The Impact of Accountability on Student Performance in a Secondary Physical Education Badminton Unit

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Abstract

The purpose of this study was to examine the effect of accountability on the quality of student motor responses during a 10-day badminton unit with female high school students enrolled in a required physical education class. Students in the control class participated in the same learning activities taught by the same teacher as the treatment class. On day three, the teacher showed students in the treatment class the assessments that would be used to determine their grades. All students in the study improved as documented by an increase in skill performance with students in the treatment class having higher success rates than students in the control class. Results of this study demonstrate that if students are informed in advance about the skills which they will be held accountable for and are given adequate opportunity to practice those skills, both the quality and quantity of responses will improve. Additionally, this study found that students of all ability levels can improve when they are informed in advance about teacher expectations and then held accountable for meeting these.

Educational reform has put increased pressure on all subject areas including physical education to increase student learning and achievement. Physical education teachers feel additional pressure because increased emphasis on achievement in other subject areas many times translates to decreased time allocated for physical education. If students are to become physically educated, teachers must find ways to increase the effectiveness of teaching and thus improve student learning.

In the search for ways to improve teaching effectiveness in physical education, several studies (Jones, 1992; Lund, 1992; Marks, 1989; Silverman, Kulinna, & Crull, 1995; Tousignant & Siedentop, 1983) have used the task systems model as a framework. Doyle (1979, 1985b, 1986) identified managerial and instructional tasks systems that he found operating in the classroom. The study by Tousignant and Siedentop (1983) was the first of several studies that identified these task systems in physical education (Alexander, 1982; Graham, 1987; Jones, 1992; Lund, 1991; Marks, 1989; Silverman et al., 1995) with Jones identifying a third task system that she called the social task system. Accountability plays a major role in whether students complete tasks (Alexander, 1982; Lund, 1992). The present study examined the effect of accountability on student learning when teacher expectations for the instructional task system were explained to students in a physical education class at the beginning of an instructional unit.

Theoretical Framework

According to Doyle (1985a), a learning task consists of four components: the goal or end product to be achieved; a set of operations or procedures used to attain the goal; resources or conditions that are available to attain the goal or end product; and a means of holding students accountable for achieving the task. The first three components of the learning task relate to task clarity; if teachers specify the goal, procedures, and conditions, students are more likely to have a clear picture of expectations. Silverman et al. (1995) found a significant relationship between the total number of tasks and time spent on tasks when the task statement included the outcome, situation, and criteria-product when studying student performance on the volleyball forearm pass. Accountability, the final component of Doyle's task systems model, is seen as a key to student behavior (Doyle, 1983b; Doyle & Sanford, 1985; Doyle, 1985a). In fact, Doyle (1980) stated that accountability was a necessary precursor for a task. If teachers fail to hold students accountable for completing the task, then students could either perform the task or could modify the task in ways that would make their performance very different from the specified task.

Several studies completed in physical education have examined task accountability (Alexander, 1982; Hastie, 1997; Hastie & Vlaisavljevic, 1999; Lund, 1992; Marks, 1989; Silverman et al., 1995; Tinning & Siedentop, 1985; Tousignant & Siedentop, 1983; Vidoni & Ward, 2006; Ward, Smith, Makasci, & Crouch, 1998). Alexander (1982) identified grading as a powerful form of accountability when student repetitions of a task increased dramatically under a grading accountability condition. Lund (1992) identified several different types of accountability besides grading that teachers used including observations, feedback on errors, public recognition, aversives (e.g., exercise as punishment, deduction of participation points, etc.), and accountability checks. Accountability conditions of public recognition, aversives, accountability checks, and grading tended to have similar effects on student response rates. Using the volleyball underhand serve, Silverman et al. (1995) found significant relationships for the total number of tasks and time spent engaged in performing tasks when accountability included teacher feedback with follow up and monitoring of off-task behavior. Silverman's study targeted highly skilled volleyball players in a physical education class.

