The Physical Educator Vol. 77 • pp. 208–229 • 2020
https://doi.org/10.18666/TPE-2020-V77-I2-9570

PHYSICAL ACTIVITY

The Effect of Prompting and Group Contingency on Middle School Students' Physical Activity During a Badminton Sport Education Season

Zachary Wahl-Alexander, Annie Malecki, Steven Smart

Abstract

This study evaluated the effect of three conditions in which 34 sixth-grade students were prompted to accumulate as much activity as possible during a Sport Education season. Three intervention conditions were assessed via an alternating treatment design: (a) baseline: no prompting of students; (b) teacher prompts: verbal prompts and suggestions on how to "maximize activity within class"; and (c) teacher prompts plus independent group-oriented contingencies: verbal prompts in addition to bonus points awarded based upon reaching step count criteria. Graphically plotted step count data illustrate data trails, variability, and trends within and across the three conditions. This demonstrates that students were more active in class when the teacher prompted the students and employed prompting in conjunction with the contingencies. The results of this study suggest that prompts and prompts plus independent group-oriented contingencies within Sport Education are effective and authentic frameworks for maximizing in-class physical activity.

Zachary Wahl-Alexander is an assistant professor, Department of Kinesiology and Physical Education, Northern Illinois University. Annie Malecki is a graduate assistant, VCU Athletics Ticket Office, Virginia Commonwealth University. Steven Smart is an undergraduate student, Department of Kinesiology and Physical Education, Northern Illinois University. Please send author correspondence to zachwahl18@gmail.com

Participation in consistent physical activity (PA) has long been associated with countless physical, social, and psychological benefits in children and adolescents (Janssen & LeBlanc, 2010). According to the Centers for Disease Control and Prevention (2008), children between the ages of 6 and 17 should regularly participate in 60 min or more of daily PA. Not adhering to these requirements may lead to increased risk of factors that control cardiovascular diseases (Loprinzi, Lee, Andersen, Crespo, & Smit, 2015), energy imbalances (Kraak, Liverman, & Koplan 2005), and an augmented risk for obesity (Centers for Disease Control and Prevention, 2008). Despite these hazards, only 21.6% of 6- to 19-year-olds in the United States achieve 60 min or more of moderate to vigorous PA (MVPA) regularly (National Physical Activity Plan Alliance, 2016).

Schools are in a unique position in their ability to provide opportunities for PA, as the amount of total contact hours are substantial. Specific to physical education, quality programs aid in developing children's motor skills and cognitive knowledge while improving their social development. Further, physical education is one setting in which PA can be encouraged daily (Centers for Disease Control and Prevention, 2011). Specifically, *Healthy People 2010*: *Health Objectives for the Nation* included objectives aimed at improving daily PA during the school day and recommended that students be moderately to vigorously active at least 50% of class time (U.S. Department of Health and Human Services, 2000). However, research indicates that these lofty goals are rarely achieved (McKenzie et al., 1995).

Because of this deficiency in providing suitable opportunities for PA within traditional physical education classes, researchers have begun to examine other contexts in which children may be able to engage in supplementary activities (Carson, 2013; Carson, Castelli, Beighle, & Erwin, 2014). More specifically, before- and after-school clubs (Carson et al., 2014; Wahl-Alexander, Schwamberger, & Neels, 2017), extracurricular sports (Bocarro, Kanters, Casper, & Forrester, 2008), and summer camps (Hickerson & Henderson, 2014; Wahl-Alexander & Morehead, 2017) have been proven to complement physical education effectively by providing other opportunities for physical activity. While such programs are particularly important, research has illustrated many barriers in facilitating (Garn et al.,

2014) and populating (McMullen, van der Mars, & Jahn, 2014) such programs. Early indications have shown these programs successfully expand activity levels; however, further attention needs to be dedicated to maximizing opportunities for physical activity within the physical education context (McKenzie et al., 1995).

The Sport Education pedagogical model has rapidly fostered positive attention since its induction in the early 1990s (Siedentop, 1994). Unlike other modes of instruction within physical education, Sport Education provides an authentic experience that aims to create students who are competent, literate, and enthusiastic performers of sport (Siedentop, Hastie, & van der Mars, 2011). The six key features of the model (affiliation, formal competition, seasons, recordkeeping, statistics, festivity and culminating event), small-sided gameplay, and the emphasis on fair play differentiate Sport Education from other forms of instruction.

To date, the majority of research on Sport Education has concentrated on its ability to develop students' competency (Hastie, Calderón, Rolim, & Guarino, 2013; Pereira et al., 2015), literacy (Wahl-Alexander, Sinelnikov, & Curtner-Smith, 2016), and enthusiasm (Brock, Rovegno, & Oliver, 2009) toward sport. However, scholars have begun to examine the potential applicability of Sport Education on fitness levels and activities, heeding Wallhead and O'Sullivan's (2005) call. Specific to student fitness levels, several studies have examined seasons with a fitness-based content focus. These studies established that students not only engaged in high levels (over 60%) of MVPA during class time (Pritchard, Hansen, Scarboro, & Melnic, 2015) but also significantly improved fitness scores (Hastie, Buchanan, Wadsworth, & Sluder, 2009; Ward et al., 2017) and fitness content knowledge (Ward et al., 2017). Researchers have also explored students' in-class PA levels during team sport seasons, finding mixed results. In one 12-lesson soccer season, Parker and Curtner-Smith (2005) reported less than 36% MVPA. However, these findings can mainly be attributed to the teacher's lack of expertise and unit length. Other researchers have established higher levels of MVPA (over 60% of class time) in elongated seasons taught by more experienced instructors (Hastie & Trost, 2002; Wahl-Alexander & Morehead, 2017). While preliminary findings posit that Sport Education appears to lead to elevated activity levels, fur-

ther research focused on improving and increasing in-class activity levels is warranted.

