

## PHYSICAL ACTIVITY

# Incorporation of Physical Activity Challenges Within a Sport Education–Based Physical Education Class

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## Abstract

*This study examined the impact of including a formal requirement of achieving predetermined energy expenditures as part of students' participation grades during a Sport Education–based college physical education class. Calorie consumption was measured using the Heart Zones Blink 3.0 sensor, and the percentage of students who reached the lesson target was calculated across a 15-week semester. The instructor kept a weekly journal and students participated in interviews at mid and end of term. Results showed that the average calorie consumption across the semester well exceeded the daily targets, while the percentage of students who reached the daily challenge cutoff ranged from 77% to 100% (average = 87%). Analysis of the journal entries and interviews resulted in the generation of four themes: students' commitment to reaching the activity targets, group-based strategies for achieving physical activity targets, activity consequences of officiating roles, and activity challenges problematized skill development for some.*

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For over 100 years, colleges and universities in the United States have offered physical education or physical activity programs to their students for course credit. Although these programs have been given different titles, from basic instruction programs (Lumpkin & Jenkins, 1993), to general instruction program in physical education (Trimble & Hensley, 1984), to perhaps the more contemporary higher education physical activity programs (Stapleton et al., 2017), the goals throughout this long history have essentially been to educate students about the benefits of physical activity and lifetime fitness (Adams & Brynteson, 1995). Specifically, as Casebolt et al. (2017) noted, these programs are designed to “provide skills and knowledge to students that encourage physical activity in what is sometimes referred to as conceptual physical education” (p. 101).

While the content focus of these courses has seen a “to and fro” in emphasis from health and fitness to more psychomotor objectives, and then back toward fitness and lifetime activities, there have been more similarities than differences in the general structure across time (Stapleton et al., 2017). Accordingly, in 2007, the National Association for Sport and Physical Education (NASPE) presented a position paper on university physical activity programs, stating that they should teach empirically supported behavior change methods to highlight and nurture motivation to engage in physical activity.

While there has been some consistency in mission, Stapleton et al. (2017) suggested there is a need for strategies that allow these programs to survive and flourish in times of decreased public funding, rising tuition costs, and concerns with student retention. These include a rebranding of these programs from a public health perspective, innovative course presentation, and a renewed focus on learner-centered approaches. Although there has been a general move toward more lifetime and fitness activities and reduction in sport-based course offerings, one particular innovation has been the adoption of the Sport Education curriculum model for teaching team sports.

Sport Education was designed to provide students with authentic and enjoyable sport experiences through a season-long program that places them into small-sided teams and takes them through a series of skill practices (planned and carried out by teachers and peer coaches), and through developmentally appropriate games

conducted as authentic competition (Siedentop et al., 2020). During a Sport Education season, students take on significant responsibility for the conduct of the unit. That is, within their teams, they may take roles that include coaches, captains, managers, publicists, or members of a sports organizing board. In addition, students participate in officiating and scorekeeping duties during competitions. In essence, Sport Education is designed to offer students a more complete sport experience than that of simply an isolated player.

The research on Sport Education at the university level has produced very positive responses from students. One theme that comes from these papers is that Sport Education provides a more complementary (in contrast to adversarial) link between the students' quest for good grades and their socializing strategies (Sinelnikov & Hastie, 2012). Indeed, this idea of being a member of a persisting team has been the most attractive aspect of courses using Sport Education. The feeling of "relatedness," an innate psychological need to interact, be connected to, and experience caring for others (Ryan & Deci, 2000) that is so pervasive within the Sport Education experience, seems to be a critical factor in students reporting that they engage at higher rates in this class than in previous activity courses (Bennett & Hastie, 1997) and believing they make significant progress in acquiring skills (Mohr et al., 2012).

As part of the trend toward university physical education courses taking a public health perspective, there has been increased attention to the potential of physical activity measurement technologies (e.g., digital pedometers, accelerometers, heart rate monitors) being included in courses for students to track their activity levels. The key outcome is that simply having students wear the activity trackers (without any specific accountability for energy expenditure) does not seem to be an effective behavior change strategy (Kim et al., 2018). What does seem to be effective is having a formal accountability system in which part of a student's grade is dependent upon reaching a specific activity target (Brock et al., 2016).

