

THE EFFECTS OF A TOKEN ECONOMY ON SELECTED MOTOR SKILLS IN  
PHYSICAL EDUCATION

by

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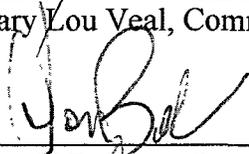
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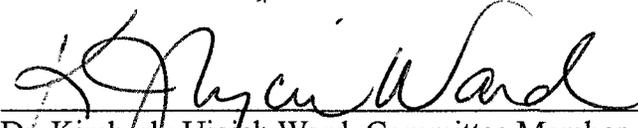
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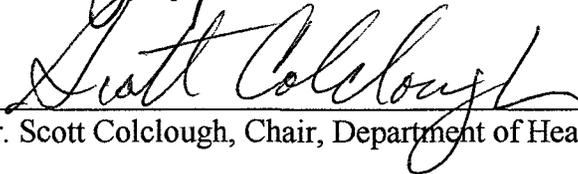
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## DEDICATION

This work is dedicated to Crystal. I couldn't have done it without your support and encouragement.

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Several sources supported the use of token economies in physical activity settings in order to improve social and skilled behaviors. However, a clear lack of empirical support for the use of token systems in physical education settings was evident. Therefore, the overall purpose of this dissertation was to examine the effectiveness of a token economy on selected motor skills in an elementary physical education setting. Manuscript one reviews the existing literature regarding token reinforcement and physical activity. This review provides the rationale and impetus for the research studies that follow. Manuscript two examines the effectiveness of a token economy on the successful jump rope practice trials performed by third grade physical education students. Results indicate that token reinforcement was effective to increase students' practice trials as well to improve the success rate of their practice. And, in manuscript three, a token system was introduced to target the overhand throw skill performance of second grade physical education students. Results from this study indicate that token reinforcement was effective in improving students' overhand throw. Additionally, this study provides evidence that second grade students can accurately conduct a peer process assessment of the overhand throw skill, indicating the feasibility of using peer assessments with lower elementary physical education students. Overall, the examinations conducted within this dissertation show that token economies can be effective in physical education and can, therefore, be a tool available for physical educators to implement in their classes.

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## **CHAPTER I**

### **Introduction**

Despite the recommendations for the use of token economies in physical education (Lavay, French, & Henderson, 2006; Rushall & Siedentop, 1972) and the successes experienced in implementing token systems in physical activity settings (Bernard, Cohen, & Moffett, 2009; DeLuca & Holborn, 1985, 1990, 1992; Wiggam, French, & Henderson, 1986), the use of token reinforcement in physical education has been essentially non-existent. Developed out of the field of behavior analysis, token economies were first introduced by Ayllon and Azrin (1968) for use in therapeutic settings. Reinforcement-based token economy systems consist of three main components. First, a target behavior is identified and operationally defined. Next, tokens are awarded to individuals upon their engagement in the target behavior. And finally, after a specified amount of time, the individuals have the opportunity to exchange their tokens for a variety of back-up reinforcers (Ayllon & Azrin). Since their inception, token systems have been implemented and found to be useful in a wide variety of settings (Kazdin & Bootzin, 1972; Kazdin, 1982).

#### **Statement of the Problem**

One of the main components of physical educators' responsibilities is to help their students develop competency in a variety of motor skills (National Association for Sport and Physical Education [NASPE], 2004). The successful development of motor skills has several documented benefits. First, according to Pangrazi (2004), the success rate of

physical education students' motor skills should be high. If students' success rate is high, they may be more likely to find physical activity to be enjoyable; this enjoyment may result in an increased likelihood of engagement in physical activity outside of the confines of the school setting. However, if success within physical education is low, distaste for physical activity may develop and continue through adulthood. And second, recent research has found a link between motor skill competence and physical fitness in young adults (Stodden, Langendorfer, & Robertson, 2009). This finding implies that if physical education students can achieve competency in several motor skills, it may impact their overall fitness levels into young adulthood. Therefore, teaching techniques that aid in the successful development of motor skills in physical education should be of great value to educators.

Within physical education literature, several seminal studies identify a link between practice within physical education classes and student achievement (Ashy, Lee, & Landin, 1988; Buck, Harrison, & Bryce, 1990; Silverman, 1985). This link suggests that students who receive optimal practice within their physical education classes are likely to achieve at a higher level and subsequently develop greater motor skill competency. Consequently, pedagogical tools that help teachers optimize the practice time in their physical education classes may help students achieve at a higher level. Based on the suggestions for the use of token economies in physical education (Lavay et al., 2006; Rushall & Siedentop, 1972) and the reported successes in physical activity settings (Bernard et al., 2009; DeLuca & Holborn, 1985, 1990, 1992; Wiggam et al., 1986), the token economy may be an effective and feasible tool for teachers to implement

in their classes to aide in the optimization of practice time and the development of competency in motor skills.

### **Purpose of the Study**

Token economy systems have been shown to be effective in increasing the skill level of students across a variety of settings and skills, including math (McGinnis, Friman, & Carlyon, 1999), reading (Ayllon & Roberts, 1974), and classroom participation (Boniecki & Moore, 2003), among others. Also, the implementation of token economies has been shown to be useful across a variety of populations in physical activity settings to increase attentive behavior (Reitman, Hupp, O'Callaghan, Gulley, & Northrup, 2001), exercise time (Bennett, Eisenman, French, Henderson, & Schultz, 1989; Bernard et al., 2009), and exercise output (DeLuca & Holborn, 1992). However, the effects of token economies on typically developing students administered by teachers in physical education settings are unknown. In fact, McKenzie (1979) stated, "despite the increased number of reported successes and the wide acceptance of token economy systems in special and regular classrooms...token economy applications remain relatively unnoticed by practitioners and researchers in sport and physical education" (p. 110). Unfortunately, since that statement was presented more than 30 years ago, very little token economy research has been conducted in physical education. Therefore, the overall purpose of the study was to examine the effectiveness of a token economy on the skill related behaviors of elementary physical education students.

The first manuscript (Chapter 2) examines the existing body of literature related to token economies in physical education. The literature review manuscript describes how token systems were developed from behavioral theory and eventually applied in

physical activity settings. Further, the manuscript presents suggestions for future research related to token economies in physical education. The information presented in the literature review manuscript provided the main rationale for the implementation and examination of token reinforcement as conducted in the research manuscripts that follow (Chapters 3 and 4).

The purpose of the second manuscript (Chapter 3) was to examine the effect of a token economy on the number of successful jump rope practice trials performed by third grade physical education students. Successful practice trials were selected with regard to the existing literature that reported the link between effective practice and achievement in physical education (Ashy et al., 1988; Buck et al., 1990; Silverman, 1985). Jumping rope was selected as the target behavior due to the nature of the task; it is one which requires persistence and much practice in order for many students to achieve competency.

And finally, the purpose of the third manuscript (Chapter 4) was threefold. First, the main purpose was to examine the effectiveness of a token economy on the technique used by second grade students to perform the overhand throw. Overhand throw was selected as the target behavior because it is one that requires the engagement in a several step process in order to successfully perform the skill; this sequence may be difficult for many low skilled physical education students to master. Also, overhand throw was one of the motor skills that were identified as a possible predictor of physical fitness in young adults (Stodden et al., 2009). Development of competency in an overhand throw skill may positively impact fitness levels into adulthood. The third manuscript also examines if reinforcing proper overhand throw technique had an impact on the distance the object that was thrown travelled. In other words, would reinforcing the process of performing

the skill have an impact on the product of performing the skill? And, the final purpose of the study was to evaluate the accuracy with which second grade students could perform a peer process assessment as well as administer tokens to partners.

### **Significance of the Study**

Unfortunately, very few of the aforementioned token economy studies that existed in the current body of literature took place in school settings and none were conducted in physical education classes with typically developing students. In fact, only one identified study was conducted in a physical education setting, but it was conducted only with a special population. Mangus, Henderson, and French (1986) implemented a token economy, administered by trained peer tutors, for children with Autism to increase time on task on a balance beam activity. Several other studies targeting physical activity of children were conducted in the school setting, but outside of physical education. For example, DeLuca and Holborn (1985, 1990, 1992) examined the effects of a token economy on the exercise behavior of obese and non-obese boys; the participants exercised on a stationary bike set up in the nurse's office. And Brock, Brock, and Willis (1972) used a token economy to increase the pole vaulting height of high school track athletes. Although token systems have been recommended for use by physical educators (Lavay et al., 2006; McKenzie, 1972; Rushall & Siedentop, 1972), no studies were identified in the existing literature that examined the effectiveness of token economies on typically developing students in a physical education setting. Based on the findings of the current series of studies, however, token economies have the potential to be a useful tool for physical educators to help improve and optimize practice time as well as aid in the development of competency of motor skills.

## CHAPTER II

### **Implications for the Use of Token Economies in Physical Education:**

#### **A Literature Review**

Research examining the implementation of the principles of behavior analysis into physical education dates back to nearly 40 years ago when Siedentop and Rushall (1972) proposed a model for applying behavioral strategies to physical education and sport settings in order to systematically change motor behaviors. The science of behavior analysis is based on the premise that environmental stimuli can be systematically manipulated in order to produce corresponding behavior changes in individuals (Skinner, 1968). Because of the endless possibilities for practical application of this science, it's no wonder pedagogy researchers so thoroughly examined behavior analysis throughout the years following its introduction to develop sound, empirically-based tools teachers could utilize (see review by Ward & Barrett, 2002). Despite numerous research and practical successes, however, several techniques that have a foundation in behavior analysis have been overlooked by physical education researchers. One of these tools, the token economy, has been applied in a variety of settings (i.e., rehabilitation, special education, classroom education, higher education, and others) to help improve skills and increase the frequency of appropriate behavior. This review examines how token economies were derived from behavioral theory and applied to rehabilitation and therapeutic, educational, and finally, physical activity settings. In addition, suggestions for further research and applications of token economies are discussed.