Behavior change techniques have been proven as an efficient way of altering an assortment of behaviors in adults and children in a variety of contexts. These techniques are defined as discernible, replicable, and irreducible components designed to change or regulate behaviors (Michie et al., 2013). Research indicates that there are 93 behavior change techniques for altering PA and healthy eating behaviors (Michie et al., 2011). Within education, several of these strategies (e.g., prompting, feedback, group contingencies) have proven to be effective at influencing behavior (Johnston, Pennypacker, & Deitz, 1981). *Prompting* can be defined as introducing a defined action and providing consistent cues that influence a behavior (Abraham & Michie, 2008), while *feedback* can be described as the monitoring of a specific behavior and providing ongoing evaluative information pertaining to the performance of that given action (Valente & Pumpuang, 2007). Specific to education, the combination of prompting and feedback is influential in individuals immediately after a target behavior (Cooper, Heron, & Heward, 2007), however can be less effective with larger groups.

Group-oriented contingencies have been successfully used to alter the behavior of many people simultaneously (Bushell, Wrobel, & Michaelis, 1968). This strategy has been used to effectively reduce various actions (e.g., truancy, unhealthy eating, risk taking) and increase behaviors such as quiz scores and on-task behavior (Heck, Collins, & Peterson, 2001; Thorne & Kamps, 2008). Group-oriented contingencies include offering a common contingency on a behavior of (a) each group member (independent group-oriented contingency), (b) part of the group (dependent group-oriented contingency), or (c) everyone in the group (interdependent group-oriented contingency; Cooper et al., 2007). In *dependent* group-oriented contingencies, the reinforcer (e.g., consequence) for the group is dependent on an individual student or small group of students achieving the given criterion. An *independent* group-oriented contingency occurs when only students who meet a criterion receive the reinforcer (e.g., consequence). The *interdependent* group-oriented contingencies entail all group members needing to meet a standard to receive the reinforcer (e.g., consequence). Group-oriented contingencies com-

monly occur over elongated units in which students can obtain or lose tokens based upon contingencies and in which they acquire reinforcers (e.g., computer time or free play) when meeting a criterion (Ennis, Blair, & George, 2016). While limited research has examined the differences of the various contingencies, investigations have demonstrated that interdependent group-oriented contingencies were more effective than dependent and independent contingencies in reducing various negative behaviors (Alexander, Corbett, & Smigel, 1976) and improving positive actions (Lloyd, Eberhardt, & Drake, 1996). Specific to physical education and different sporting contexts, group-oriented contingencies have been shown to effectively improve on-task behavior (Hume & Crossman, 1992; Ward & Dunaway, 1995) and promote positive fair play behaviors (Patrick, Ward, & Crouch, 1998; Vidoni & Ward, 2006). In each of these studies, students modified specific behaviors when provided with a specific reinforcer.

Through the use of fair play points, formal competition, and recordkeeping, the Sport Education model offers a unique opportunity for promoting group-oriented contingencies. During a fourth-grade jump rope season, group contingencies provided students with an opportunity to accumulate bonus points toward the league standing for engaging in out-of-school PA. In this season, students were more active outside of school when the contingency reinforcement was in place, which demonstrates that Sport Education is an effective context for promoting such contingencies (Hastie, van der Mars, Layne, & Wadsworth, 2012). These findings, coupled with the ongoing need to optimize activity time within the physical education setting, provide the rationale for this study. Although preliminary findings suggest Sport Education is an appropriate model for providing opportunities for physical activity, further attention needs to be dedicated to optimizing such opportunities. Therefore, this study examined the influence of prompting and prompting plus independent group-oriented contingencies on students' in-class PA during a badminton Sport Education season. This study evaluated three research questions: (a) how physically active students were during the badminton Sport Education season without any intervention, (b) whether the instructor prompting the students to be physically active during class would increase in-class PA levels, and (c) whether

prompting plus independent group-oriented contingencies would increase students' in-class PA levels.

Method

Participants and Settings

The participants in this study were 34 sixth-grade students (15 males, 19 females) from one middle school in the Midwestern United States. The majority of the children were African American (61%), with several reporting Caucasian (26%) and Hispanic (13%). At the time of the study, the middle school enrolled 469 sixth, seventh, and eighth graders, of which 54% were on free and reduced lunch. Each class period at this school was 30 min long, excluding transitional time and changing in and out of gym clothes. The authors' university institutional review board approved this study, and prior to the initiation of the study, all students provided assent and their parents gave informed consent.