Given the potential of Sport Education to offer a positive learning experience in a university sport-based physical education setting, and given the recommendation for these classes to adopt physical activity measures, the purpose of this study was to examine the impact of including a formal requirement of achieving predetermined energy

expenditures as part of students' participation grades during a Sport Education–based college physical education class. This question is compatible with the call for future research on sport-based physical education to move away from “versus” designs to those that provide a “deeper understanding of the dynamics of teachers’ and students’ interactions” (Hastie & Mesquita, 2016, p. 80). Specifically, this study focused on the implementation of a specific pedagogical approach (including an energy expenditure requirement) to identify the key factors that made this approach successful and the problems perceived by the various participants (Metzler, 2011).

## Method

### Participants and Setting

The participants in this study were 18 university students (6 females, 12 males,  $M_{\text{age}} = 20.72$  years,  $SD = 1.67$ ) enrolled in a tennis class at a land grant university in the Southern United States. The students' class standing ranged from freshmen to senior, while the ethnicities of participants included Caucasian ( $n = 16$ ) and Asian American ( $n = 2$ ). These participants had not engaged regularly in tennis prior to the course, and none had experience with the Sport Education model.

The instructor in this study had extensive experience with respect to tennis. As a former major in physical education during his studies, he had studied and played tennis for over 7 years and had taught tennis for more than 5 years. Within the current setting, this was the ninth occasion in which he had been the instructor of a physical education tennis course. In addition, the instructor had conducted several seasons of Sport Education at the college physical education level and had been involved in planning and conducting a number of Sport Education projects both in the United States and overseas.

All participants provided informed consent to participate in the study. The study was approved by the university's Institutional Review Board for Human Subjects Research.

### Lesson Content

The course took place over a 15-week semester. Classes met three times each week on Monday, Wednesday, and Friday and lasted

50 min, for a total of 45 lessons. In terms of the Sport Education season design, the “progressive competition format” (Siedentop et al., 2020, p. 99) was followed. This format involves teams moving through three phases where they first learn skills, rules, and aspects of officiating, then participate in nonconsequential practice games (which we call scrimmages), and then finally take part in a formal competition and a culminating event.

In the first phase, following team formation, the content included the development of skillful groundstrokes (forehand and backhand), serving, and volleying. The instructor provided whole-class instruction related to the mechanics of the strokes and to the key movement patterns. Students also practiced within their teams under the leadership of a more skillful player who they nominated as their “coach.” The environment in which the skills were used gradually become more open and dynamic as the students mastered the essential object control skills.

The second phase, the preseason, saw lessons in which teams played informal games whose scores did not count toward the league table and whose focus was on the development of competency in officiating and maximizing team function. Following the concept of “graded competition” (Siedentop et al., 2020), which is a way of arranging competitions so that students of similar skill levels are matched against one another, each team selected players to participate in either the “advanced” or “recreational” competitions. While games in the advanced competitions followed the official tennis scoring protocols, the recreational games in this class adopted a “seven-score” system. That is, the first player to reach 7 points wins the game, with an unreturnable winner counting for 2 points but an error (hit into the net or out of court) counting for -1 point. This format reinforced the use of consistent groundstrokes and decreased the impact of the serve as a rally begins only when the receiving player decides to return the serve.

The third phase, the formal competition, involved lessons in which match results from both “advanced” and “recreational” competitions were formally recorded in a league table together with the fair play points allocated by the officiating team. The season concluded with a series of playoff matches and a festive culminating event.

## **Instruction and Treatment Validity**

Given that this study served to determine the influence of a pedagogical model on student learning, it was critical to validate that the instruction was indeed consistent within the accepted standards for that model. According to Metzler (2005), to achieve this, researchers need to itemize the key teacher and/or learner processes designed in the model and then verify that those processes were sufficiently present in the unit. With respect to this verification, in this study, Hairui Liu and Peter Hastie, who had a significant research and publication record relating to Sport Education, attended six randomly selected lessons and completed the 10-item checklist developed by Pritchard et al. (2008). They reached 100% agreement that the essential elements of Sport Education were present in each lesson.