## **Behavior Analysis**

Behavior analysis has its foundations in the influential early works of Ivan Pavlov, John Watson, and B.F. Skinner, among others (Cooper, Heron, & Heward, 2007). Their collective works culminated in what Skinner (1953) termed “operant conditioning,” a method of behavior analysis that focused on manipulating the consequences for engaging in a specified behavior in order to change the behavior (i.e., increase or decrease the frequency, intensity, duration, etc. of the behavior). Operant conditioning has two main categories of consequences: punishers and reinforcers. A punisher is a stimulus that, upon its occurrence after a specified behavior, reduces the likelihood the behavior will occur again in the future in a similar situation (Cooper et al.; Skinner, 1953, 1974). Conversely, a reinforcer is a consequence that increases the likelihood the behavior will occur again under similar circumstances (Cooper et al.; Skinner, 1953, 1974). If a behavior is reinforced, it is likely to occur more frequently. For example, if a child picks up the toys in his room (i.e., desired behavior), his parents will let him watch television for 15 minutes (i.e., consequence). If the desired behavior (i.e., picking up toys) increases, then the consequence (i.e., TV time) has served as a reinforcer. Similarly, if undesirable behavior is punished, it is likely the behavior will occur less frequently. Using the above example, if, instead of picking up his toys, the child throws them around his room (i.e., undesirable behavior), the parents implement a time out procedure (i.e., consequence). If the undesirable behavior (i.e., throwing toys) decreases, then the consequence (i.e., time out) has served as a punisher. Through the process of consequence manipulation, behaviors can be systematically altered (Skinner, 1968); problem behaviors can be decreased while desirable behaviors can increase in frequency,

duration, intensity, etc. (for a more thorough discussion of behaviorism and operant conditioning, see Chiesa, 1994; Cooper et al.; Skinner, 1953, 1974). These basic principles have been applied in a wide variety of settings for the purposes of systematic and practical behavior change.

Behavior analysis has three main components: behaviorism, the experimental analysis of behavior, and applied behavior analysis. Behaviorism refers to the philosophy of the science of behavior while the experimental analysis of behavior is the basic experimental arm of the science. The main component of interest to physical educators, applied behavior analysis, focuses on the development and practical application of the technologies for behavior change (Cooper et al., 2007). Technologies developed through the experimental analysis of behavior and then utilized under applied behavior analysis are commonplace throughout a variety of settings and used to reduce an array of problem behaviors and to increase many appropriate behaviors. The focus on external stimuli as the controlling agents for behavior has allowed practitioners across a variety of disciplines to systematically manipulate environmental stimuli, resulting in corresponding behavior changes. Researchers have shown behavioral principles to be effective in changing countless behaviors, including academic behaviors (e.g., Neef et al., 2004), social skills (e.g., Hagopian, Kuhn, & Strother, 2009), aggression (e.g., Borrero & Vollmer, 2006), driving skills (e.g., Ludwig & Geller, 1991), medical services (e.g., Cunningham & Austin, 2007), business behaviors (e.g., Marholin & Gray, 1976), and motor behaviors (e.g., Hardiman, Goetz, Reuter, & LeBlanc, 1975), as well as a myriad of other behaviors pertinent to a wide variety of settings and populations. This review,

however, will focus on how behavior analysis has been used in educational and physical activity settings.

### **Behavior Analysis in Education**

One of the more frequently examined areas of behavior analysis application is in the field of education. Despite some criticisms of using extrinsic rewards to increase appropriate academic behaviors (Kohn, 1998), behavioral principles are often present in classrooms in such forms as tangible reinforcers (e.g., stickers, pencils, edibles, etc.), intangible reinforcers (e.g., extra recess time, social praise, high grades, attention, etc.), and punishers (e.g., time out, extra assignments, low grades, etc.). Alberto and Troutman (2006) describe numerous behavioral principles and how to implement them in classroom settings. Many of these principles have been examined through applied research and have been shown to be an effective method of increasing appropriate classroom behavior (e.g., Ardoin, Martens, & Wolfe, 1999) and decreasing inappropriate classroom behavior (e.g., Harris & Sherman, 1973; Lalli, Browder, Mace, & Brown, 1993; Porterfield, Herbert-Jackson, & Risley, 1976). Additionally, principles based in behavior analysis have been shown useful to improve academic skills and behaviors, such as math skills (e.g., Fueyo & Bushell, 1998; Wood, Frank, & Wacker, 1998), homework performance (e.g., Miller, & Kelley, 1994), and class participation (e.g., Gardner, Heward, & Grossi, 1994). Further, a meta-analysis examining the effects of a variety of teachers' instructional methods on student academic achievement revealed that principles based in applied behavior analysis (i.e., reinforcement, cues, and feedback) produced large effect sizes (Walberg, 1984). Numerous education-related behaviors, settings, and populations have been improved through the use of techniques based in applied behavior analysis. In

particular, this review is primarily concerned with how behavior analysis has been used in physical activity settings.

### **Behavior Analysis in Physical Education, Sport, and Physical Activity**

As a subdiscipline of general education, physical education (and similarly, sport and physical activity) practitioners were formally introduced to the field of behavior analysis in the early 1970s when Siedentop and Rushall proposed a model of operant conditioning for the improvement of motor skills (Rushall & Siedentop, 1972; Siedentop & Rushall, 1972). Physical education and sport researchers and practitioners were introduced to the terminology of operant conditioning and behaviorism as well as related strategies pertinent to the acquisition of skills (Siedentop & Rushall). From that point, the use of behavioral principles in physical education was expanded. As identified by Ward and Barrett (2002), researchers examined behavior analytic interventions within four areas of the discipline: student learning interventions (Patrick, Ward, & Crouch, 1998; Sharpe, Brown, & Crider, 1995; Ward, Smith, Makasci, & Crouch, 1998), class and behavior management interventions (Paese, 1982; White & Bailey, 1990), interventions with special needs populations (Houston-Wilson, Dunn, van der Mars, & McCubbin, 1997; Leiberman, Dunn, van der Mars, & McCubbin, 2000), and teacher training interventions (Eldar, 1990; Lounsbery & Sharpe, 1999; van der Mars, 1987). Throughout all of these areas of application, the literature reveals the effectiveness of behavioral interventions in both physical education and sport settings (Donahue, Gillis, & King, 1980; Lee, 1993; Ward & Barrett).

Interventions based in behavior analysis have been used to improve a wide variety of physical education related, sport related, and physical activity related skills, including

tennis (Allison & Ayllon, 1980; Buzas & Ayllon, 1981), volleyball (Crouch, Ward, & Patrick, 1997; Ward, Crouch, & Patrick, 1998; Ward et al., 1998), basketball (Kladopoulos & McComas, 2001), football (Komaki & Barnett, 1977), ballet (Fitterling & Ayllon, 1983), and soccer skills (Brobst & Ward, 2002), among others. Throughout the literature, behavioral interventions have been shown to be effective in improving a wide variety of physical activity behaviors in a range of settings with various populations. Teaching techniques based in applied behavior analysis can be useful tools for physical education, sport, and physical activity practitioners. None of the aforementioned studies, however, examined the effectiveness of a token economy, a tool that has its foundation in behavior analysis.

### **Token Economies**

According to McKenzie (1979), "...token reinforcement systems [are] one of the most widely used and effective behavior management strategies to evolve from behavior analysis" (p. 102). Introduced by Ayllon and Azrin (1968) for use in a therapeutic setting, the token economy system consists of three basic components: (a) selection and definition of behavior(s), (b) administration of tokens or points as a result of individuals engaging in the selected behavior, and (c) a scenario (i.e., a "store" or other setting) in which individuals can exchange the tokens they have earned for a variety of back-up reinforcers. Upon engagement in a targeted behavior, the participant is awarded a secondary reinforcer (i.e., tokens or points), which have little or no inherent value to the individual. At a later time, the secondary reinforcers are then exchanged for primary reinforcers (i.e., back-up reinforcers; tangible or social rewards), which are of value to the individual. Tokens can be awarded quicker, easier, and with a smaller delay than

traditional reinforcement (i.e., tangible rewards) and can be exchanged for a variety of secondary reinforcers. This variety can reduce the likelihood the individual becomes satiated with the reinforcers (Rushall & Siedentop, 1972). Token reinforcement systems work similarly to our monetary system. An individual is assigned specific job tasks (i.e., target behaviors). When the individual completes those tasks, he/she is awarded money in the form of a paycheck (i.e., secondary reinforcer), which has very little inherent value itself. The money earned can then be exchanged for a variety of items (i.e., primary reinforcers) that are of value to the individual.

Token economies have been recommended for use in a variety of settings to increase appropriate behavior(s) and decrease problem behavior(s). For example, Stainback, Payne, Stainback, and Payne (1973) proposed a model for implementing token economies in educational settings, specifically within the classroom. Researchers have examined the effects of token reinforcement in classrooms and have found them to be effective across a variety of academic behaviors, including math behaviors (McGinnis, Friman, & Carlyon, 1999), reading behaviors (Ayllon & Roberts, 1974), and class participation behaviors (Boniecki & Moore, 2003), among others.

**Using token economies in physical activity settings.** Specifically within physical education, sport, and other physical activity settings, the use of token economies has been suggested for use to decrease problem behaviors, improve skill acquisition, and increase other appropriate physical activity behaviors (e.g., time on task, attending, etc.). Rushall and Siedentop (1972) first introduced the concept of token reinforcement to physical education practitioners, citing two main advantages of using token systems. First, the ongoing educational process that occurs in physical education and sport settings

does not necessarily have to be disrupted as it is when administering traditional reinforcement. In other words, giving a student a token or points can be done very promptly which will minimally interrupt his/her skill practice or other educational activities. Second, the token(s) earned by students can be exchanged for a wide variety of back-up reinforcers. This variety reduces the likelihood the student(s) will become satiated with the traditional reinforcers (Rushall & Siedentop). Additionally, Lavay, French, and Henderson (2006) reiterate the advantages of implementing a token economy, stating that it is not always convenient to administer traditional tangible reinforcement, especially in physical activity settings. The immediacy of reinforcement plays an important role as well. Cooper et al. (2007) discuss the importance of avoiding delays in reinforcing desired behavior, stating, "...behaviors other than the target behavior occur during the delay...the behavior temporally closest to the presentation of the reinforcer will be strengthened by its presentation" (p. 259). Tokens can be given out immediately following successful engagement in the desired behavior during physical activity (Lavay, et al.) whereas tangible reinforcement may be more cumbersome to administer effectively and not as immediately following the target behavior.