Target Behavior

The target behavior in this study was the average number of steps accumulated within the physical education class. The average step count was based on the number of steps each student accumulated each class period.

Intervention

The participants' in-school PA was monitored across three diverse conditions throughout a 15-lesson badminton Sport Education season. The study included three experimental conditions: *baseline*, *prompting only*, and *prompting plus independent group-oriented contingencies*. During all *baseline* (Condition A) lessons, the teacher did not provide prompts regarding in-class PA, which reflected the traditional instructional patterns of the physical education teacher. During the *prompting only* (Condition B) lessons, the teacher prompted students to "get as many steps during this class period as you can" and encouraged PA in class (i.e, jog in place, pace while you wait for gameplay to start) during the introduction, at closure, and throughout the lesson. In *prompting plus independent group-oriented contingency* (Condition C) lessons, the teacher verbally prompted students to engage in as much PA as possible in class (Condition B),

in addition to implementing a independent group-oriented contingency in which teams could earn bonus points toward the league standings by achieving step count goals independently.

For this study, the teacher used the independent group-oriented contingency by providing each student with an opportunity to earn bonus points for their team. During all Condition C lessons, 1, 2, or 3 points were awarded to any student who accumulated 1,500, 2,000, and 2,500 steps, respectively. Not only were these step count goals discussed during the introduction, but they were also posted in various publicly accessible points throughout the gymnasium. At the conclusion of all Condition C lessons, the teacher announced any students who were awarded bonus points and reminded others of these goals.

Research Design

This study employed an alternating treatment design that allows for the comparison between two or more experimental conditions while reducing the possible confounding caused by order or sequencing effects. More specifically, the alternating treatment design precipitously exchanges several distinct treatments while measuring the effect of the independent variable on a target behavior (Cooper et al., 2007). In this study, after the first five Condition A (baseline) lessons, the three conditions were determined by random sequencing, which minimizes the potential for order and sequence effects (Cooper et al., 2007). Each condition was systematically arranged so that each condition was preceded and followed by each condition at least once. The more frequently such sequences are replicated, the sturdier the case for experimental control.

Fidelity of Treatment

For fidelity of the treatment, the instructor was reminded immediately prior to each lesson if they needed to avoid prompting the students (baseline, 7 lessons), provide prompts to promote PA in the introduction and during the lesson (prompting, 4 lessons), or prompt the students while explaining the step count goals that would lead toward achievement of bonus points (prompting with independent group-oriented contingency, 4 lessons). For further fidelity, all lessons were observed throughout the study for the alignment of the teacher with the expected behaviors. During the study, the instruc-

tor did not mention step counts during any Condition A lessons. On Condition B days, the teacher promoted maximizing PA levels and ways students could increase activity during every introduction and closure, and reiterated this a minimum of five times throughout the lesson. Finally, on Condition C days, step count goals were posted in two publicly visible locations, instructions and step count goals were explained explicitly during the introduction, and the teacher explained several ways to maximize activity during the lesson. It is also of note that after Condition C lessons, the teacher announced which players on each team achieved their goals and how many points were awarded because of their successes. Achievement level of fidelity for each condition was 100%, as this procedure was followed correctly in all cases.

Badminton Season

The Sport Education badminton season integrated all six of Siedentop's (1994) key tenets of the model and followed standard protocols. The season extended across 15 lessons and included a preseason, a regular season, and a postseason tournament (Table 1). The preseason extended across six lessons and included teacher directed skill instruction, application of game rules, officiating protocols, team creation, and role selection. During daily instruction, the instructor demonstrated and explained a skill or strategy, with student subsequently leading team practices. The last two preseason lessons introduced officiating protocols and responsibilities. Students practiced this role as a whole group and during an intrateam scrimmage that determined seeding.

The regular season included seven lessons and a student-initiated daily routine of a warm-up and practice, followed by two modified badminton matches against another team. The teacher created the first two warm-ups, but the "warm-up leader" facilitated these; however, students created the remaining warm-ups. Similarly, the teacher created the first two practice task cards and then provided each coach with a skill or tactic to focus on when creating all subsequent practices. During the regular season, the students reported to their designated practice space upon arrival to class; prepared the courts for gameplay; checked the daily schedule to determine playing areas and opponents; and reported scores, stats, and fair play to the teacher. On each regular season day, two teams officiated the remaining

Table 1
Badminton Sport Education Season Outline

Lesson	Content	Intervention
1	Outline of Sport Education season, team selection, team colors, name, mascot	A
2	Selection of team roles, teacher-led activities focusing on offensive and defensive strategies	A
3	Poster creation, offensive and defensive strategies	A
4	Student-led activities focusing on offensive and defensive strategies	A
5	Mock demonstration of game focused on officiating protocols	B
6	Intrasquad scrimmage with officiating practice	C
7	Team warm-up, team practice, two regular season league games	A
8	Team warm-up, team practice, two regular season league games	B
9	Team warm-up, team practice, two regular season league games	C
10	Team warm-up, team practice, two regular season league games	A
11	Team warm-up, team practice, two regular season league games	C
12	Team warm-up, team practice, two regular season league games	B
13	Team warm-up, team practice, two regular season league games	C
14	Quarter and semifinals of elimination bracket tournament	B
15	World championship badminton final and award ceremony	A

competitions. The postseason consisted of a quarter and semifinal single elimination bracket officiated by the last- and first-place teams, a championship game, and an award ceremony. Important to note is that the season was intended to be 16 lessons (8-day regular season); however, the school went into lockdown, which caused a reduction in total season length.