## **Incorporation of Physical Activity**

A physical activity challenge was integrated into the Sport Education season and accounted for 10% of each student's final grade. To earn these "activity points," students were required to achieve a specific calorie consumption during classes. Following a familiarization period, the cutoff scores increased throughout the semester. In addition to the individual student's accountability, a group-oriented contingency was also offered to each team. That is, students who doubled or tripled the required energy expenditure cutoff for a specific day could add 2 or 3 points, respectively, to their team's total score on the league table.

The cutoff scores for the physical activity challenge were based upon the findings of Anthanont et al. (2017), who determined that healthy sedentary adults burn approximately 170 kCal/hour. By consequence, the physical activity challenge began with a target of 120 kCal/lesson for a practice week, then progressed to a maximum of 260 kCal/lesson. Table 1 shows the weekly physical activity targets across each Sport Education season phase.

## **Data Collection**

### ***Energy Expenditure***

Calorie consumption was measured using the Heart Zones Blink 3.0 (Sacramento, CA, USA). The Blink 3.0 heart rate monitor is a tool for managing heart rate, calories burned, distance, and pace. In

**Table 1**  
*Physical Activity Targets*

<b>Weeks</b>	<b>kCal target</b>	<b>Sport Education season phase</b>
1–3	no target	Training camp
4	120	
5	140	
6	160	Preseason
7	200	
8	240	
9	250	
10	250	
11	250	Formal competition and
12	250	final series
13	260	
14	260	
15	no target	

this intervention, the instructor used an iPad that connected with a bridge to links to all sensors. The iPad display allowed all students easy access to their heart rates and calories while they progressed through the lessons.

### ***Instructor Journal***

In addition to the measure of energy expenditure, the instructor kept a weekly journal in which he reflected upon the students' in-task behaviors and their responses to the Sport Education intervention. The journal entries included aspects of the students' engagement, their responses to the content and teaching, skill development, and learning activities, specifically as related to the inclusion of the energy expenditure requirements. Across the term, over 25 pages of text were produced.

### ***Student Interviews***

All students were provided the opportunity to participate in interviews at midterm and at the end of the semester, with the participation rate being 70% and 65%, respectively. Interviews were

conducted in a classroom near the tennis courts, were recorded on a digital device, and later transcribed. Group interviews were used in preference to individual interviews for several reasons. These included (a) the interactions between students, which would have been absent in a one-on-one situation; (b) the social support peers could provide during the interview; and (c) the possibility of responses emerging that probably would not have if individual interviews had been conducted (see Carey & Asbury, 2016).

Interviews were conducted by Hastie (not the course instructor), with participants signing up for any 20-min block that suited their schedules. Typical groups consisted of either three or four students. The participants were assured that the comments would not be made available to the instructor until after final grades were posted. In addition, they were also guaranteed that any personally identifiable information would not be shared outside the research team.

A standard protocol was used in all interviews. Interviews began with a series of general questions about the course. Sample questions included “What were some of the reasons for enrolling in this class?” and “Tell me about how you are finding the structure of the class (with teams and competitions etc.)” While not specifically related to the purpose of the study, these questions helped the students feel comfortable in their answers and provided them with opportunities to actually respond, thereby promoting their engagement in the interview process. These questions were followed by those related to the wearing of sensors. A funneling technique (Smith, 2016) was used where the students’ general views were sought first, followed by more specific questions that addressed the central research question. In particular, the students were asked to comment about if and how the sensors had an impact on their perceptions of their development of skills, feelings about team affiliation, and their nonplaying responsibilities such as umpiring and scorekeeping.

## **Data Analysis**

### ***Energy Expenditure***

All energy expenditure data were exported in an Excel file from the iPad after each lesson. Weekly class means were then calculated from all participants. The percentage of students who reached the target score was also calculated for each lesson.

## *Instructor Journal*

The transcripts of the instructor's journal were subject to a deductive analysis (Gilgun, 2011). In contrast to an inductive approach that aims to generate new theory that emerged from the data, deductive thematic analysis uses a structure or predetermined framework to analyze data. In this deductive form of analysis, the basis of student motivation within Sport Education (see Wallhead, 2012) served as that initial theory, and the data from the journals were subjected to the five-phase model outlined by Braun et al. (2017), starting with familiarization and coding, then moving to theme development, refinement, and naming. The results from this analysis were examined in terms of whether they confirmed, added to, or provided negative cases of the original theory (Elo & Kyngäs, 2008; Gilgun, 2011).