#### **Empirical support for the use of token economies in physical activity settings.**

Numerous researchers have used a token economy system to increase or improve a variety of physical activity behaviors. Token economies were found to be effective in improving attentive and on-task behaviors during physical activity (Mangus, Henderson, & French, 1986; Reitman, Hupp, O'Callaghan, Gulley, & Northrup, 2001) as well as exercise time and output behaviors (Bennett, Eisenman, French, Henderson, & Schultz, 1989; Bernard, Cohen, & Moffett, 2009; DeLuca & Holborn, 1985, 1990, and 1992).

Additionally, other physical activity behaviors, such as distance walked (Wiggam, French, & Henderson, 1986), distance walk/run times (Trocki-Ables, French, & Henderson, 2001), and pole vault height (Brock, Brock, & Willis, 1972) were improved using token reinforcement. A more in-depth discussion of each of these studies follows. Also, see Table 1 for a summary of each study.

*Attentive and on-task behaviors.* Reitman et al. (2001) examined the effectiveness of a token economy in conjunction with medication typically used for treating symptoms of Attention Deficit Hyperactivity Disorder (ADHD) on attentive behavior during physical activity. Three participants were selected from an ADHD summer treatment program for young children aged 4 to 7. Each morning of the program, the children played a game of kickball. During these games, two measures of “attentive behavior” were assessed. First, the researchers observed the participants to see if they were in the ready position before each pitch. Second, following each pitch, the participant was asked one of three possible questions pertaining to the game; these questions inquired the participants’ knowledge of the number of balls and strikes on the batter, the number of outs, or the current score. During the intervention phases, participants had the opportunity to receive up to two tokens after each pitch (i.e., one for being in the proper ready position before the pitch and one for correctly answering the question following the pitch). The introduction of the token economy improved the attentive behavior of the participants more than medication alone. Finally, when treatments were combined (i.e., token economy and medication), attentive behavior was at its highest. It is apparent that the token economy was effective in increasing the attentive behavior of children diagnosed with ADHD during physical activity.

Table 1  
*Studies Examining the Effects of Token Economies on Physical Activity Behaviors*

Study	Participants	Setting	Target Behavior(s)	Intervention	Results
Bennett et al. (1989)	3 women with Down syndrome, aged 24 to 26	Experimental room at the participants' school	Revolutions and time on task on a stationary bike	Token economy	<ul style="list-style-type: none"> <li>Participant 1 (P1) increased mean time on task from 184.3 sec to 493.7 sec</li> <li>P2 increased from 186.1 sec to 356.9 sec</li> <li>P3 increased from 520.6 sec to 862.0 sec</li> </ul>
Bernard et al. (2009)	3 girls with Cystic Fibrosis, aged 8 to 12	Participants' homes	Total exercise time measured by minutes of exercise per day	Token economy	<ul style="list-style-type: none"> <li>All participants increased mean daily exercise time and mean days per week exercised</li> </ul>
Brock et al. (1972)	2 boys on a high school track team, age 15	High school track and field facilities	Pole vault height	Token economy	<ul style="list-style-type: none"> <li>P1 increased pole vault height from under 9 ft. to 10.5 ft.</li> <li>P2 increased from under 9 ft. to 10.0 ft.</li> </ul>
DeLuca & Holborn (1985)	4 boys (2 obese, 2 non-obese), age 11	Elementary school seminar room set up with stationary bicycles	Minutes of exercise on a stationary bicycle and mean revolutions per minute	Token economy on a fixed interval (FI) 1-min schedule	<ul style="list-style-type: none"> <li>Obese boys exercise time increased but mean revolutions decreased from 84.0 per min to 74.9</li> <li>Non-obese boys exercise time increased; mean revolutions slightly decreased from 99.4 per min to 98.6</li> </ul>
DeLuca & Holborn (1990)	6 boys (3 obese, 3 non-obese), age 11	Elementary school nurse's office set up with stationary bicycles	Minutes of exercise on a stationary bicycle and mean revolutions per minute	Token economy on a fixed interval (FI) 1-min schedule and a fixed ratio (FR) schedule	<ul style="list-style-type: none"> <li>Obese boys' mean exercise time increased from 12.28 min to 30; mean revolutions per min decreased</li> <li>Non-obese boys' mean exercise time increased from 14.64 min to 30; mean revolutions per minute remained similar</li> </ul>

Table 1 Continued

DeLuca & Holborn (1992)	6 boys (3 obese, 3 non-obese), age 11	Elementary school nurse's office set up with stationary bicycles	Minutes of exercise on a stationary bicycle and mean revolutions per minute	Token economy on a variable ratio (VR) schedule with changing criteria	<ul style="list-style-type: none"> <li>• Obese boys' mean exercise time increased from 12.9 min to 30; mean revolutions per min increased from 59.2 (baseline) to 85.51, 101.2, and 117.0 (VR1, VR2, and VR3 subphases, respectively)</li> <li>• Non-obese boys' mean exercise time increased from 15.2 min to 30; mean revolutions per minute increased from 71.9 to 98.89, 114.2, and 130.0</li> </ul>
Mangus et al. (1986)	5 children with autism	Integrated physical education class	Time on task measured by time on a balance beam	Token economy with tokens distributed by trained peer tutors	<ul style="list-style-type: none"> <li>• 4 out of 5 participants increased their time on task for at least one phase of the study</li> </ul>
Reitman et al. (2001)	3 children (2 girls, 1 boy) with ADHD, ages 4 to 7	Summer treatment program for children with ADHD	Attentive behavior measured by a "total attention score" (% of correct ready position + correct "attention question" answers)	Methylphenidate (ADHD medication), placebos, token economy, and medication + token economy	<ul style="list-style-type: none"> <li>• P1 increased from 26% (placebo) to 43 (medication) to 52 (token economy) to 64 (medication + token economy)</li> <li>• P2 increased from 39% to 58 to 78 to 93</li> <li>• P3 increased from 26% to 34 to 90 to 96</li> </ul>
Trocki-Ables et al. (2001)	5 boys with ADHD, ages 8 to 10	Elementary school outdoor field	1-mile walk/run times	Token economy, verbal praise, token economy + verbal praise	<ul style="list-style-type: none"> <li>• Token economy was effective in reducing 1-mile walk/run times; token economy + verbal praise was most effective for 4 out of 5 participants</li> </ul>
Wiggam et al. (1986)	6 women, ages 70 to 92	Retirement center where the participants resided	Mean distance walked per day	Token economy	<ul style="list-style-type: none"> <li>• P1 increased mean daily walking distance by 110%</li> <li>• P2 increased by 84%</li> <li>• P3 increased by 73%</li> <li>• P4 increased by 56%</li> <li>• P5 increased by 114%</li> <li>• P6 increased by 71%</li> </ul>

In another study, Mangus et al. (1986), investigated the effects of a token economy implemented by peer tutors on the on-task time of children with Autism during physical education; on-task time was measured as the total amount of time the participants walked on a balance beam. During baseline phases, no token reinforcement was given to the participants. During the intervention phases, trained peer tutors were assigned to administer token reinforcement to partners. The schedule of reinforcement was individualized for each participant by finding the mean of the previous three sessions' on-task time. When the participant had remained on task for at least the mean target time, the peer tutor reinforced the behavior by dropping a token into a clear plastic container. When five tokens were earned, the participant could exchange them for a variety of edible back-up reinforcers. Results indicated that on-task time increased for four out of the five participants for at least one of the phases of the study. This finding suggests that token reinforcement can positively influence the on-task time of students with Autism in physical education settings.

***Exercise time and output behaviors.*** A token economy was implemented to improve the exercise behavior of three overweight women, ages 24 to 26, with Down syndrome (Bennett et al., 1989). The target behavior was "exercise behavior" as measured by total time spent riding a stationary bicycle. A multiple baseline across participants design was used to assess the effects of the intervention. During baseline, participants were given the opportunity to ride a stationary bike for up to 15 minutes a day for up to 5 days a week. During the intervention phase, the same allowances were given to the participants with the addition of token reinforcement. Tokens were administered when the participant engaged in exercise behavior that consisted of a

predetermined number of revolutions at a specified intensity on the stationary bike. Tokens could then be exchanged for preferred items immediately following the exercise session or they could be accumulated and exchanged at a later date. Results showed that with the introduction of the token economy, time riding the stationary bicycle increased for all three participants. The results of this study indicate that a token economy can be effective in increasing exercise time for women with Down syndrome.

Bernard et al. (2009) also examined the effectiveness of a token economy on exercise time. A reversal design was used to investigate the effectiveness of a token economy on the minutes of exercise per day by three school aged children with cystic fibrosis. Exercise diaries, which included frequency, type, and duration of exercise and daily pedometer readings, were written by the parents of the participants and used as the outcome measure. During the intervention phases, participants earned one point for every 10 minutes of exercise. Points would accumulate and later be exchanged for tangible or social rewards. Time spent exercising increased for all three participants during the two intervention phases as compared to the initial baseline and reversal phases of the study. In addition, the average number of exercise days per week increased for all participants during the two intervention phases. These results indicate token economies can be effective in increasing the general exercise time and days of exercise of children with cystic fibrosis.