Model Fidelity

This study aimed to examine the effect of prompting and prompting plus independent group-oriented contingencies on students' in-class PA during a Sport Education season and thus employed guidelines from the literature to determine model fidelity (Sinelnikov, 2009). One independent Sport Pedagogy faculty member with significant experience teaching with Sport Education coded teacher pedagogy behaviors during the badminton season. Interobserver reliability was conducted on two lessons during each phase (preseason, regular season, and postseason) and, in accordance to scholars, interobserver reliability was 96% (van der Mars, 1989). The results of this fidelity check establish that the teacher demonstrated a majority of the teacher-specific behaviors vital for proper implementation of this Sport Education badminton season (Table 2).

Table 2
Demonstration of Sport Education–Specific Pedagogical Behaviors During a Badminton Season

		Badminton season	
Benchmark element		**Planned**	**Actual**
Teacher plans the unit around principles of a "season"	Management/organizational phase	✓	✓
	Team selection phase	✓	✓
	Preseason scrimmage phase	✓	✓
	Regular season phase	✓	✓
	End of season event	✓	✓

Table 2 (cont.)

Benchmark element		Badminton season	
		Planned	Actual
Teacher promotes the "affiliation" concept	Students involved in team selection process	✓	✓
	Consistent teams for duration of unit	✓	✓
Teacher promotes students taking "responsibility"	Incorporates student roles	✓	✓
	Teacher holds students accountable	✓	✓
	Teacher provides referee training	✓	✓
	Teacher provides task sheets	✓	✓
	Teacher adopts facilitator approach during interactions	✓	✓
	Teacher encourages conflict resolution	✓	✓
Teacher uses "formal competition" within unit plan	A formal schedule of competition established	✓	✓
	Fair play and sportsmanship utilized	✓	✓
Teacher utilized a form of "record keeping" within unit	Teacher provides rubric for scorekeeper	✓	✓
	Incorporates peer assessments as part of recordkeeping process	✓	✓
Teacher uses "culminating event" near the end of the season	Culminating event is festive in nature	✓	✓
Teacher creates "festivity" within unit	Teams are easily identifiable (team names, team colors, team posters)	✓	✓
	Teacher emphasizes the celebration of fair play	✓	✓

Data Collection

Immediately after changing, all students were fitted with a Yamax Digi Walker SW-701 pedometer (Tokyo, Japan) and were instructed to wear it for the entire lesson. At the conclusion of each lesson, the student handed their pedometer to the teacher, who recorded the total number of steps for each student. The instructor of the class announced which teams obtained bonus points based upon achieving team step count goals during the closure of all group-oriented contingency lessons. This same sequence was followed each day of the study.

The Yamax Digi Walker model has been shown to be a valid instrument for assessing PA (Brusseau & Kulinna, 2015) and has been proven to be a reliable appraisal of step count in adolescents (Rowe, Barfield, & Michael, 2001). The Yamax Digi Walker model pedometer has been shown to be accurate within ± 3% of actual step count, and researchers have determined this as a valid measure of assessing PA (Crouter, Schneider, Karabulut, & Basset, 2003). It should be noted that all students routinely wore pedometers during normal physical education instruction, knew the purpose of the pedometer, and how the pedometer operates.

Data Analysis

The data from this study were plotted graphically, which is standard practice in applied behavior analysis research. The authors utilized visual analysis to determine all functional relationships between the conditions (prompting and prompting plus independent group-oriented contingencies) and the target behavior (step counts). For this iteration, in-class PA for every class was calculated and graphed along the horizontal axis above the given lesson day, with each condition given its own symbol to aid with analysis. As an experimental design was utilized in this study, the authors aimed to determine the presence and degree to which the treatment effect affected each of the conditions. The authors visually analyzed the graphic data, examining trends, overlap, and data path separation, including the number of data points, variability, and trends within and between the conditions.

Results

Figure 1 demonstrates the students' mean in-class step count across the 15 Sport Education lessons, whereas Table 3 shows the mean and standard deviation for each condition. As Figure 1 shows, the total amount of in-class PA within each condition remained stable throughout the season. This is reflected in the lack of noticeable up or downward trends in the data paths and in a minimal group variability within each session. Students achieved higher levels of activity in the prompting and prompting plus independent group-oriented contingency conditions than in the baseline condition. This is revealed in the absence of overlap between Condition B and C and the other condition and in the sizable separation between data paths. As Table 3 shows, students averaged over 22% more steps during Condition B lessons and 25% more during Condition C lessons than in the baseline condition lessons. However, contrary to similar findings focused on out-of-school PA, students only accrued less than 4% more steps with the addition of contingent reinforcement to instructor prompting (Hastie et al., 2013). This illustrates that in this study, the instructor's consistent prompting to focus on PA contributed to the increase in activity level during Condition B and C lessons.