## *Student Interviews*

Like the instructor journal, interviews were subjected to deductive analysis, again focusing on their feelings concerning the utility, value, and participation implications of the physical activity challenges. The same protocol for theme development was adopted for interviews.

## **Trustworthiness of the Qualitative Analysis**

Two coders participated in developing the themes, and a number of peer debriefing sessions were included, promoting the credibility and confirmability of the findings (Shenton, 2004). Liu and Hastie repeatedly read field notes and interview transcripts, which were reduced to meaningful units and then collated to form broader themes. Evidence from both journals and interviews was sought to provide a strong association.

## **Results**

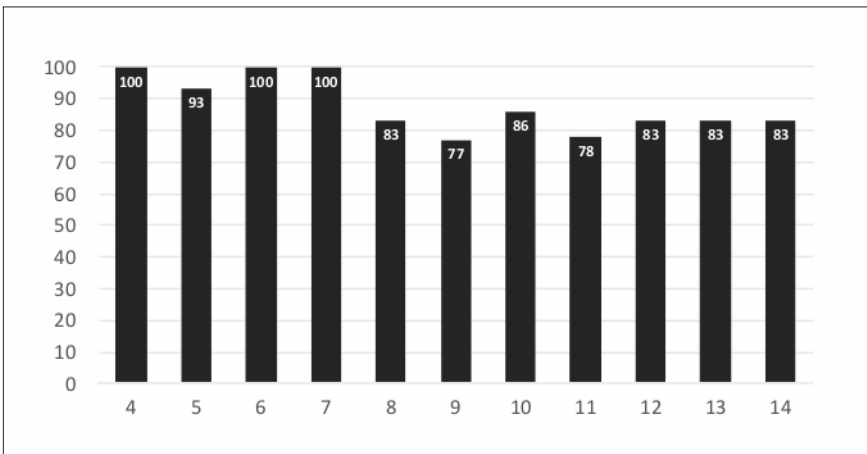
### **Energy Expenditure**

Figure 1 shows the calorie consumption across the season. In all weeks following the introduction of formal accountability, the class mean exceeded the baseline requirement. Figure 2 shows the percentage of students who reached the daily challenge cutoff. As an overall score, the students reached the daily required score 87.4% of the time.

**Figure 1**  
*Average Calorie Consumption Across Weeks*



**Figure 2**  
*Percentage of Students Achieving the Weekly Targets*



## **Journal and Interview Themes**

The analysis of the instructor's journal entries and the students' interviews led to the generation of four themes. The content of these themes was consistent across the two data sources and as a result were put together to provide a more comprehensive account of the class. In order from general to more specific, the themes are students' commitment to reaching the activity targets, group-based strategies for achieving physical activity targets, activity consequences of officiating roles, and activity challenges problematized skill development for some.

### **Students' Commitment to Reaching the Activity Targets**

There were significant findings within the instructor's log and student interviews that described the student behaviors that led to their high levels of energy expenditure. For example, as early as Week 2, he mentioned how a number of students "wanted feedback about their progress towards the calorie target." He further noted that

the feedback certainly encouraged students to play more and run more during team practice. They were always asking, "How many calories do I have so far?" They will immediately run, jump, or playing more intense tennis once I told them their calories were low. For example, Collins's team had one person missing so that his team already lost one point in the PA challenge. He tried to save every stroke when he heard his calorie count was only 85. He was moving back and forth, left and right to cover every shot. When I returned later he asked again and had reached 190. I told him he could double his calories to earn one more point for his team. By the end of the lesson he had over 400 and also earned two points for his team. (Week 4 log)

The instructor reported in nine of his journal entries the extent to which students were showing high levels of effort and intensity in team practices and even more during competitive matches. One entry from the preseason is typical of the support students showed in match play:

Minions (the #1 team in the competition) were playing today against the Mean Girls. However, they lost their advanced singles, leaving Charlie and Chris needing to win. Hannah (their singles player) was watching her teammates and cheered for them throughout the match: Go, Minions, you guys can do this!”