Studying accountability in both the secondary school and sports settings, Hastie and Saunders (1991, 1992) found that accountability plays an important role. Student perceptions of the teacher were related to the teacher's active instruction, monitoring, and rewards. Additionally, these perceptions actually predicted how involved students were in the lesson. These studies indicated that tasks and accountability were related to student behavior and performance.

Although accountability has a powerful influence on student learning, by itself it is not a sufficient condition for student learning. An adequate amount of practice trials is necessary if students are to learn new skills. Along with adequate practice trials, good task progressions are necessary to support student learning (French et al., 1991). For optimal learning to occur, students must have an opportunity to practice skills at an appropriate level of difficulty (Rink, 2006; Siedentop & Tannehill, 2000). If teachers use good teaching progressions and provide an adequate number of practice trials, students still must be held accountable for completing these tasks using correct form if optimal learning is to occur (Buck, Harrison, & Bryce, 1991). Increases in the quality and quantity of student responses during practice trials and drills are likely lead to increased levels of student learning (Ashy, Lee, & Landin, 1988; Buck et al., 1991; Silverman et al., 1995).

Given the limited amount of time allocated to physical education, teachers need to make their instruction as efficient and effective as possible. Deciding how to hold students accountable is a dilemma faced by many physical education teachers in K-12 settings in today's educational climate that focuses on outcomes-based learning. Teachers cite large class sizes and limited amounts of time as barriers to using assessments in physical education (Kneer, 1986; Veal, 1988). Some physical educators question whether assessing student performance is worth the effort (Hensley, Lambert, Baumgartner, & Stillwell, 1987). Previous research has demonstrated a relationship between accountability and the number of student responses but the impact of accountability on the quantity and quality of responses for students with a variety of skill levels (such as those seen in a typical physical education class) has not been studied.

Purpose of the Study

The purpose of this study was to examine the effect on student motor responses when students were informed of the assessments early in an instructional unit. The independent variable in this study was participant knowledge of criteria for which they would be held accountable during the early phases of instruction. Students in the treatment class were informed early in the unit about the skills for which they would be held accountable and the criteria for each of these skills while students in the control class were not informed of teacher expectations regarding the final grade. Student motor responses were used as the dependent variable because they are indicators of student performance and learning during instructional sequences, and the number of correct practice trials that students experience during an instructional unit in physical education is the most consistent way to measure learning (Buck et al., 1991).

Method

Participants and Setting

After receiving permission from the Institutional Review Board at a Midwest university, the researcher obtained participant and parental consent to videotape 63 of 77 students enrolled in two female high school physical education classes. The classes used for the study were required freshman classes that satisfied the physical education requirement for the state. Students were randomly selected for the class by the central office (intact classes were used for the study) with no regard to level of skill, experience, or ability. Both classes were equivalent in size (35-40 students) and taught by the same female teacher with over 20 years of teaching experience and who had taught badminton on several occasions. Classes met daily for 50 minutes, with an average of 35-37 minutes of actual instruction. The 10-day badminton unit began approximately 6 weeks after the start of the semester and was the third unit taught.

Selection of Target Students

Prior to the start of the unit, all students in both classes were given the opportunity to serve and continuously hit the shuttlecock across the net with a partner as part of a preassessment. (Note: these data were not used for data analysis). From the percentage of correct successful responses on this task, the teacher assigned students to skill level groupings. Students in both classes were grouped as having less, average, or more skill. From these groupings, four students from each category who had signed consent forms were randomly selected as target students for the study. Students were not aware of their selection as target students. The badminton unit was 10 days long and all lessons were analyzed. Following data collection, data from two of the target students with the best attendance from each category (less, average, and more) from each class were coded. In the case of similar at-

tendance rates, target students were randomly selected.