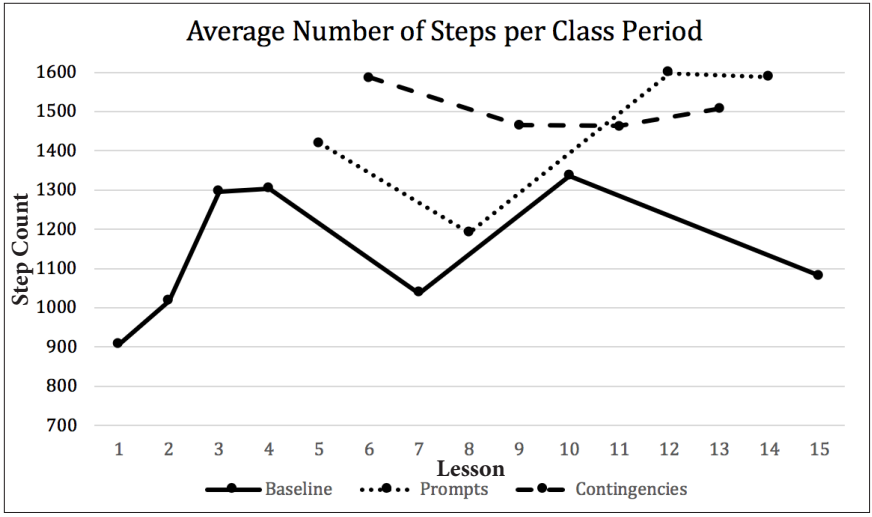

Figure 1. Mean in-school step count across conditions.

Table 3
Mean Step Count for Each Condition

Condition	*M*	*SD*
A (baseline)	1,139	169.8
B (prompting only)	1,448	190.5
C (prompting plus independent group contingency)	1,505	57.9

Although there were minimal discernible differences in average step count between prompting and prompting plus independent group-oriented contingency conditions, the standard deviation within Condition C is considerably smaller than that for Condition B. This reveals that almost everyone spent a similar amount of time being physically active during class, suggesting that almost all students were dedicated to achieving points toward the league standings board. While it is impossible to speculate why only small differences in average steps among these conditions occurred, less variability within Condition C demonstrates more students reaching higher levels of activity during this condition. Another trend needs to be considered, as all three data paths increased as the Sport Education season progressed. This aligns with previous findings (Wahl-Alexander & Morehead, 2017) and demonstrates improvements to PA as a season progressed. Although speculative, this trend suggests that the students became increasingly invested in the season, which led to elevated levels of activity regardless of condition.

Discussion

The purpose of this study was to determine the effect of prompting with and without a group-oriented contingency on in-class PA in sixth-grade students within a badminton Sport Education season. Throughout the season, the use of prompting and prompting plus independent group-oriented contingency produced consistently higher PA levels than the baseline condition.

It has been well documented that most adolescents are consistently sedentary and do not accumulate the recommended amount of daily PA. Although this population amasses almost 60% of their activity outside of school hours (Brusseau et al., 2011; Tudor-Locke, Lee, Morgan, Beighle, & Pangrazi, 2006), maximizing every opportunity for physical activity is imperative. It has been established that

specific to physical education, fitness/invasion games provide the highest amount of PA, whereas net/wall games lead to lower quantities (between 33 and 41 steps/min; Brusseau & Burns, 2015). The findings from this badminton Sport Education season compare favorably, as across the three conditions, students accrued an average of over 1,300 steps (in 30 min of activity) and just under 44 steps/min. Globally, these findings substantiate scholars who established Sport Education as a pedagogical model that promotes PA levels greater than recommended guidelines (Hastie & Trost, 2002; Pritchard et al., 2015; Wahl-Alexander & Morehead, 2017). Similar to these studies, this study found that the heightened levels of activity are likely caused by modified gameplay, team affiliation and festivity, and the authentic nature of Sport Education. The results from this study reaffirm that although PA is not a primary objective of the model, Sport Education indirectly provides ample opportunities for PA.

Another significant finding from this study was the effect of prompting and prompting plus independent group-oriented contingencies on student PA levels throughout the season. Students accumulated 21% more steps during all prompting lessons and 24% more steps during prompting plus independent group-oriented contingency lessons than during baseline. These results conflict with research that utilized prompting and group contingencies during a Sport Education season to promote out-of-school PA. This previous iteration found no differences in out-of-school PA in prompting compared with baseline (Hastie et al., 2012). One potential reason prompting was more effective in this study might be the proximity of feedback given by the teacher (Abraham & Michie, 2008). For example, the instructor discussed and promoted PA within the introduction, however was able to provide real-time reminders to the class or individual students who were deficient. This immediate feedback was successful in raising activity levels within class, however appears less effective in promoting out-of-class activity (Hastie et al., 2012).

Although PA increased 24% during prompting and prompting plus independent group-oriented contingency lessons compared with the baseline, it appears the group contingency in this iteration had little effect on increasing activity. These findings are in stark contrast to Hastie et al. (2012), who found slightly lower than a 50% improvement in activity outside of school when students were able

to earn points toward the league standings board. Several rationales might account for this finding. First, the instructor was effective at eliciting high levels of in-class activity through prompting. This success may not have allowed students to garner additional gains in an abbreviated 30-min class. Further, researchers have found that students accumulate fewer steps per minute (Brusseau & Burns, 2015) and lower MVPA (Chow, McKenzie, & Louie, 2008) in net/wall games compared to other activities, which may have further contributed to the limited differences between conditions.