Later in the season, the following excerpt from the instructor’s journal shows further evidence of this commitment:

Amazing rally appeared in this advanced single match. Charlie was giving all he could in this epic match: lob, backhand attack, and strong serve. Anthony was in trouble at the beginning. However, he was determined and patient in dealing with the attacks from Charlie. The A-Team was highly motivated to play in the final, especially after last Friday when they spent a couple of hours practicing after class in order to qualify in second place.

This level of investment and intensity was something the instructor had not experienced in other tennis courses he had taught that were not conducted using a team-based format.

From the students’ perspective, all who were interviewed concurred that the physical activity challenges changed their behavior in class and were motivating. One student commented during the midterm interviews,

The watches are motivating—sure—Now like I run a lot more in class—we check our scores and make sure we get the target. For example, when we round up the balls I run instead of walking to get them. Without the sensors I certainly would have walked.

## **Group-Based Strategies for Achieving Physical Activity Targets**

Prior to the competition phase, all teams had already begun to create strategies to ensure they reached the day’s designated activity target. As early as Week 4, the instructor’s journal showed evidence that “all teams [were] trying to boost their calories in their PA

challenge.” These varied in their sophistication, with the simplest including teams “doing jumping-jacks while one player is presenting the strategy for the upcoming practice.” More complex strategies included specific player assignments during practices. For example, “Team of Orange has three people. The team coach has scheduled that two people play together and another one student running around their tennis court. After two laps they will switch to another runner.” As another example, “Team Blue was playing double games on their home court (4 people). The student that makes a mistake in the rally runs a quick penalty lap.” In still another case, Anthony, the captain of the “A-Team,” scheduled a one against two tennis game for his teammate Abby, because her calorie count was low during the first 20 min of the class. Anthony explained to the instructor that he hoped “the adapted tennis play could help his teammate be more active in the rest of 30 minutes.” This strategy of deliberately creating imbalanced games to promote possibilities for great energy expenditure was also reported by members from Team Orange and the Mean Girls team during interviews.

### **Activity Consequences of Officiating Roles**

The students mentioned in 60% of weekly entries that the physical activity challenges made it difficult for them to achieve their daily target when their teams were officiating. As can be appreciated, this element of Sport Education placed students in more passive roles such as scorekeeping and umpiring and the slightly more active role of ball retriever. The instructor noted that a frequent question from students during the first lessons when officiating was “Do we need to finish our physical activity challenge if we are the referee?” Indeed, a number of students reported during interviews that they felt surprised when the instructor first told them the officiating team still needed to complete the physical activity challenge. They also acknowledged that “it was hard to get to the calorie target when you were essentially standing around.”

Despite these difficulties, there was evidence in the instructor’s journal entries about how several students initiated physical activity strategies during their officiating duties. Examples include “The Orange team’s players are all doing jumping-jacks while officiating” and “Anthony is running across the net to pick up the ball between rallies. Abby is jumping and running in place as she keeps score.” The

students acknowledged that while it seemed pretty “artificial” in the role of an official, they did consciously, “out of pragmatism,” perform “some form of exercise in between rallies.”

### **Activity Challenges Problemated Skill Development for Some**

There were, however, negative cases with respect to the formal accountability inherent in wearing the sensors. Particularly in the early phases of the season, as reflected in the midterm interviews, three students commented that the physical activity requirement compromised their tennis development. Comments included “It gets to where I focus more on meeting the calorie goal for the goal for the day than doing anything else” and “I spend more time running laps than actually playing tennis.” These students then faced a double jeopardy situation. Believing they were at a level of tennis competence at which they were unable to achieve the daily activity target solely through practicing skills and playing games, they had to exercise outside the practice context. This in turn limited their ability to improve. For those with higher skill, the situation was different: “It was a chore at the beginning, and we were practicing and didn’t have much activity—but now we are playing games we can do it.” One student who identified as higher skilled noted during an interview, “It is crazy, the gameplay was great because I have to run a lot to cover the court. I was easily getting over double the daily target.”