DeLuca and Holborn (1985, 1990, 1992) conducted a series of studies examining the effects of the implementation of token economies on exercise behaviors of obese and non-obese boys. In their 1985 study, DeLuca and Holborn administered a fixed interval (FI) schedule of token reinforcement to four boys in fifth grade in an attempt to improve

the total time spent exercising on a stationary bicycle as well as the mean revolutions per minute. Across all four participants, the time spent exercising increased upon introduction of the token economy. The mean revolutions per minute, however, either remained the same during the intervention phase or decreased. These results indicate that token reinforcement on a FI schedule can positively influence the time spent exercising. It is interesting to note, however, that only exercise time was reinforced, mean revolutions per minute were not. This may explain why exercise time increased during the intervention while mean revolutions per minute remained constant or decreased during the treatment phase.

In their second study in the series, DeLuca and Holborn (1990) examined the effectiveness of FI and fixed ratio (FR) schedules of token reinforcement on six 11-year old boys. As with the previous study, sessions were conducted on a stationary bicycle and time spent exercising and mean revolutions per minute served as the dependent variables. Similar to the previous study, all six participants' exercise time increased during both the FI and FR schedules of reinforcement phases. Also like the previous study, the mean number of revolutions per minute decreased during the intervention phases. Again, this dependent variable was not reinforced on either a FI or a FR schedule. The behavior that was reinforced with token reinforcement (i.e., time spent exercising) was the dependent variable that showed an increase. This study again shows that implementing a token economy can have a positive effect on the specific target exercise behavior that is reinforced.

In the final study in their series, DeLuca and Holborn (1992) examined the effectiveness of a token economy administered on a variable ratio (VR) schedule with

changing criteria on the exercise behaviors of obese and non-obese boys. Exercise behavior was recorded as the number of minutes exercised on a stationary bike as well as the mean number of revolutions per minute. During baseline, participants were given the opportunity to exercise at their own pace for as long as they wanted. The intervention phase consisted of three subphases. For each subphase, the criterion for token reinforcement was set at 15% above the mean number of revolutions per minute of the previous subphase. When the participant's exercise intensity reached the criterion level, they were reinforced with tokens on a VR schedule. As with the previous two studies, results indicated that the time spent exercising increased upon implementation of the token economy. In fact, the performance of all six participants stabilized at 30 minutes, the maximum time allotted for exercise. Unlike the previous two studies, the mean number of revolutions per minute increased as well. This result may be due to the target behavior in this study being mean revolutions per minute, not exercise time as in the previous two studies in the series. This study's results indicate that token economies can have a positive influence on the exercise intensity of its participants.

*Other physical activity behaviors.* Wiggam et al. (1986) implemented a token economy targeting walking distance for senior citizens living in a retirement center. During baseline, participants were instructed to record their own walking distance and frequency. After a consistent baseline was established (i.e., consistent performance across 14 days with less than 10% deviation between scores), the intervention was introduced and lasted 14 to 21 days. Tokens were given to participants when they showed an increase of 5% over their mean baseline distance walked. Tokens were later exchanged for a variety of tangible items, such as edibles, entertainment tickets, and household

goods. As a result of the intervention, all six participants increased their walking behavior by at least 56% over baseline with a mean increase of 85%. The results of the study indicate that token economies may be an effective tool to increase the exercise behavior of female senior citizens.

Trocki-Ables et al. (2001) used a token economy to decrease the one-mile walk/run times of five boys, ages 8 to 10, diagnosed with ADHD. Baseline consisted of three one-mile run trials conducted on a field located at the participants' school. The intervention phase consisted of three elements: token economy, verbal praise, and a token economy paired with verbal praise. Tokens were given when a lap was completed in less time than the previous lap, which allowed the participants to earn up to five tokens per day (one mile equaled five and a half laps around the field). Tokens then were exchanged for desired objects. Results indicated that token reinforcement, verbal praise, and a combination of tokens and verbal praise all resulted in decreased one-mile walk/run times, indicating that token reinforcement can be an effective means to decrease distance run times of boys diagnosed with ADHD.

In another study, Brock et al. (1972) examined the effects of token reinforcement on the pole vaulting height of two high school track athletes. A token system was implemented which consisted of awarding three points to the participant who performed the highest pole vault of the day and subtracting one point if the participant did not improve from his previous day's height. Once five points were accumulated, they could be exchanged for either a milkshake or an excused absence from a regular track team workout. Brock et al. concluded the token economy system was an effective tool to improve pole vaulting behaviors.

And finally, Alstot (2011) recently completed two studies examining the effectiveness of a teacher-implemented token economy in an elementary physical education setting with typically developing students. In study one, tokens were administered when participants completed jump rope practice trials and, in study two, participants were rewarded with tokens when they correctly performed overhand throw technique. In both studies, participants exchanged their tokens for a variety of small toys and/or school supplies. Results indicated that token reinforcement had a positive influence on the number of successful jump rope practice trials performed by third grade participants as well as on the overhand throw technique of second grade participants. The token economy was an effective tool for positively influencing physical activity behaviors of elementary aged students when implemented in a physical education setting.

### **Summary and Recommendations**

Although several studies were identified that used token reinforcement to improve motor behaviors, only a few were conducted in school settings. DeLuca and Holborn's (1985, 1990, 1992) research was conducted in a clinical setting within the participants' school site; stationary bicycles were set up in the nurse's office or a seminar room in the school. Brock et al. (1972) implemented a token economy in a high school sport setting. And, Trocki-Ables et al. (2001) conducted their study on a school's outdoor field. Although improving physical activity behaviors in schools would most logically fit into physical education settings, only a few studies were identified that examined the effectiveness of token reinforcement systems in physical education. Mangus et al. (1986) implemented a token system in physical education; however, the target population of that study was children with Autism. Therefore, the studies conducted by Alstot (2011) were

the only ones identified that examined the effectiveness of token reinforcement systems in physical education classes with typically developing students.

More than 30 years ago, in his literature review for physical educators, McKenzie (1979) wrote, “although little research has been completed in physical activity settings, token reinforcement systems appear to be a largely untapped resource for improving social and skilled behaviors in sport and physical education environments” (p.112). Despite several recommendations to implement token economies in physical education settings (Lavay et al., 2006; Rushall & Siedentop, 1972), the scarcity of existing published empirical work in this area indicates that research is still needed. Alstot (2011) found token reinforcement to be very effective with second and third grade participants, but it is unknown if a token economy implemented with older physical education students would be as impactful. Additionally, the aforementioned token economy studies used a variety of token economy variations (i.e., tokens vs. points, choices of back-up reinforcers vs. pre-determined reinforcers, etc.). Additional research could examine the most effective and efficient ways to utilize these systems in a physical education setting. Preliminary investigations suggest token systems can be an effective tool for widespread use in physical education, but additional research is needed to further examine and refine these conclusions.

“That token programs are effective in altering behaviors, and offer numerous advantages as treatment programs, cannot be disputed from an examination of the literature” (Kazdin & Bootzin, 1972, p. 367). The same conclusion can be drawn for the implementation of token economies in physical activity settings with a variety of populations. Despite these conclusions, little token economy research has yet to be

extended to physical education settings. The existing body of literature suggests that it can be a useful tool for physical education teachers.

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## **CHAPTER III**

### **The Effects of Peer-Administered Token Reinforcement on Jump Rope Behaviors of Elementary Physical Education Students**

Physical education research repeatedly supports the relationship between practice and student achievement (Ashy, Lee, & Landin, 1988; Buck, Harrison, & Bryce, 1990; Silverman, 1985). Silverman found a positive relationship between skill practice at an appropriate level and student achievement, while Ashy et al. discovered a relationship between practice trials using correct technique and student achievement. Further, Buck et al. found a positive link between student achievement and correctly performed practice trials where the outcome of the trial was successful. Because the link between practice and achievement is so strongly established, it is important for teachers to incorporate optimal practice time into their classes. Therefore, the development of teaching techniques and strategies that can be used to increase student practice within a physical education setting should be of great value to physical educators. One tool that can be beneficial in improving student practice is the token economy. Consequently, the current study seeks to examine the effectiveness of a token economy on jump rope practice trials performed by third grade physical education students.

#### **Behavior Analysis in Physical Education**

Interventions based in applied behavior analysis have been used in physical education and sport settings to improve practice behaviors and improve a variety of physical activity and skill-related behaviors (see reviews by Donahue, Gillis, & King,

1980; Lee, 1993; Ward & Barrett, 2002). Reinforcement, a fundamental component of applied behavior analysis, occurs when a stimulus is presented to or removed from an individual upon his/her engagement in a desired behavior. This consequence increases the likelihood of the desired behavior occurring again in a similar situation (Cooper, Heron, & Heward, 2007). Several studies in physical education and sport settings have used reinforcement principles, either as an independent intervention or a component of a package intervention, to improve tennis skills (Buzas, 1981; Allison & Ayllon, 1980), volleyball skills (Crouch, Ward, & Patrick, 1997; Ward, Crouch, & Patrick, 1998; Ward, Smith, Makasci, & Crouch, 1998), locomotor and manipulative skills (Houston-Wilson, Dunn, van der Mars, & McCubbin, 1997), basketball skills (Kladopoulos & McComas, 2001), football skills (Komaki & Barnett, 1977), hockey skills (Anderson, Crowell, Doman, & Howard, 1988), and baseball skills (Heward, 1978). Both social reinforcers, such as praise (Buzas; Allison & Ayllon), and tangible reinforcers, such as money (Heward), have been effective to increase achievement of motor skill-related behaviors. Several behavior analysis-based studies also found peer-mediated accountability, which included peer-administered assessments and public postings as well as additional physical activities as reinforcers, increased the number of students' practice trials in physical education (Crouch et al.; Ward, Crouch, & Patrick; Ward, Smith, Makasci, & Crouch).