Throughout this season, students earned points for their team by individually accumulating either 1,500, 2,000, or 2,500 steps during rompting plus independent group-oriented contingency lessons. It is conceivable that modifying these contingencies might influence the results of this study. One alternative is to employ an interdependent group-oriented contingency in which all team members must meet a step count standard to earn bonus points. Other options that may improve activity levels within this condition include increasing the requirements to earn points or increasing the point total being rewarded. While these decisions may motivate students to be more physically active, this also demonstrates to the class that PA accumulation is more significant than formal competition. Another interesting finding is that although there was little difference in total step counts between prompting only and prompting plus independent group-oriented contingency lessons, the standard deviation within the contingency condition was small (57.9). This reveals that more students were being physically active while in class. The reason for this decreased variability cannot be definitively stated; however, one can speculate that during this condition, more students attempted to achieve the step count goal.

The results of this study are promising. The use of prompting throughout a lesson seems to improve in-class PA levels during a Sport Education season; however, the lack of a maintenance phase and the small sample size are the main limitations of this study. First, a maintenance phase is significant for establishing the extent to which the effect of an intervention is sustained after the intervention has been completed (Ward & Barrett, 2002). In this study, the intervention was tethered to the framework of the Sport Education model; thus, it would not make sense for the instructor to continue

to provide bonus points toward a league standings board after the season. However, future research can aim to determine the effect of group contingencies in consecutive Sport Education seasons while using similar contingencies. Second, before further conclusions can be made, replications of this study using similar interventions with different activities, grade levels, and contingencies would provide more generalizable results. Moving forward, scholars should attempt to complete longitudinal research expanding this study over multiple consecutive seasons to demonstrate if such improvements to in-class PA can be maintained or improved through prompts and contingencies. The results of this study demonstrating that instructor prompting can improve PA levels by 20% are significant, as obesity rates continue to increase and more emphasis is being placed on student inactivity within physical education. Moving forward, attention needs to be placed on determining if similar results occur during physical education classes taught with other pedagogical models.

References

Abraham, C., & Michie, S. (2008). A taxonomy of behavior change techniques used in interventions. *Health Psychology, 27*(3), 379–387. https://doi.org/10.1037/0278-6133.27.3.379

Alexander, R. N., Corbett, T. F., & Smigel, J. (1976). The effects of individual and group consequences on school attendance and curfew violations with predelinquent adolescents. *Journal of Applied Behavior Analysis, 9*(2), 221–226. https://doi.org/10.1901/jaba.1976.9-221

Bocarro, J., Kanters, M. A., Casper, J., & Forrester, S. (2008). School physical education, extracurricular sports, and lifelong active living. *Journal of Teaching in Physical Education*, *27*(2), 155–166. https://doi.org/10.1123/jtpe.27.2.155

Brock, S., Rovegno, I., & Oliver, K. (2009). The influence of student status on student interactions and experiences during a Sport Education unit. *Physical Education and Sport Pedagogy, 14*(4), 355–375. https://doi.org/10.1080/17408980802400494

Brusseau, T. A., & Burns, R. D. (2015). Step count and MVPA compendium for middle school physical education activities. *Journal of Physical Education and Sport*, *15*(4), 646–650. https://doi.org/10.7752/jpes.2015.04098

Brusseau, T. A., & Kulinna, P. H. (2015). An examination of four traditional school physical activity models on children's step counts and MVPA. *Research Quarterly for Exercise and Sport*, *86*(1), 88–93. https://doi.org/10.1080/02701367.2014.977431

Brusseau, T. A., Kulinna, P. H., Tudor-Locke, C., Ferry, M., van der Mars, H., & Darst, P. W. (2011). Pedometer-determined segmented physical activity patterns of fourth- and fifth-grade children. *Journal of Physical Activity and Health, 8*(2), 279–286. https://doi.org/10.1123/jpah.8.2.279

Bushell, D., Jr., Wrobel, P. A., & Michaelis, M. L. (1968). Applying "group" contingencies to the classroom study behavior of preschool children. *Journal of Applied Behavior Analysis, 1*(1), 55–61. https://doi.org/10.1901/jaba.1968.1-55

Carson, R. L. (2013). Calling all practitioners: Encourage and support the creation of active schools and school physical activity champions. *American Journal of Lifestyle Medicine, 7*(5), 343–345. https://doi.org/10.1177/1559827613492604

Carson, R. L., Castelli, D. M., Beighle, A., & Erwin, H. (2014). School-based physical activity promotion: A conceptual framework for research and practice. *Childhood Obesity*, *10*(2), 100–106. https://doi.org/10.1089/chi.2013.0134

Centers for Disease Control and Prevention. (2008). *2008 physical activity guidelines for Americans 2008*. Washington, DC: U.S. Department of Health and Human Services.

Centers for Disease Control and Prevention. (2011). School health guidelines to promote healthy eating and physical activity. *Morbidity and Mortality Weekly Report*, 60(RR05), 1–76.