Data Collection

A total of 10 lessons were observed during each of the classes (treatment and control). Prior to the start of the study and the badminton unit, the researcher brought cameras into the classes to determine the best placement and to decrease student reactivity. Data were not collected during these initial days. Target students in both classes were assigned to specific courts to ensure that they would be in an area viewed by the two cameras used for data collection. Those students who did not return permission forms were on courts that were not videotaped. The cameras began recording three minutes after the tardy bell and continued until students were dismissed at the conclusion of class to go to the locker room and change their clothes. For each of the target students the researcher recorded the total number of skill attempts for the backhand, forehand, overhand clear, and serve responses. Each skill attempt was coded as correct successful (CS), correct unsuccessful (CU), incorrect successful (IS), or incorrect unsuccessful (IU) because the grading scale required the response to have both correct form and land within the boundaries of the court. Table 1 shows the definitions used for coding the quality of the response.

The same drills and activities were used in both classes as the teacher followed the same lesson plan for each class. The treatment class was not informed of the skill assessments and grading criteria until Day 3 of the unit to establish the performance pattern prior to treatment.

At the end of the third day of the badminton unit, students in the treatment class were verbally informed of the grading criteria of the unit. Students in the control class were unaware of the grading criteria until being tested on the final day of the unit. Testing for both classes included a skill test in serving, a wall

Table 1

Definition of Terms for Badminton Accountability Study

Term	Definition
Correct Successful (CS)	Skill attempt used correct form as defined for each type of hit, and the shuttlecock landed within court boundaries
Correct Unsuccessful (CU)	Skill attempt used correct form as defined for each type of hit, but the shuttlecock did not land within court boundaries
Incorrect Successful (IS)	Skill attempt used incorrect form as defined for each type of hit, and the shuttlecock landed within court boundaries
Incorrect Unsuccessful (IU)	Skill attempt used incorrect form as defined for each type of hit, and the shuttlecock did not land within court boundaries

volley skill test, a game play assessment, and a written test. The serving skill test and the wall volley test were both timed and used process (correct form) and product (serve: 20+ = A, 15-19 = B, 10-14 = C, D = 5-9; wall volley: 30+ = A, 20-29 = B, 10-19 = C, 5-9 = D) criteria. For a skill attempt to count toward this score, it needed to be completed with correct form and remain in bounds or in play. Skill attempts that did not have correct form were not counted nor were skill attempts that were executed with correct form but then failed to stay in bounds. Both classes were given a handout on rules prior to the written test. Instruction on days 4-10 was the same for both classes, covering rules, tactics, and skill instruction. The same skill assessments were administered in both classes on day 10 of the unit.

Reliability

Table 1 contains the definitions used for coding the data for this study. Responses were coded as correct successful (CS), correct unsuccessful (CU), incorrect successful (IS), or incorrect unsuccessful (IU). The guidelines were objective and based upon the boundaries of the badminton court and the form criteria presented in class lessons. An independent observer trained on the observation protocol checked 20% randomly selected tapes. The percentage of interobserver agreement was calculated using the following formula (Cooper et al., 1987): the number of agreements divided by the number of agreements and disagreements and then multiplying by 100. Interrater reliability ranged from 84 to 94% for all tapes coded.

Data Analysis

Descriptive statistics were used to look at individual student responses. Percentages of total responses were calculated for correct successful, correct unsuccessful, incorrect successful, and incorrect unsuccessful to show the change in the quality of the skill responses as the unit progressed. The percentage of correct successful responses was calculated by adding the total number of correct successful responses for the forehand, backhand, serve, and overhand shots for each of the 10 days of the study and then dividing by the total responses for the day. Total responses for each day was determined by adding the number of correct successful, correct unsuccessful, incorrect successful, and incorrect unsuccessful.

$$\frac{\text{CS (serve + forehand + backhand + overhand)}}{\text{Total Responses (CS + CU + IS + IU)}}$$

The same procedure was followed for calculating the daily percentage for correct unsuccessful, incorrect successful, and incorrect unsuccessful responses. Percentages of total responses were calculated for correct successful, correct unsuccessful, incorrect successful, and incorrect unsuccessful.