### **Token Economies**

The token economy is a tool derived from the field of behavior analysis which may be useful to physical education practitioners. It is a technique that uses tokens or points to reward desired behavior. First introduced by Ayllon and Azrin (1968), the token economy has been shown to be useful across a variety of settings to improve numerous

behaviors, including academic behaviors (e.g., Boniecki & Moore, 2003; McGinnis, Friman, & Carlyon, 1999) and physical activity behaviors (e.g., Bennett, Eisenman, French, Henderson, & Schultz, 1989; DeLuca & Holborn, 1985, 1990, 1992; Mangus, Henderson, & French, 1986), among others. Having been described as “one of the most widely used and effective behavior management strategies to evolve from behavior analysis” (McKenzie, 1979, p. 102), token economies are most often reinforcement-based systems, consisting of three major segments: (a) specifically defined target behavior(s); (b) tokens or points to be awarded to participants upon their engagement in the target behavior(s); and (c) back-up reinforcers for which participants can exchange their tokens (Cooper et al., 2007). More specifically, when a student engages in the desired behavior, he/she is rewarded with a token. After a specified amount of time or amount of tokens earned, each student can exchange his/her tokens for a variety of reinforcers (e.g., tangible prizes, edible rewards, privileges, etc.); these are referred to as “back-up reinforcers.” When implemented properly, a token economy can be “...a system that will allow teachers to be effective” (Stainback, Payne, Stainback, & Payne, 1973, p. 4).

Specifically within physical education and physical activity settings, the use of a token economy can be an effective tool with several advantages. First, the educational process does not have to be stopped to administer reinforcement; tokens or points can be administered quickly with little interruption to the practice or play activities of the students (Rushall & Siedentop, 1972). Second, the students’ earned tokens can be used to purchase from a selection of back-up reinforcers, minimizing the chances of satiation on an individual reinforcer (Rushall & Siedentop). And third, tokens can be administered immediately following engagement in the target behavior. It may not always be

convenient to administer tangible reinforcers during physical activity. Therefore, the use of token reinforcement delays the presentation of tangible reinforcers until a more convenient time (Lavay, French, & Henderson, 2006).

Token economies have proven useful across several physical activity settings to improve a variety of exercise and activity behaviors, such as pedaling a stationary bike (Bennett et al., 1989; DeLuca & Holborn, 1985, 1990, 1992), walking distance (Wiggam, French, & Henderson, 1986), one-mile walk/jog times (Trocki-Ables, French, & O'Connor, 2001), time spent exercising (Bernard, Cohen, & Moffett, 2009), pole vaulting (Brock, Brock, & Willis, 1972), and attentive behavior during physical activity (Reitman, Hupp, O'Callaghan, Gulley, & Northrup, 2001). As with the range of activity behaviors addressed in these studies, the range of populations examined varied greatly as well. Token economies have been shown effective in improving the physical activity behaviors of children with ADHD (Reitman, et al.; Trocki-Ables et al.), adult women with Down Syndrome (Bennett et al.), children with Cystic Fibrosis (Bernard et al.), senior citizens (Wiggam et al.), and obese and non-obese boys (DeLuca & Holborn, 1985, 1990, 1992). Unfortunately, few of the aforementioned token economy studies that address physical activity behaviors have been conducted in school settings, while even fewer have been done specifically within physical education classes. Additionally, none have been implemented with typically developing children in physical education.

Although token economy systems have been shown to be effective in improving the skill level of students across a variety of settings and behaviors, the effects of token economies on typically developing students administered by teachers in physical education settings are unknown. In fact, McKenzie (1979) stated, “despite the increased

number of reported successes and the wide acceptance of token economy systems in special and regular classrooms...token economy applications remain relatively unnoticed by practitioners and researchers in sport and physical education” (p. 110). Unfortunately, since that statement was presented more than 30 years ago, very little token economy research has been conducted in physical education. Therefore, the purpose of the current study was to examine the effect of a token economy administered by an elementary physical education teacher on the number of successful jump rope practice trials performed by typically developing students within a physical education class.

## **Method**

### **Participants**

Participants were selected from one intact third grade physical education class. Third grade was chosen as the target population due to the students’ developmental level as related to the nature of the jump rope task being examined; the task was one that necessitated persistence and practice in order for children as young as third grade to show improvement. Informed consent was requested from the teacher and from each student’s parent or legal guardian; informed assent also was obtained from each participating student. Using the Generic Levels of Skill Proficiency (Graham, Holt/Hale, & Parker, 2007), the physical education teacher was asked to characterize each student’s skill level as one of the following levels: pre-control, control, or utilization (Graham et al.). Ten students (i.e., 5 girls and 5 boys) identified by their physical education teacher to be at the pre-control, control, or utilization levels were selected from one class to serve as participants. The study was originally intended to target only low skilled students (i.e., pre-control or control), the population that is in greatest need of skill improvement;

however, too few potential participants were identified as low skilled. Therefore, several students characterized as at the utilization level were added as participants. Table 1 describes participants' characteristics, including demographic information (i.e., gender and age) and skill level as determined by the teacher. Pseudonyms were used for all participants.

Table 1

*Participant information and Generic Level of Skill Proficiency as Rated by the Teacher*

Participant	Gender	Age	Skill Level
Allison	Female	8	Control
Kendra	Female	8	Control
Carrie	Female	8	Control
Wendy	Female	8	Utilization
Carla	Female	8	Pre-control
Eddie	Male	9	Utilization
Daniel	Male	8	Utilization
Levi	Male	8	Pre-control
Isaiah	Male	9	Pre-control
Doug	Male	8	Pre-control

*Note.* Generic Level of Skill Proficiency was rated for each participant by the teacher prior to the onset of the study.

### **Setting and personnel**

The study was conducted in an elementary school located in a suburban city in southeastern United States. All sessions took place in the school's gymnasium during third grade physical education classes with the exception of session two which was conducted outside on the school's outdoor tennis courts. The physical education classes

usually met once a week for approximately 45 minutes (occasionally, depending on the school's rotating schedule, the class met twice in a single week). Personnel included the physical education teacher who taught the class and implemented the intervention and the researcher who was present during all sessions to collect pertinent data. The presence of the researcher did not appear to influence the participants' behavior. The school is located in close proximity to a university; the students are, therefore, accustomed to frequent observers in classes.

### **Data collection and equipment**

All ten sessions were recorded using two video cameras; a Sony Handycam DCR-SR47 digital video camera served as the primary recording device while a Kodak Zi6 Pocket video camera served as a backup. Additional equipment included jump ropes for each student in the class, tokens (i.e., 3/4 inch round plastic "Bingo" chips) to be distributed during the intervention, personalized token containers (i.e., 4 inch square plastic boxes which included removable lids with a one inch round holes for easy token entry) to store each student's earned tokens, and a menu of back-up reinforcers (e.g., stickers, yo-yos, balls, erasers, glow sticks, etc.) for which tokens were exchanged.

### **Experimental design and procedures**

The dependent variable of interest was successful jump rope practice trials. The jump rope skill was selected due to the nature of performing a jump rope task; persistence is needed to improve the jump rope skill. The study was designed to examine a potential link between token reinforcement and an increase in the number of successful jump rope practice trials. Jumping rope is a skill that may be difficult for some children without adequate practice.

A multielement design was used to assess the effects of the intervention.

Multielement designs alternate between treatment conditions to assess whether levels of the target behavior are different under the varying treatments. The two conditions implemented in this study were baseline and token economy conditions. A functional relation can be determined if response differentiation occurs between the two conditions (Kennedy, 2005).

Prior to the beginning of each day's class, the researcher randomly selected one of the conditions (i.e., baseline or token economy) to be implemented. The entire class participated in the condition, although videos were only recorded of the participants. The students did not have prior knowledge of the experimental condition that was to be presented each day. Upon entering the physical education class, the teacher informed the students which condition was to be performed during that class period. On occasion, in order to increase the number of sessions included in the study, two sessions were conducted during the same day, one at the beginning of the class period and one at the end. On these occurrences, the researcher randomly selected which condition was to be implemented at the beginning of the class. The opposing condition was then implemented at the end of the class session. For example, the researcher flipped a coin to determine which condition was implemented at the beginning of the class. If a baseline session was selected, it was implemented following the procedures described below. Upon its completion, the teacher conducted a condensed version of her usual class. Then, during the final 10 to 15 minutes of class period, the teacher conducted another session, this time a token economy session.

**Experimental conditions.** Two experimental conditions took place: baseline and token economy. The following section describes each condition implemented during the study.

**Baseline.** The teacher had previously taught several jump rope lessons prior to the onset of the study; all participants received instruction on the proper way to perform the skill. Upon the commencement of the study, all students in the class were divided into pairs (although data were collected on the selected participants only). While one member of each pair performed a jump rope skill, the partner counted the total number of jumps (prior to the first baseline session, the teacher gave thorough instructions on how to properly count jumps). The teacher prompted the students to begin jumping and cued them to stop after 30 seconds; a 30 second rest period then was given (i.e., one cycle, consisting of 30 seconds of jump rope and 30 seconds of rest, for a total of one minute). Each participant continued for five cycles (i.e., 5 minutes total) before switching roles with their partners. Once the partners switched roles (i.e., one jumping while the other counts jumps) the process was repeated, giving each partner a chance to jump for a complete 5 minute session. Each baseline session took approximately 10 to 15 minutes.

**Token economy.** During the intervention phase, the participants followed a similar procedure as was followed during the baseline sessions, with the addition of the administration of token reinforcement. During the 30 second rest period described above, the partner rewarded the participant with tokens based on the number of practice trials he/she performed. Partners were instructed to give one token for every ten times the participant swung the rope from behind his/her body overhead to the front of the body and attempted to jump over the rope with both feet (e.g., 20 jump attempts yielded 2

tokens, 35 jumps yielded 3, 48 jumps yielded 4, etc.). During the 30 second activity period, the partner counted total practice trials. When the 30 second rest period began, the partner retrieved the appropriate amount of tokens from a central location (i.e., a large container, located on the gym floor, which held an ample amount of tokens) and deposited them into the participant's token container which was located on the ground near where the participant was jumping rope. Dropping plastic tokens into a plastic container provided each participant with multiple stimuli (i.e., visual and auditory) to be associated with token reinforcement. This process was repeated five times (i.e., 5 minutes total) before partners switched roles.