Chow, B. C., McKenzie, T. L., & Louie, L. (2008). Children's physical activity and environmental influences during elementary school physical education. *Journal of Teaching in Physical Education*, *27*(1), 38–50. https://doi.org/10.1123/jtpe.27.1.38

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). London, United Kingdom: Pearson.

Crouter, S. E., Schneider, P. L., Karabulut, M., & Basset, D. L. (2003). Validity of 10 electronic pedometers for measuring steps, distance, and energy cost. *Medicine and Science in Sports and Exercise, 35*(8), 1455–1460. https://doi.org/10.1249/01.mss.0000078932.61440.a2

Ennis, C. R., Blair, K.-S. C., & George, H. P. (2016). An evaluation of group contingency interventions: The role of teacher preference. *Journal of Positive Behavior Interventions*, *18*(1), 17–28. https://doi.org/10.1177/1098300715577663

Garn, A. C., McCaughtry, N., Kulik, N. L., Kaseta, M., Maljak, K., Whalen, L., . . . Fahlman, M. (2014). Successful after-school physical activity clubs in urban high schools: Perspectives of adult leaders and student participants. *Journal of Teaching in Physical Education*, *33*(1), 112–133. https://doi.org/10.1123/jtpe:2013-0006

Hastie, P. A., Buchanan, A. M., Wadsworth, D. D., & Sluder, B. J. (2009). The impact of an obstacle course Sport Education season on students' aerobic fitness levels. *Research Quarterly for Exercise and Sport, 80*(4), 788–791. https://doi.org/10.1080/02701367.2009.10599620

Hastie, P. A., Calderón, A., Rolim, R., & Guarino, A. J. (2013). The development of skill and knowledge during a Sport Education season of track and field athletics. *Research Quarterly for Exercise and Sport, 84*(3), 336–344. https://doi.org/10.1080/02701367.2013.812001

Hastie, P. A., & Trost, S. G. (2002). Student physical activity levels during a season of Sport Education. *Pediatric Exercise Science, 14*(1), 64–74. https://doi.org/10.1123/pes.14.1.64

Hastie, P., van der Mars, H., Layne, T., & Wadsworth, D. (2012). The effects of prompts and a group-oriented contingency on out-of-school physical activity in elementary school-aged students. *Journal of Teaching in Physical Education, 31*(2), 131–145. https://doi.org/10.1123/jtpe.31.2.131

Heck, A., Collins, J., & Peterson, L. (2001). Decreasing children's risk taking on the playground. *Journal of Applied Behavior Analysis, 34*(3), 349–352. https://doi.org/10.1901/jaba.2001.34-349

Hickerson, B. D., & Henderson, K. A. (2014). Opportunities for promoting youth physical activity: An examination of youth summer camps. *Journal of Physical Activity and Health*, *11*(1), 199–205. https://doi.org/10.1123/jpah.2011-0263

Hume, K. M., & Crossman, J. (1992). Musical reinforcement of practice behaviors among competitive swimmers. *Journal of Applied Behavior Analysis, 25*(3), 665–670. https://doi.org/10.1901/jaba.1992.25-665

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 1–16. https://doi.org/10.1186/1479-5868-7-40

Johnston, J. M., Pennypacker, H. S., & Deitz, S. M. (1981). *Strategies and tactics of human behavioral research*. Hilldales, NJ: Erlbaum Associates.

Kraak, V. A., Liverman, C. T., & Koplan, J. P. (Eds.). (2005). *Preventing childhood obesity: Health in the balance*. Washington, DC: National Academies Press.

Lloyd, J. W., Eberhardt, M. J., & Drake, G. P. (1996). Group versus individual reinforcement contingencies within the context of group study conditions. *Journal of Applied Behavior Analysis, 29*(2), 189–200. https://doi.org/10.1901/jaba.1996.29-189

Loprinzi, P. D., Lee, I. M., Andersen, R. E., Crespo, C. J., & Smit, E. (2015). Association of concurrent healthy eating and regular physical activity with cardiovascular disease risk factors in US youth. *American Journal of Health Promotion*, *30*(1), 2–8. https://doi.org/10.4278/ajhp.140213-quan-71

McKenzie, T. L., Feldman, H., Woods, S. E., Romero, K. A., Dahlstrom, V., Stone, E. J., . . . Harsha, D. W. (1995). Student activity levels and lesson context during third-grade physical education. *Research Quarterly for Exercise & Sport, 66*(3), 184–193. https://doi.org/10.1080/02701367.1995.10608832

McMullen, J., van der Mars, H., & Jahn, J. A. (2014). Chapter 2 Creating a before-school physical activity program: Preservice physical educators' experiences and implications for PETE. *Journal of Teaching in Physical Education*, *33*(4), 449–466. https://doi.org/10.1123/jtpe.2014-0063

Michie, S., Ashford, S., Sniehotta, F. F., Dombrowski, S. U., Bishop, A., & French, D. P. (2011). A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. *Psychology & Health*, *26*(11), 1479–1498. https://doi.org/10.1080/08870446.2010.540664

