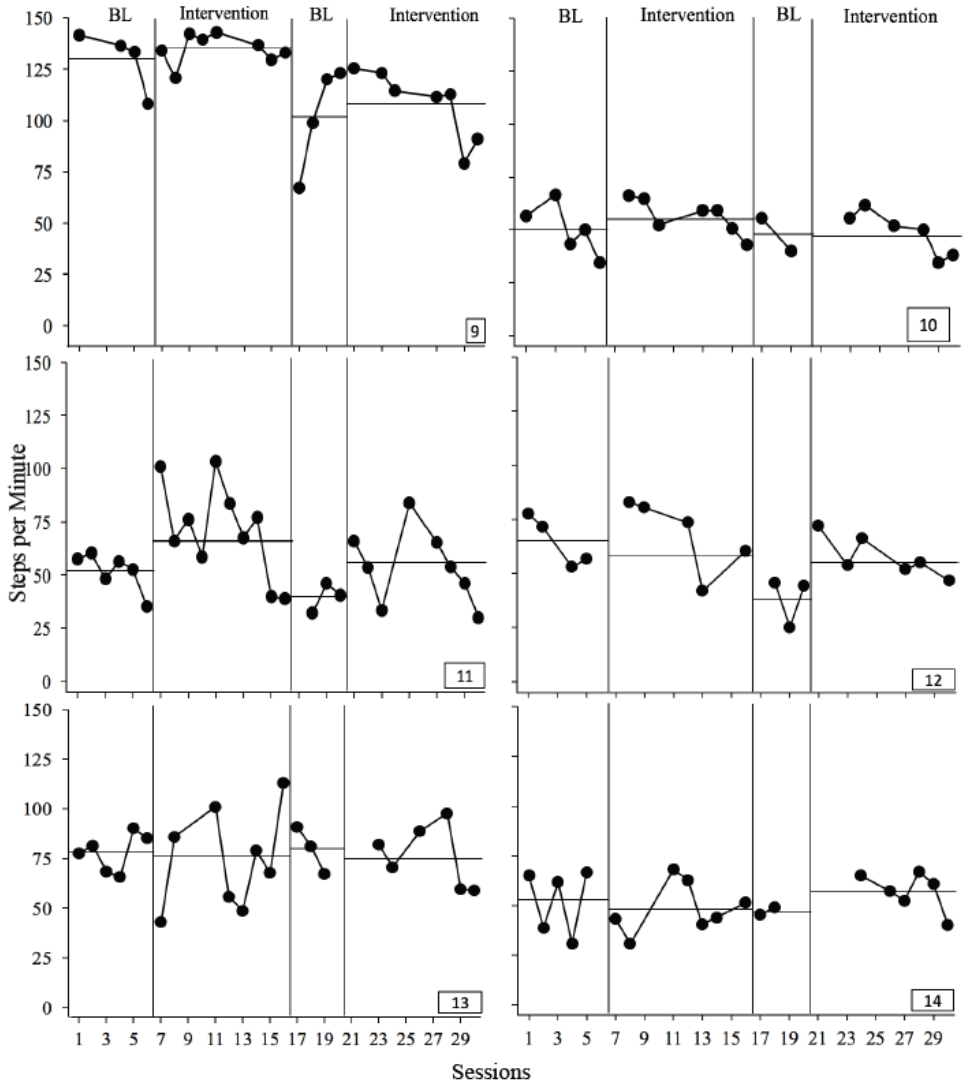

Figure 3. Mean steps per minute across participants 9-14.

DISCUSSION

The purpose of this study was to evaluate the effectiveness of a peer-implemented recess intervention that used student pairing and feedback to increase physical activity. The results of this study were mixed, but generally experimental control was not achieved in the ABAB design. The data indicate that the first intervention was effective in an ABA design, but the effects did not persist into the second intervention phase and thus experimental control was lost in the ABAB design. Although the class mean data display an initial ABA effect, most of the individual data do not. Looking at individual data, six participants demonstrated an ABA effect, one participant demonstrated an AB effect, two participants demonstrated a BAB effect, and five participants demonstrated no effect.