Throughout the duration of the study, the participants did not retain the same partner. Pairs were changed four times, resulting in each participant having five different partners throughout the study.

Students had an opportunity approximately once a week to exchange their tokens for a variety of back-up reinforcers at the "store." The teacher asked not to conduct a reinforcer preference assessment prior to stocking the token store. In lieu of the preference assessment, the teacher suggested items that she thought would be of interest to the participating students. The store consisted of four containers that each held items of different value: 10, 15, 20, or 30 tokens. Smaller items (e.g., small stickers and erasers) were the least expensive, costing only 10 tokens, while larger items (e.g., yo-yos and glow sticks) were the most expensive, costing 30. Students had the option to spend their tokens at the store or to save until a later date, accumulating tokens in order to exchange them for more "expensive" reinforcers.

**Teacher training.** Before implementation of the intervention, the researcher trained the physical education teacher on all procedures of the study. The teacher's competency of the procedures of the study was assumed when the teacher was able to fully describe the steps in the implementation of the components of the study to the researcher without error. During the study, the researcher was present for all sessions, available to answer the teacher's questions as well as correct any errors in the implementation of the study's procedures.

**Token training.** Before the intervention was introduced, the researcher and teacher conducted a short token training session with the students. According to Cooper et al. (2007), initial token training with high-functioning children can primarily consist of verbal instructions and modeling. Therefore, the researcher explained to the class how they were able to earn tokens, modeled to them how tokens were to be earned and distributed, and showed them what could be purchased with their earned tokens.

**Social validity.** Upon the conclusion of the intervention, a questionnaire was administered to the physical education teacher to inquire of her perception of the effectiveness of the intervention as well as her opinion regarding the feasibility of using token economies in physical education. The questionnaire also addressed the cost of implementing a token economy, the teacher's future intentions of using a token economy, and an open-ended response area for the teacher to share any additional thoughts she had on the study (see Appendix E).

### **Data Analysis**

Data from all sessions were analyzed using the recordings from the primary camera with the exception of the third session which necessitated the use of the backup

camera due to a user error in the recording process. For each session of the study, videos were viewed in slow motion and the number of successful and unsuccessful jump rope practice trials were recorded for each participant. A jump rope practice trial was coded as “successful” if each of the following elements of the skill were performed: (a) hands holding the handles of the rope on each side of the body, (b) jump rope starts behind the body, (c) rope will swing in a circular motion above head with rope ending in front of the body, and (d) rope passes under both feet. A trial was recorded as “unsuccessful” if one or more of the above criteria were not properly performed. After each trial was coded as successful or unsuccessful; the total numbers of successful and unsuccessful trials were then recorded for each session for each individual participant (see Appendix B).

Data analysis was ongoing throughout the duration of the study. The study was ceased when the two conditions showed a consistent and stable sequence as evident in a visual analysis of the graphs.

**Interobserver agreement.** Interobserver agreement (IOA) was assessed for approximately 30% the sessions. Using video tape data, a trained independent observer coded each practice trial of a session as successful or unsuccessful. Percentage agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. Overall agreement was 95.9%, ranging from 87.8% (i.e., Doug, session 5) to 99.0% (i.e., Wendy, session 8).

**Treatment integrity.** A treatment integrity measure of the independent variable was conducted. For each token session, the researcher calculated the absolute percent error (APE) of token distribution to determine the accuracy of treatment administration. APE was calculated by subtracting the criterion amount (how many tokens the participant

should have received for the session) from the actual amount (how many tokens the participant actually received), dividing by the criterion amount and multiplying by 100. The resulting APE represents the percent error with which tokens were administered to each participant for the given session.

Table 2

*Token Administration Accuracy*

Participant	Total # Tokens Received	Actual # Tokens Received per Session	# Tokens Should Have Received per Session	MAPE (%)	APE Across all Sessions (%)
Allison	108	27.00	22.50	20.84	20.00
Kendra	93	18.60	18.40	5.16	1.09
Carrie	104	20.80	19.00	11.29	9.47
Wendy	125	25.00	23.40	10.06	6.84
Carla	48	9.60	9.20	25.33	4.35
Eddie	85	17.00	16.40	6.26	3.66
Daniel	83	20.75	20.50	10.80	1.22
Levi	22	4.40	6.20	30.71	29.03
Isaiah	108	21.60	19.80	12.83	9.09
Doug	32	6.40	7.20	28.83	11.11

*Note.* MAPE = mean absolute percent error; APE = absolute percent error

Across all sessions, only one participant, Levi, was given tokens with less than 80% accuracy (i.e., APE higher than 20%), while most participants received tokens with

more than 90% accuracy (i.e., APE less than 10%). Figures 1 and 2 show the APE (i.e., the amounts inside the parentheses) for each participant for each token session. Table 2 shows the mean absolute percent error (MAPE), that is, the mean of all sessions' APE amounts per participant, and the APE across all sessions (i.e., the total APE if all token sessions were combined).

## Results

The results are presented in four sections. *Successful jump rope practice trials* refers to the response differentiation between baseline and token conditions, while *graphical trends* refers to the trends present in the data as evident through visual analyses of the graphs. The *success rate* section describes the differences in the achievement of the participants between baseline and token conditions. And, the *social validity* section presents the teacher's perception(s) of the intervention.

### Successful jump rope practice trials

The influence of the token economy intervention on the number of successful jump rope practice trials is indicated in the line graphs in Figures 1 and 2. Response differentiation between baseline and token sessions is evident in nine out of ten participants. Carrie, who was classified as control level, was the only student whose data did not indicate differences between the two conditions. With this lone exception, notable differences were present in the mean number of successful jumps during baseline sessions and token sessions for all participants. Kendra, Allison, and Wendy each increased their mean number of jumps per session by more than 50 ( $M = 63.40$ ,  $56.92$ , and  $53.25$ , respectively) during token sessions as compared to the baseline condition. Isaiah, Daniel, and Eddie improved their mean by over 30 jumps ( $M = 37.20$ ,  $34.60$ , and

33.05, respectively) while Carla improved by 21.80 jumps per session, Doug added 17.00 jumps during token sessions, and Levi increased by 10.85 jumps. Carrie showed only a minimal change by increasing by 1.60 jumps per session.

### **Graphical trends**

Trendlines for each condition (i.e., baseline and token economy) were added to the line graphs in Figures 1 and 2. Four distinct patterns were present in the graphical analysis. First, Levi, Wendy, and Carla's graphs each showed both baseline and token data to be trending upward, while still maintaining level differentiation between the two conditions. Second, Eddie, Daniel, and Doug's token condition data trended upward, while their baseline levels were falling. Again, response differentiation between conditions was present. Third, although notable differences between conditions existed, Isaiah and Allison showed a decreasing trend in both baseline and token conditions. And finally, Kendra's baseline was falling while the token economy trendline remained relatively unchanging.

### **Success rate**

There were noteworthy differences in the success rate between conditions as well. Success rate was calculated for each condition by dividing the total number of successful jumps by the total number of jump attempts and multiplying by 100. The bar graphs presented in Figures 1 and 2 indicate an improvement in the success rate of nine out of ten participants; Carrie was the sole exception. Of the participants who showed an increased success rate, the improvement ranged from a 2.00% increase (i.e., Wendy) to a 9.00% improvement (i.e., Kendra).