The daily percentage or fraction of total events for correct successful, correct unsuccessful, incorrect successful, and incorrect unsuccessful were compared between treatment and control groups over the 10 days of observation. To make these comparisons, dependent variables were analyzed separately using a group (control v. treatment) by time (Days 1-10) ANOVA with time as a repeated measure. Upon finding a group by time interaction for all dependent variables (see results), post hoc means comparison testing was performed with a Bonferonni correction of alpha to assess where the differences were located. The alpha level for all statistical analyses was set at $p < .05$. Data analyses were completed using SPSS Version 16 software.

Results

A statistical analysis of the data showed a significant interaction between group (control, treatment) and time (days 1-10) for correct successful [F (9, 90) = 24.443, $p < .001$],

correct unsuccessful [F (9, 90) = 24.410, $p < .001$], incorrect successful [F (9, 90) = 17.214, $p < .001$], and incorrect unsuccessful [F (9, 90) = 22.591, $p < .001$]. Prior to the start of the intervention (days 1-3) there was no difference ($p < .05$) between students in the control group and the treatment group when comparing the quality of the response for CS, IS, and IU (Figure 1). On days 1-3, there was a significant difference between the groups for the CU responses with the control group having a higher percentage of CU responses than the treatment group. Following the intervention, a difference ($p < .05$) was noted between the two groups of students with regard to CS responses (days 4-10), CU (days 6-10), IS responses (days 6-10), and IU responses (days 6-10). These differences are shown on Figure 1.

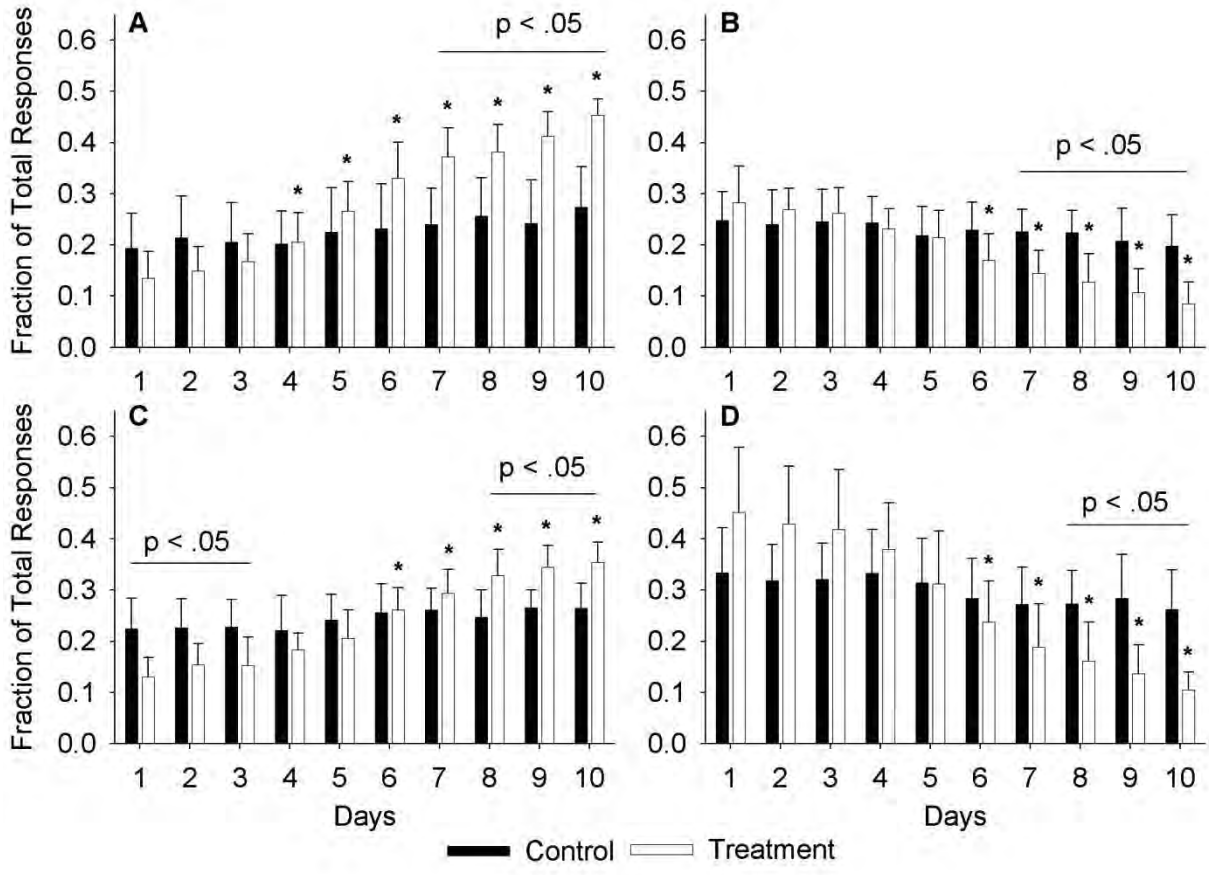
The lower skilled students from the treatment class showed an increase in the quantity of responses as well. On day 1 of the study lower skilled students from the treatment group averaged 80.5 total responses while lower skilled students from the control group averaged 119 total responses. At the conclusion of the study on day 10, the lower skilled students from the treatment group showed an increase in the quantity of total responses when they averaged 116.5 total responses while the lower skilled students from the control group averaged 121.5. Total responses from the higher skilled students did not vary much over the 10 day study.