Social validity results showed that students enjoyed the study, found it easy to be a part of, and were generally favorable about components of the study, such as viewing the graphs and being on teams. However, they were more mixed about their activity levels as a result of the teams and graph. Social validity also showed less favorable results for peer leaders. Their ratings are consistent with their verbal reports to the researcher indicating the peer leader role was time consuming and disrupted their typical routine. The teacher social validity results indicated both teachers believed it was easy for the students to participate in the study.

Zerger et al. (2017) reported lower class baseline means and higher class intervention means than this study's class mean data. Zerger et al.'s class mean intervention data also reached moderate-to-vigorous activity levels of at least 100 steps per minute, but this study's class mean intervention data did not ever reach that level in either intervention phase. Although

the results were different, there were many similarities between the Zerger et al. study and the current study. The assessment and intervention procedures were the same, and the setting was the same. As with anecdotal reports from Zerger et al., participants in the current study were observed to engage in the same activities across baseline and intervention phases (except for changes made by the teachers in the second intervention phase, as will be discussed later). Zerger et al. ran their study at the same time of day and in similar months to the current study, so there were unlikely to be differences in the weather between the two studies. The main difference between the two studies is that Zerger et al. had the researcher implement the intervention whereas this study had peers implement the intervention. It is not clear why the peer-implemented intervention produced less favorable results, however one explanation is that with the student leaders there may be less of an establishing operation for engaging in physical activity. That is to say, peer delivered feedback may have been less powerful than researcher delivered feedback (the students may have been more interested in "pleasing" the young adult researcher than their peers).

Although Zerger et al. (2017) showed increases in children's physical activity without the use of rewards, other research shows that rewards are effective in increasing step count with students across the day and with students during recess (Ek et al., 2016; Hayes & Van Camp, 2015; Miller et al., in press; Washington et al., 2014). Furthermore, Miller et al. (in press) showed that self-monitoring and feedback produced moderate increases in physical activity, but that the addition of rewards increased steps even further. In the Miller et al. study, students received a raffle ticket for achieving step goals and the tickets were entered into a lottery for rewards (leisure items from a prize box). Future research may look into adding rewards to this

intervention for 1st, 2nd, and 3rd place teams. This may include monetary rewards or include a token economy contextually fit to the classroom. Future research may also look into providing these contingencies for peer leaders for completing their assigned tasks.

A few limitations to the study should be noted. One limitation was the time constraint in regards to the school schedule. Recess occurred in the afternoon and ended 15 min before the students' dismissal for the day. This meant that peer leaders were not always able to complete all the designated after-recess duties before dismissal. As a result, they finished as much as they could before dismissal and finished the remainder (i.e., totals, ranking, or graphing) before the next recess session to announce the teams and complete the before recess duties. It is possible that this problem with time limits on completing the intervention activities immediately after recess contributed to the limited effects of the intervention.

Another limitation was a teacher-directed change in recess activities during the second intervention phase. Due to some rough physical contact occurring during a soccer game, the teachers told the students that that soccer and football were no longer allowed during recess - this occurred before the start of session 29. Soccer and football were frequently chosen by the class during recess and typically included all students, thus contributing to high step counts. The elimination of these activities removed a reinforcing activity from recess and may have had a detrimental effect on the participants' step count during the last intervention phase. The students did begin to play baseball once soccer and football were no longer allowed, but baseball is a game with much more inactivity than soccer and football. Anecdotally, when soccer was reintroduced, there was a substantial increase in steps compared to the last two data sessions

counted where soccer was not allowed. However, this data past session 30 could not be counted due to there being fewer than four teams participating.