The instructor also noticed where the overall experience in the Sport Education season was potentially compromised for lower skilled students by the inclusion of the energy expenditure requirement. He noted during the formal competition where “one recreational player worried about their PA challenge decided to play with another classmate rather than cheering for their team.”

## **Discussion**

The purpose of this study was to examine the perceptions of students and their instructor to a specific pedagogical approach to teaching a university physical education class. In this case, that approach was a tennis class organized around the principles of Sport Education with the inclusion of a physical activity requirement. The students demonstrated significant buy-in to the course and its requirements, and most students achieved the daily cutoff targets.

This finding adds to the literature that shows the strong potential of Sport Education to produce positive outcomes in terms of college and university students' physical activity behaviors (Mohr et al., 2012). Further, the use of a group-oriented contingency as presented to students in this study (i.e., being able to earn extra points that counted toward the season's league standings) is an authentic and effective means of promoting in-class physical activity.

It is also clear from the research on Sport Education (in school and university settings) that the persistent team membership and the peer teaching responsibilities have the potential to foster physical engagement within classes. That is,

the focus of a holistic game-play evaluation, together with the added provision of individual role responsibilities within the team fosters an individual accountability for achieving group goals. As a result, students see that their own individual efforts are critical to the success of the team. (Hastie & Wallhead, 2015, p. 134)

It is clear from the outcomes of this study that the students embraced this team aspect, which was clearly demonstrated by the extent to which they practiced volitionally outside of class hours.

With respect to engagement in classes, Doyle (1983) commented that "students tend to take seriously only that work for which they are held accountable" (p. 186). While this in part can provide the answer to why a majority of students reached the activity targets a majority of the time, it does not explain the significant gap between the required target and those achieved by many students. In particular, it should be noted that doubling or tripling the challenge targets was irrelevant to a student's final grade. Rather, they were only relevant to promoting team rankings. As such, these challenges became more of a "bonus" rather than a "burden." It is our contention in this study that the focus on group goals and the resultant positive interactions between students provide a plausible explanation for the high levels of energy expenditure that were achieved. That is, Sport Education is known to include an element of "content-embedded accountability" (Hastie, 2000). Because games "count" in Sport Education toward a season outcome, team practices tend to be taken more seriously, a factor we know from accountability research to be crucial.

Nonetheless, the negative case in this conclusion related to the limited possibilities for activity accrual came during officiating duties and in games in which the students had fewer opportunities to perform tennis abilities. While some students were successful in creating strategies to become active during refereeing roles, it may be prudent to have differential activity targets in these cases.

These findings supporting the positive outcomes of Sport Education may provide a useful incentive for universities where physical activity courses are offered only on an elective basis. Kim and Cardinal (2019) noted, where courses are elective, it seems that only the most competent, motivated, and physically active students tend to enroll. That Sport Education offers potentially positive experiences for students who are less competent and offers a high degree of relatedness among class members, thereby promoting activity engagement, might well be a strong advocacy element for those responsible for these courses. This is particularly relevant given the findings that graduates who participated in activity courses during their higher education reported higher levels of physical activity in adulthood in comparison to those who did not participate in these types of courses (Casebolt et al., 2017).

This article is not without limitations, the major one being that the data came from one instructor with one class. While the general findings concerning the students' responses to Sport Education in this study mirror those from previous works in university courses, the addition of the energy expenditure requirement created a novel course. Replication of this study would be a valuable addition to research in university-based physical education.

A second limitation is the profile of the sample in this study. There was little diversity among the students in terms of their identified ethnicity, their level of tennis skill (most were novices), and their history with university physical education. This general conformity confines the degree of generalizability of the findings. Again, a replication of this study with a more varied sample of students is warranted. A class in which the students were more skillful in the selected sport might experience the competition aspect differently, while a group of students with more experiences in university physical education may be able to make more sophisticated comparisons between these experiences and the current course.

A final limitation lies in the reliance of only two sources of data in the generation of the themes. While the analysis of these data sources was thorough and reliable, both rely on the perceptions of the participants (both instructor and students). Video records of student engagement during classes (which may or may not be analyzed quantitatively) and field notes taken by an independent observer are two potential additions. Both of these sources would allow for an expanded data set, which would make the generalizability of the findings more robust.

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