Figure 1 also shows that all students improved both the quality of their responses and accuracy throughout the unit. Compared to day 1 values, there were no significant differences through time for the control group. However, for the treatment group there were changes over time for each measure. Specifically, treatment group CS values for days 4 - 10, CU values for days 6 – 10, IS values for days 6 – 10, and IU values for days 6 – 10 were significantly different from day 1 values ($p < 0.05$).

Discussion

Doyle (1983b) noted that without accountability there is no task. In this study, students from intact physical education classes were held accountable for learning badminton skills by assessing four different components at the conclusion of the unit: serving, wall volley shots, game play, and cognitive knowledge. The results of this study suggest that knowing teacher expectations can impact student responses when assessments and the criteria used to evaluate them are explained near the beginning of the unit. This expands upon Alexander's (1982) findings that student response rates increased on the day that students were graded because students in this study showed improved performance on several days prior to the final skill assessments. Prior research indicates that an emphasis on grading leads to greater practice (Alexander, 1982; Doyle, 1983a; Lund, 1991; Silverman et al., 1995). The findings of this study suggest a way for teachers to increase student performance and achievement during physical education classes without increasing allocated time.

In this study, students in the treatment class knew that they were going to be assessed but also knew the criteria for success on these assessments. By informing students of specific criteria, the teacher eliminated some of the ambiguity in the task. Figure 1 illustrates the difference in improvement with the greatest change being for CS and IU responses. Although both treatment and control students show improvement during the unit, the treatment group shows greater improvement. When students know what they need to be successful, they have a better chance at success (Davies, 2000). The teacher in this study gave students a clear picture of her expectations and then provided practice experiences for students to reach this standard. Silverman et al. (1995) suggested that reducing task ambiguity by using more explicit tasks would



The figure shows the relative number of correct successful (A), incorrect successful (B), correct unsuccessful (C), and incorrect unsuccessful (D) events expressed as a fraction of the total number of events for control and treatment conditions. Values for days denoted with a solid bar are significantly different between control and treatment groups ($p < 0.05$). An asterisk (*) is used to denote a significant change from day 1 values for the treatment group ($p < 0.05$).