On a number of occasions, students stayed inside during all or part of recess to get other work completed or because they needed to leave early for non-school activities. As a result, on a number of occasions, there were not enough children present to collect data and run the intervention (we designated four teams out of seven as the minimum needed to collect data and conduct the intervention). In regards to not meeting the minimum number of teams to include sessions, future research may investigate the effect of a group contingency on step count rather than an intervention that focuses on partners. If one student was missing on a team, that team would not be counted for that day; a group contingency may limit the effects of these discrepancies and absences in team data. Future research may also consider adding a partner meet-up during recess to review step counts, as there were few observations of partners meeting to check each other's step counts. Future research may also include a component analysis to evaluate the multiple components (i.e., public posting, competition, changing implementers) to see which appear to contribute most to increases in steps. Finally, as Zerger et al. (2017) suggested, future research may investigate a teacher-implemented intervention instead of a peer-implemented intervention with the majority of students suggesting in the social validity assessment that they preferred having their teacher rather their peers implement the intervention.

The researchers observed or overheard a number of interesting anecdotes over the course of conducting the study. In regard to peer leader duties, leaders reported that at first they felt rushed with the initial expectation to finish before recess, but after being able to finish as much as they could as long as they could work before the next recess, they reported not feeling as

rushed. Some leaders originally opted out of being a peer leader earlier in the study, after being peer leader at least once, because they felt rushed, but when the expectations were stated to finish as much as they could, two peer leaders who initially did not want to be peer leader rejoined as peer leader for other weeks. In regards to peer leader duties, some leaders did still refuse, stating that they had already been peer leader and did not want to be peer leader that week. Anecdotally, some peer leaders reported they enjoyed creating the graph and were observed including designs within the bars of the bar graph. In regard to the team members' performance, two anecdotes suggest factors that may have contributed to lower steps for some participants. First, the researcher overheard some students discussing that they didn't need to get as many steps because their partner would get enough for them for the team rankings. Second, one participant reported to the researcher that he did not like the team member assigned to him for the intervention. On the other hand, another participant was also consistently heard providing encouragement and checking in with his team member before going out to recess. It is not clear what effect, if any, these factors had on step counts.

School recess is an ideal opportunity to implement an intervention intended to increase step count, such as the one in this study, due to having a designated time for physical activity. Taking advantage of this naturally occurring opportunity for physical activity makes it more likely that interventions will not interfere with educational activities and thus may increase their acceptability to school personnel. There continues to be a need for low-cost, easy to implement interventions for school use. There is also a continued need for research to determine whether interventions can be successful without rewards. Continuing to expand research targeting

interventions without rewards may yield more efficient and accessible interventions more readily available and acceptable for implementation in schools.

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APPENDICES

Appendix A: Social Validity Questionnaire for Students

Social Validity Questionnaire

Please rate the following sentences:

1. I enjoyed participating in this study.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. I feel that I was more active when on a team than not on a team.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. I liked working in teams during recess.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4. I enjoyed seeing our team totals before recess.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5. It was easy to be a part of this study.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6. I think being on a team made me want to get more steps at recess.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. Seeing the graph of the team totals made me want to get more steps during recess.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. I liked being in a competition against my classmates.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

9. I would have tried to get more steps if rewards were given to 1st, 2nd, and 3rd place teams.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. I would have tried to get more steps if we were not in teams, but if I did this myself (not on a team) and just saw a graph of my steps.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. I would rather choose my partner than be given a partner.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

12. Having a partner made me want to get more steps during recess.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13. Who would you rather have run the study? (Circle One)

My teacher My peers

Comments:

Appendix B: Social Validity Questionnaire for Peer Leaders

Social Validity Questionnaire (Leader)

Please rate the following sentences:

1. I enjoyed being a leader in this study.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. I enjoyed making our team total graphs after recess.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. It was easy to be a leader.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4. I would be a leader again in the future.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Appendix C: Social Validity Questionnaire for Teachers

Social Validity Questionnaire (Teacher)

Please rate the following sentences:

1. I enjoyed my students participating in this study.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. It was easy for the class to be a part of this study.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. I feel that my students were more active when on a team than not on a team.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Appendix D: Treatment Integrity Task Analysis