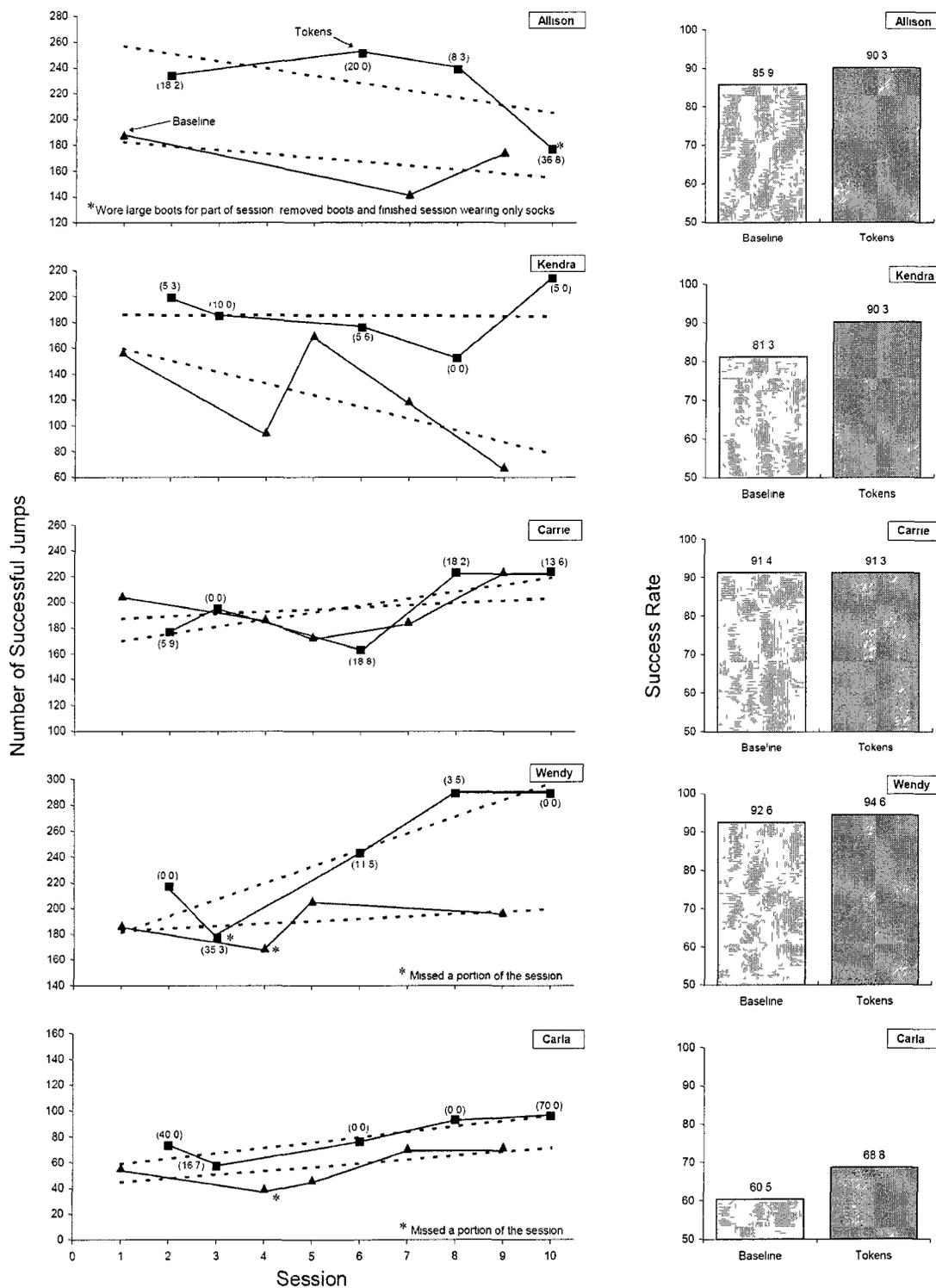


Figure 1. The number of girls' successful jump attempts across all sessions and success rate (%) of jump attempts by session type.

Note. Numbers in parentheses ( ) represent the absolute percent error (APE) of token distribution per session.

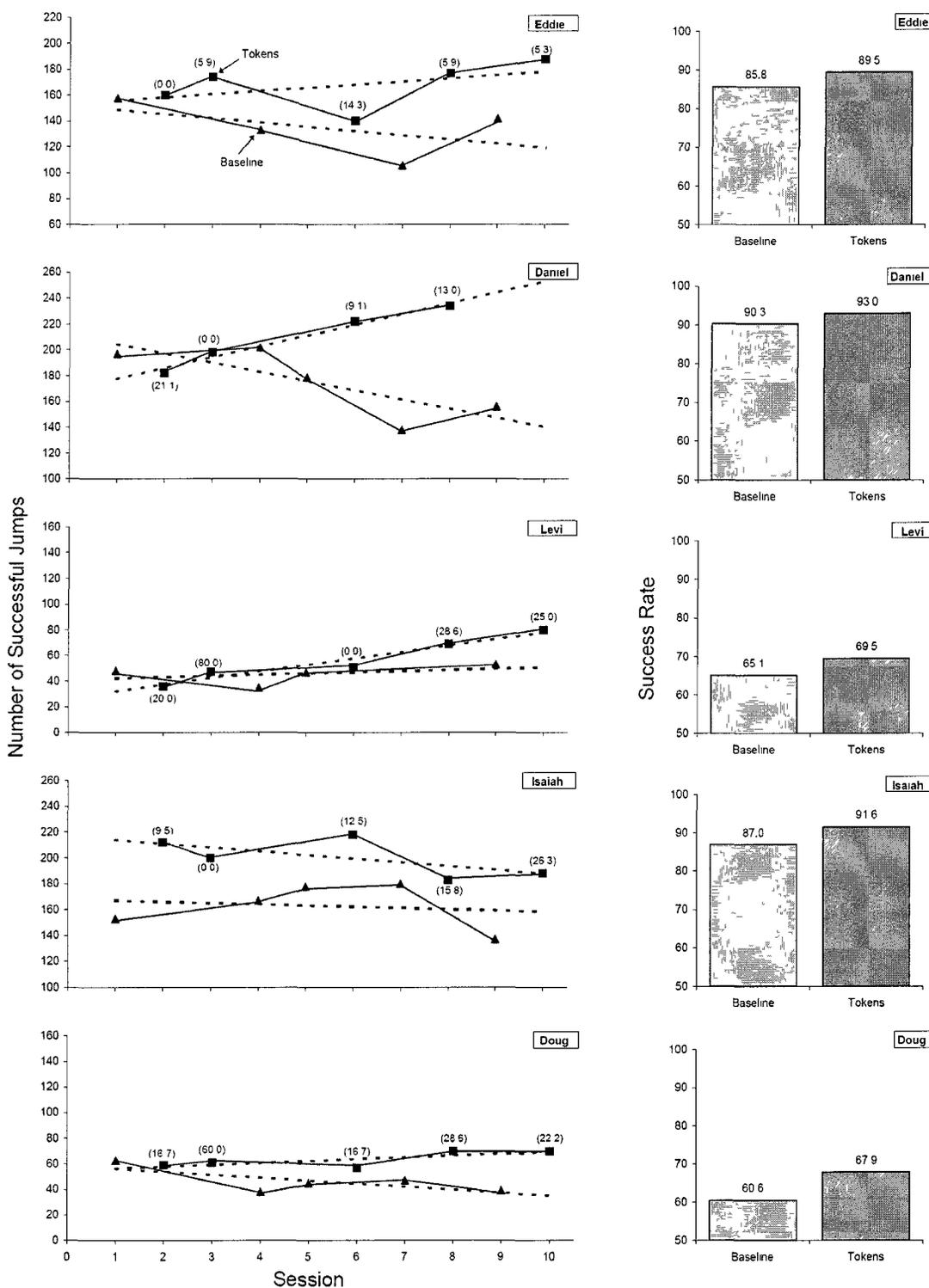


Figure 2. The number of boys' successful jump attempts across all sessions and success rate (%) of jump attempts by session type.

Note. Numbers in parentheses ( ) represent the absolute percent error (APE) of token distribution per session.

### **Social validity**

The physical education teacher's responses to the social validity questionnaire were consistently positive. Her perception was that the token economy was "very effective" in helping her students learn jump rope skills while stating the implementation of the token economy was "very easy." The researcher calculated the total monetary cost of operating the token store (i.e., less than approximately 75 cents per student across a two month period); the teacher suggested on the questionnaire that she thought the positive effects of the intervention were worth the cost of its implementation. However, she was only "somewhat likely" to operate a token economy in her future classes due to the "budget."

### **Discussion**

The primary objective of this study was to examine the effectiveness of a token economy on jump rope practice trials performed by typically developing third grade students in a physical education class. The results indicated the token economy had a positive effect on the number of successful jumps as compared to baseline levels in nine out of ten participants. The only exception, Carrie, did not show response differentiation between baseline and token economy sessions. By definition, positive reinforcement occurs when a stimulus is presented after engagement in a behavior *and* the presentation of the stimulus increases the frequency with which the behavior occurs again in similar circumstances (Cooper et al., 2007). Because Carrie's baseline and token economy session responses did not differ, it can be assumed that the tokens, and subsequently the back-up reinforcers available at the token store, did not have reinforcing properties for Carrie. This reflects one of the major theoretical foundations of behaviorism – that

behavior is an individual phenomenon (Skinner, 1953). What is reinforcing to one student may not be reinforcing to another. Further inquiry into Carrie's reinforcer preferences or history of reinforcement may have yielded different results; if the store was stocked with items of particular interest to Carrie, she may have also increased the number of responses during token sessions. Teachers, when instructing a class of numerous individuals, should understand that what controls one student's behavior may not impact another student in the same way, due to the individualistic nature of reinforcement. However, the results of the study indicated that nine of the ten participants showed an increase in successful jumps. For these remaining participants, the back-up reinforcers available in the token store provided some reinforcement for the engagement in jump rope practice trials, thus, an increase in the number of jumps.

Because the literature consistently supports the relationship between practice and achievement in physical education (Ashy et al., 1988; Buck et al., 1990; Silverman, 1985), it is important to examine tools that improve and increase practice time in the gym; the current study reveals token economies to be one of these tools. Buck et al. demonstrated a relationship between achievement and correctly performed practice trials where the outcome of the trial was successful (i.e., the process and outcome were both successful). In the current study, the operational definition for a "successful" jump attempt included both a correctly performed process as well as a successful outcome. The token economy sessions produced a higher number of successful jump attempts as compared to baseline sessions. Additionally, sessions that included token reinforcement also produced more efficient practice sessions (i.e., success rate tended to be higher when receiving token reinforcement). If success rate is used as the achievement measure, it can

be inferred that a relationship between the increase in the number of successful jump attempts and student achievement (i.e., success rate) exists in the current data as well. This supports the literature showing that improved practice produces greater achievement. The results also indicate that token economies have the potential to positively influence students' practice within physical education settings, thereby increasing student achievement.

This study supports Rushall and Siedentop's (1972) arguments for the use of token systems in physical education settings. First, tokens were administered during built in rest periods. The administration of the token reinforcement did not interrupt any educational process or skill practice. All students in the class were reinforced with tangible items without any interruption to the planned class activities. And second, because the tokens could be exchanged for a wide variety of items, a general decrease in jump responses during token sessions was not observed. It can therefore be assumed that the choices available in the token store provided enough variety in reinforcement to continue to result in an increase in jump rope trials throughout the duration of the study. Two participants, however, showed a downward trend during token sessions, both of which may be explained by influences outside of the control of the study. During Allison's last token session (i.e., session 10), she wore large boots to class; she jumped for the first part of the session while wearing these boots, but removed them and finished the session in socks. If this data point is removed, Allison's overall trend is increasing. And, Isaiah's last two token sessions (i.e., sessions 8 and 10) were notably lower than his previous token sessions. During these sessions, the researcher observed Isaiah struggle with the length of the jump rope he chose to use. If a jump rope of proper length was

used, Isaiah's results may have been different. These two participants' downward trends may be anecdotally explained away. The results, however, still provide enough evidence to support Rushall and Siedentop's claims.