Figure 1: Differences Between Treatment and Control Students for Performance in a Ten-Day Badminton Unit Using a Repeated Measures Split Plot Anova

lead to increased task completion and adherence. Informing students about the criteria used for various skill assessments indirectly reduced the ambiguity of the tasks. Additionally, knowing the criteria for assessment may have allowed students to do formative/self assessments throughout the unit. The power of formative assessment has been noted in several studies reviewed in the meta analysis of formative assessment by Black and Wiliam (1998). The use of formative assessment in physical education is an unexplored topic and one worth studying in the future.

Several researchers (Graham et al., 1996; Silverman, Subramaniam, & Woods, 1998) note the presence of learning gains among students of varying skill level during highly structured practice and instructional activity units. This study found that the quality and quantity of skill responses increased for students regardless of initial skill level. Students with initial weak performance increased the number of CS responses while decreasing the number of IU responses which is evident when looking at Figure 1. As the quality of the skill response improved so did the quantity of

student responses indicating that increased skill competence resulted in increase practice attempts. This study demonstrated that students of various ability levels benefit from knowing the criteria and learning they will be held accountable for during the unit of instruction. Previous studies found that students with better proficiency tend to learn more efficiently (Silverman, 1993; Silverman, Tyson, & Krampitz, 1993; Solomon, 1992). In this study, response rates for higher skilled students improved with regard to the quality of the performance more so than for the quantity of responses. Additionally, this study found that students with low initial response rates improved both the quality and quantity of responses using the same practice tasks as those given students with higher skill levels (i.e., tasks were not simplified for lower skilled students). Siedentop and Tannehill (2000) note that lower skilled students generally make fewer responses per unit of time than do students with greater skill and that lower skilled students have a much lower percentage of successful responses. This study deliberately chose both lower and higher skilled students. When looking at the raw data, students who began with lower response and success rates were able to improve their response rates as well as the quality of the response. Using increased rates of correct successful responses as an indicator of learning, students from the treatment class initially at lower skill levels were able to demonstrate significant learning during this unit.

Several researchers have identified lack of time as a reason for not doing assessment (Kneer, 1986; Veal, 1988). Matanin and Tannehill (1994) reported that physical education teachers place higher value on keeping students active and having them enjoy the activities than on whether students learn. This current study underscores the importance of assessment and demonstrates its positive impact on student response rates. It appears that time spent assessing in physical education is worthwhile because teachers can increase student achievement and learning throughout a unit by setting and stating specific assessment criteria at the beginning of instruction.

By providing knowledge of how they would be held accountable as well as quality instruction, students in this study demonstrated greater learning than students who did not know how they would be held accountable. Reducing the ambiguity of the task by giving explicit criteria for the assessments also contributed to student learning and may have caused some students to self assess during the unit. Results of this study show that both the quality and quantity of responses can improve significantly with this prior knowledge. Thus, time spent doing assessment appears to be time well spent when teaching physical education. Given the limited amount of time allocated to physical education, teachers need to use it as efficiently and effectively as possible. The results of this study show a significant impact on student learning just days after students were informed about how they would be held accountable for their skill performance.

Conclusion

Too often teachers consider assessment something to be done at the conclusion of instruction. By introducing assessments and performance criteria early in the instructional unit, students used this knowledge to improve performance experiencing greater levels of success than did students without this information. Given the importance of assessment in today's educational climate, future research is needed to determine how to use both formative and summative assessment effectively throughout the instructional unit. The current study examined student response rates but did not study teacher behaviors in classes where assessment was interwoven with instruction. Future research is needed to observe whether teachers do things differently under these instructional conditions. Additionally, most

of the research cited for this article was conducted with veteran teachers. Preservice and beginning teachers must also be studied to determine whether they can also demonstrate increased levels of student learning using assessment throughout the instructional process. Assessment appears to be a powerful force in the instructional process. More research will help reveal the full extent of its impact on student learning.

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