Recess Task Analysis

Participant #: _____ Date: _____

Attempt #: _____

✓ if completed X if not completed N/A if not applicable

STEPS	COMPLETION
Before Recess	
Check that the pedometers are set to zero (if not, reset pedometer)	
Remind students to look at graph and team totals (if applicable)	
Instruct teams to get assigned pedometers together	
Tell team that they can look at their pedometers and the other students' pedometers during recess	
Tell team they can praise or urge each other to get more steps	
Tell team to get as many steps as they can	
After Recess	
Leader first into the classroom	
Tell pairs to place pedometers on stand together	
Correctly record individual pedometer step counts	
Correctly calculate team totals	
Correctly rank team totals	
Plot step count on graph to nearest 100	
Place step count number above bar on graph	
Place corresponding team numbers on x-axis of graph	
Display bar graph to class	

Announce top three teams	
Place graph in viewable location	

Appendix E: Peer Implementer Task Analysis

Recess Task Analysis

Leader Name: _____ Date: _____

✓ if completed X if not completed N/A if did not need to complete

STEPS	COMPLETION
Before Recess	
I checked that the pedometers are set to zero (if not, I reset the pedometers)	
I reminded my classmates to look at graph and team totals (if available)	
I told the teams to get assigned pedometers together	
I told the teams that they can look at their pedometers and the other students' pedometers during recess	
I told the teams they can praise or urge each other to get more steps	
I told the teams to get as many steps as they can	
After Recess	
I was first into the classroom	
I told the teams to place pedometers on stand together	
I recorded individual pedometer step counts	
I calculated team totals	
I ranked team totals	
I graphed step count on graph to nearest 100	
I placed step count number above bar on graph	
I placed corresponding team numbers on x-axis of graph	
I showed the bar graph to class	

I announced top three teams	
I placed the graph in viewable location	

Appendix F: Class Teams Template

TEAMS

Team 1	#	Participant Rank 1 Name
	#	Participant Rank 16 Name
Team 2	#	Participant Rank 2 Name
	#	Participant Rank 15 Name
Team 3	#	Participant Rank 3 Name
	#	Participant Rank 14 Name
Team 4	#	Participant Rank 4 Name
	#	Participant Rank 13 Name
Team 5	#	Participant Rank 5 Name
	#	Participant Rank 12 Name
Team 6	#	Participant Rank 6 Name
	#	Participant Rank 11 Name
Team 7	#	Participant Rank 7 Name
	#	Participant Rank 10 Name

Team 8	#	Participant Rank 8 Name
	#	Participant Rank 9 Name

Appendix G: Individual Participant Data Sheet Template

TEAM STEPS

DATE:_____

Pedometer Number	Team Number	Pedometer Step Count
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