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., . . . Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behavior

change interventions. *Annals of Behavioral Medicine*, *46*(1), 81–95. https://doi.org/10.1007/s12160-013-9486-6
National Physical Activity Plan Alliance. (2016). *2016 US report card on physical activity for children and youth*. Columbia, SC: Author.
Parker, M. B., & Curtner-Smith, M. (2005). Health-related fitness in Sport Education and multi-activity teaching. *Physical Education & Sport Pedagogy, 10*(1), 1–18. https://doi.org/10.1080/17408980420003348 72
Patrick, C. A., Ward, P., & Crouch, D. W. (1998). Effects of holding students accountable for social behaviors during volleyball games in elementary physical education. *Journal of Teaching in Physical Education, 17*(2), 143–156. https://doi.org/10.1123/jtpe.17.2.143
Pereira, J., Hastie, P., Araújo, R., Farias, C., Rolim, R., & Mesquita, I. (2015). A comparative study of students' track and field technical performance in Sport Education and in a direct instruction approach. *Journal of Sports, Science, and Medicine, 14,* 118–127.
Pritchard, T., Hansen, A., Scarboro, S., & Melnic, I. (2015). Effectiveness of the Sport Education fitness model on fitness levels, knowledge, and physical activity. *Physical Educator, 72*(4), 577–600. https://doi.org/10.18666/tpe-2015-v72-i4-6568
Rowe, D. A., Barfield, J. P., & Michael, T. J. (2001). Inter-instrument consistency of the Yamax Digi-Walker pedometer in elementary school-aged children. *Medicine & Science in Sports & Exercise*, *33*(5), S251. https://doi.org/10.1097/00005768-200105001-01415
Siedentop, D. (1994). *Sport Education*. Champaign, IL: Human Kinetics.
Siedentop, D. L., Hastie, P., & Van der Mars, H. (2019). *Complete guide to Sport Education*. Champaign, IL: Human Kinetics.
Sinelnikov, O. A. (2009). Sport Education for teachers: Professional development when introducing a novel curriculum model. *European Physical Education Review, 15*(1), 91–114. https://doi.org/10.1177/1356336x09105213
Thorne, S., & Kamps, D. (2008). The effects of a group contingency intervention on academic engagement and problem behavior of at-risk students. *Behavior Analysis in Practice, 1*(2), 12–18. https://doi.org/10.1007/bf03391723
Tudor-Locke, C., Lee, S. M., Morgan, C. F., Beighle, A., & Pangrazi, R. P. (2006). Children's pedometer-determined physical activity during the segmented school day. *Medicine and Science in Sports and Exercise, 38*(10), 1732–1738. https://doi.org/10.1249/01.mss.0000230212.55119.98

U.S. Department of Health and Human Services. (2000). *Healthy People 2010* (Conference ed.). Washington, DC: Author.
Valente, T. W., & Pumpuang, P. (2007). Identifying opinion leaders to promote behavior change. *Health Education & Behavior*, *34*(6), 881–896. https://doi.org/10.1177/1090198106297855
van der Mars, H. (1989). Observer reliability: Issues and procedures. In P. W. Darst, D. B. Zakrajsek, & V. H. Mancini (Eds.), *Analyzing physical education and sport instruction* (pp. 53–80). Champaign, IL: Human Kinetics.
Vidoni, C., & Ward, P. (2006). Effects of a dependent group-oriented contingency on middle school physical education students' fair play behaviors. *Journal of Behavioral Education, 15*(2), 80–91. https://doi.org/10.1007/s10864-006-9012-z
Wahl-Alexander, Z., Schwamberger, B., & Neels, D. (2017). In-depth analysis of a teacher's experience implementing Sport Education in an after-school context. *Physical Educator*, *74*(4), 627–652. https://doi.org/10.18666/tpe-2017-v74-i4-7544
Wahl-Alexander, Z., & Morehead, C. A. (2017). Comparing campers' physical activity levels between Sport Education and traditional instruction in a residential summer camp. *Journal of Physical Activity and Health*, *14*(9), 665–670. https://doi.org/10.1123/jpah.2017-0039
Wahl-Alexander, Z., Sinelnikov, O., & Curtner-Smith, M. (2017). A longitudinal analysis of students' autobiographical memories of participation in multiple Sport Education seasons. *European Physical Education Review, 23*(1), 25-40. https://doi.org/10.1177/1356336x15624246
Wallhead, T., & O'Sullivan, M. (2005). Sport Education: Physical education for the new millennium? *Physical Education and Sport Pedagogy, 10*(2), 181–210. https://doi.org/10.1080/17408980500105098
Ward, P., & Barrett, T. (2002). A review of behavior analysis research in physical education. *Journal of Teaching in Physical Education*, *21*(3), 242–266. https://doi.org/10.1123/jtpe.21.3.242
Ward, P., & Dunaway, S. (1995). Effects of contingent music on laps run in a high school physical education class. *Physical Educator, 52*(1), 2–7.
Ward, J. K., Hastie, P. A., Wadsworth, D. D., Foote, S., Brock, S. J., & Hollett, N. (2017). A Sport Education fitness season's impact on students' fitness levels, knowledge, and in-class physical activity. *Research Quarterly for Exercise and Sport, 88*(3), 346–351. https://doi.org/10.1080/02701367.2017.1321100