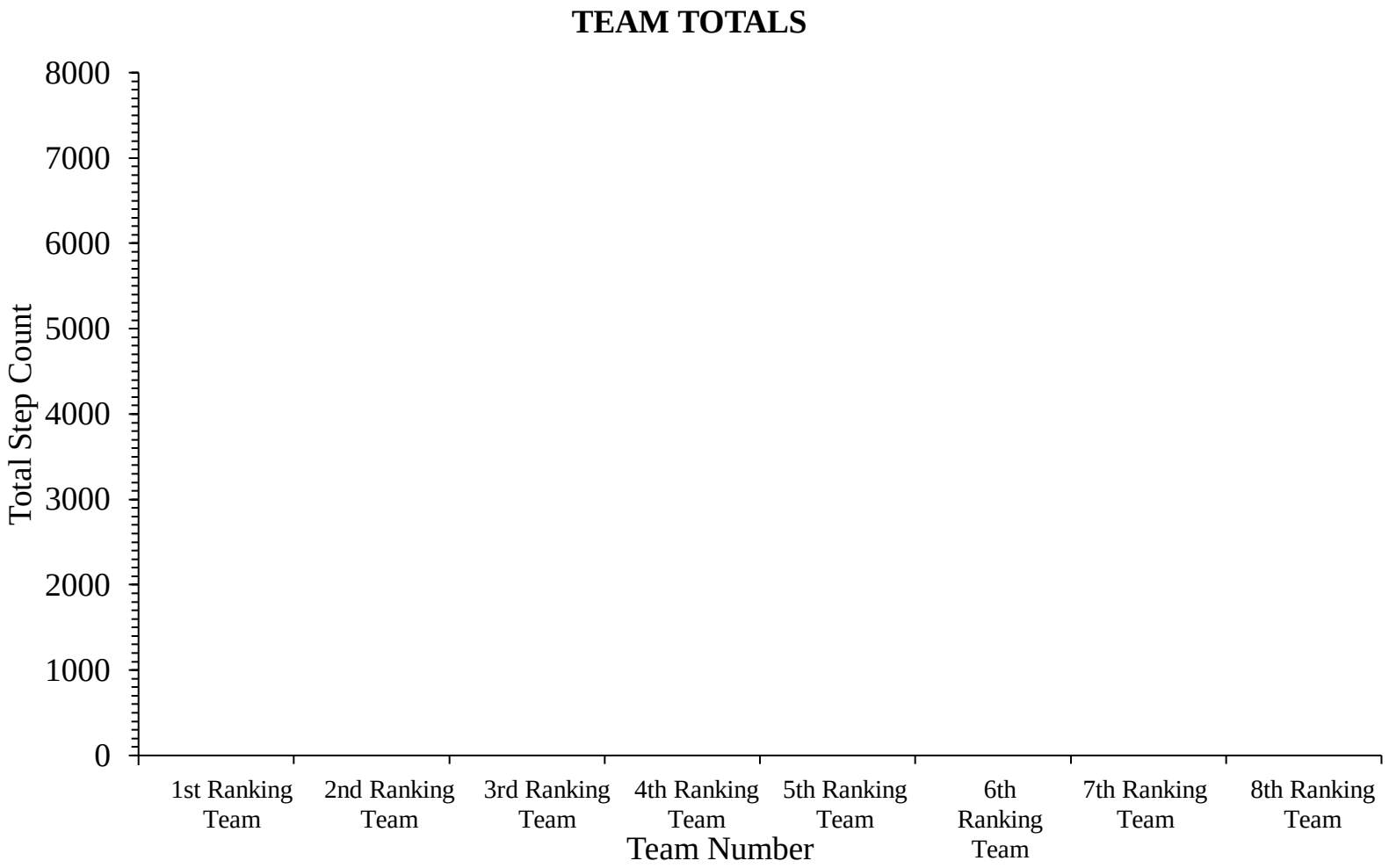
Appendix H: Team Totals and Ranking Data Sheet Template

TEAM RANK

DATE: _____

Team Number	Team Total	Team Rank
1 (pedometer numbers)		
2 (pedometer numbers)		
3 (pedometer numbers)		
4 (pedometer numbers)		
5 (pedometer numbers)		
6 (pedometer numbers)		
7 (pedometer numbers)		
8 (pedometer numbers)		
9 (pedometer numbers)		
10 (pedometer numbers)		

Appendix I: Team Total Graph Template



Appendix I: IRB Approval Letter

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
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10/23/2017

Carolina Luque
FCIC-Florida Center for Inclusive Communities
16601 Palm Coast CT
APT 624
Tampa, FL 33647

RE: **Expedited Approval for Initial Review**
IRB#: Pro00031713
Title: Evaluating a Peer-Implemented Intervention for Increasing Physical Activity during School Recess

Study Approval Period: 10/22/2017 to 10/22/2018

Dear Ms. Luque:

On 10/22/2017, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Study Protocol

Consent/Assent Document(s)*:
Parental Permission Form.pdf
Teacher Permission Form.pdf
Verbal Assent Form (Overall Study)*
Verbal Assent Form (Peer Leader)*

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. *Assent scripts are not stamped.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve

only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Children as Participants (45 CFR 46, Subpart D)

Research Involving Children as Subjects: 45 CFR §46.404
This research involving children as participants was approved under 45 CFR 46.404: Research not involving greater than minimal risk to children is presented.

Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408 / 21 CFR 50.55
Permission of one parent is sufficient.

Assent is required of all children.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board