A third argument for the use of token economies in physical education settings, presented by Lavay et al. (2006), states that tangible reinforcers are not always convenient to administer during physical activity sessions; tokens provide a way to delay reinforcement until a more convenient time. Again, the current study supports this rationale. Tokens were administered without any interruption of learning activities. However, if tangible reinforcers were given during activity time, it may have inhibited the learning environment. The token store was opened after the learning activities were completed, thus delaying tangible reinforcement until a more convenient time that did not disrupt the academic environment. In addition to these three reasons for using token systems in physical education, the results of the current study provide evidence for one additional rationale. A token economy that includes an assortment of back-up reinforcers serves a wide variety of individuals. Not only will a variety of reinforcers reduce satiation within a singular student (Rushall & Siedentop, 1972), but it will also provide a greater chance that more students will find an item with individually reinforcing properties, therefore servicing the wide range of individuals found within a physical education class.

Another facet of the current study involves the accuracy with which tokens were administered by peers. Ward and colleagues (Crouch et al., 1997; Ward, Crouch, & Patrick, 1998; Ward, Smith, Makasci, & Crouch, 1998) conducted a series of studies examining peer-mediated accountability, which used peers to assess performance; based on the results of these assessments, students received additional reinforcement. Students'

assessments were found to be reasonably accurate (i.e., above 80% accuracy across all three studies). Mangus et al. (1986) also used students to administer reinforcement and found that the peer tutors gave token reinforcement with greater than 90% accuracy. The current study supports these findings in that student peers were able to administer token reinforcement with a relatively high degree of accuracy. The mean absolute percent error (MAPE) across all participants was 16.21%, indicating the participants in the study administered reinforcement with nearly 84% accuracy. As with the aforementioned research, before the onset of the current study, peers were trained to properly administer reinforcement. However, training sessions took very little time and were completed in less than one class period. Therefore, when analyzing the time it took to train the students, the time saved by having students reinforce each other, and the accuracy with which tokens were administered, peer-administered reinforcement appears to be a feasible and reasonable option for physical education teachers to implement into their instructional activities.

One of the potential barriers to the incorporation of a token economy is related to organizational and administrative issues in its implementation (Kazdin, 1982). This study, however, showed that the implementation of the token economy in a physical education setting was remarkably simple. In fact, the teacher indicated on the social validity questionnaire that the token system was “very easy” to execute. Initial token and peer training took some effort on the part of the teacher and researcher, but by the second session the token system basically managed itself, with students taking responsibility for administering the intervention. Nevertheless, when asked if she would use a token system in her class in the future, the teacher indicated she was only “somewhat likely,” noting

the cost of running the token store may have been too high, despite the fact she stated the benefits of the token system were worth the cost of its implementation. She was, however, willing to attempt another token economy using inexpensive, non-tangible back-up reinforcers, such as line leader privileges and free choice time. Overall, the teacher perceived the token economy as positive, stating, “the token economy study seemed not only to improve student participation, but also helped to motivate the students. They were eager to ask me if the following PE day would be a ‘token’ day.”

The main limitation of the current study is related to the issue of external validity. From a behavior analysis perspective, individuals behave, whereas groups of people do not. Due to this theoretical perspective, behavior analysis research is typically conducted using single subject design (Kennedy, 2005). Because of this, the external validity of the study is restricted. However, proponents of single subject design advocate for a strengthening of the external validity of findings through direct and systematic replication of the study. Cooper et al. (2007) state, “...the discovery of behavioral principles with generality across persons is best accomplished by replicating the already demonstrated functional relations with additional subjects” (p. 161). Therefore, unless the current study is replicated, generalization to the population should be considered with caution.

Further research should be conducted in the area of token economies in physical education in a variety of grades and with more teachers. Additionally, more areas of potential token economy in physical education research became evident through the conducting of the current study. First, the physical education teacher agreed that the use of inexpensive reinforcers (i.e., privileges, choices, etc.) may be more feasible than continually purchasing items to keep the token store stocked. However, this needs to be

examined more closely before its widespread use. And second, the use of tangible tokens and token containers may be too cumbersome for some teachers. Less intrusive methods of implementing a token economy, such as using points or check marks on a poster board, instead of tangible tokens dropped into personalized containers should be examined. It may be an even easier method to incorporate token reinforcement in physical education, if it is deemed effective.

This study's results reveal the implementation of a token economy system in a physical education class was effective in increasing the number of jump rope practice trials in nine out of ten third grade participants. Despite the overall lack of token economy research in physical education within the past 30 years, the current study provides evidence of the potential of token systems to be an effective and feasible tool for physical educators.

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## CHAPTER IV

### **Effects of Peer-Administered Token Reinforcement on Second Grade Physical Education Students' Overhand Throw Performance**

Physical education teachers have ample responsibilities as educators. Of these responsibilities, one of the most important in their job description is to help their students develop competency in a variety of motor skills. As described in Standard 1, a physically educated person “demonstrates competency in motor skills and movement patterns needed to perform a variety of activities” (National Association for Sport and Physical Education [NASPE], 2004, p. 11). Additionally, achieving competency in motor skills has further importance. According to Pangrazi (2004), physical education students’ motor skill success should be at a high level. It has been suggested that if students’ success rate is high, they may be more likely to find physical activity to be an enjoyable experience. However, if achievement is low, an aversion to physical education and physical activity may develop and continue into adulthood (Pangrazi). Further evidence supports the importance of the development of motor skills as well. Stodden, Langendorfer, and Robertson (2009) found a relationship between young adults’ competence in three motor skills (i.e. throwing, kicking, and jumping) and their overall fitness. These findings suggest that the development of motor skills during childhood may have a positive impact on fitness levels into young adulthood. Based on these rationales, strategies to increase student achievement and aide in the teaching of motor skills in physical education should be of great value to physical educators. One strategy that can be

valuable to physical educators is the token economy, a motivational system derived from the field of behavior analysis. Therefore, this study examines the effectiveness of a token economy on the technique second grade physical education students use to perform the overhand throw, one of the skills Stodden et al. found to be associated with higher fitness levels in young adults.

### **Behavior Analysis in Physical Education**

One theoretical perspective that has been explored in the physical education literature has its foundations in behavior analysis (Ward & Barrett, 2002). Behavior analysis includes both the examination of the reasons for engagement in behavior(s) as well as the development of technologies in which the controlled manipulation of antecedent and/or consequence variables is utilized in order to systematically change target behaviors (Cooper, Heron, & Heward, 2007). Interventions based in behavior analysis have been used in numerous physical education settings in order to methodically modify various skill-related behaviors, including skills in tennis (Ziegler, 1987), volleyball (Ward, Crouch, & Patrick, 1998), basketball (Ward, Smith, Makasci, & Crouch, 1998), and striking (Johnson & Ward, 2001). In other physical activity settings, such as in sport or recreation, behavioral principles have been applied in order to systematically alter additional motor skill-related behaviors, including skills in football (Smith & Ward, 2006; Ward & Carnes, 2002), soccer (Rush & Ayllon, 1984), track and field (Shapiro & Shapiro, 1985), and gymnastics (Wolko, Hrycaiko, & Martin, 1993), among others. Teaching and coaching techniques based in applied behavior analysis have a well-established foundation in physical education and sport literature.

### **Token Systems in Physical Education**

One technique which has its foundations in applied behavior analysis is the token economy system. Originally developed as a motivational tool for use in a rehabilitation setting (Ayllon & Azrin, 1968), token economies consist of three main parts: (a) a specifically defined behavior targeted for change, (b) tokens, tickets, or points to be rewarded to the individual when he/she engages in the target behavior (or when he/she does not engage in the behavior if it is one targeted for reduction), and (c) a selection of back-up reinforcers for which individuals can exchange their earned tokens (Cooper, et al., 2007). Specifically within physical education settings, the implementation of a token system has several recommended benefits: (a) unlike the administration of traditional tangible reinforcement, token reinforcement does not interrupt the educational process (Rushall & Siedentop, 1972), (b) token reinforcement can be administered immediately following engagement in the behavior without interruption of educational activities, while delaying tangible reinforcement until a convenient time (Lavay, French, & Henderson, 2006), and (c) by having a variety of available back-up reinforcers from which to choose, the chance of satiation on a single reinforcer is reduced (Rushall & Siedentop).

Token economies have been found useful in several physical activity settings to improve an array of behaviors, including attention and time on task (Mangus, Henderson, & French, 1986; Reitman, Hupp, O'Callaghan, Gulley, & Northrup, 2001), exercise behaviors (Bernard, Cohen, & Moffett, 2009; DeLuca & Holborn, 1985, 1990, 1992), distance walked (Wiggam, French, & Henderson, 1986), and one mile walk/jog times (Trocki-Ables, French, & O'Connor, 2001). Despite the recommendations for

implementing token economies in physical education (Lavay et al., 2006; Rushall & Siedentop, 1972) paired with the successes reported in a wide variety of physical activity behaviors and settings, only one study was identified that examined the effectiveness of a token system implemented specifically within a physical education setting. Mangus et al. introduced a token economy in an integrated physical education class; however, their target population was children diagnosed with autism. Therefore, no studies were found that examined a token system implemented in a physical education setting with typically developing students. Consequently, the primary purpose of the current study was to examine the effectiveness of a token economy on typically developing elementary physical education students' technique used to perform an overhand throwing skill. Overhand throw was selected as the target behavior due to the complexity of the task that involves several sequential steps in the correct execution of the skill.

A secondary purpose of the study was to examine the effect reinforcing correct overhand throw technique had on the result of the throw (i.e., throw distance). It is believed that correctly performing the process of the overhand throw will positively impact the product of the throw. Finally, this study also sought to examine the accuracy with which elementary aged physical education students administered token reinforcement and process assessments to their peers. Ward and colleagues (Crouch, Ward, & Patrick, 1997; Ward, Crouch, & Patrick, 1998; Ward, Smith, Makasci, & Crouch, 1998) conducted a series of behavior analysis-based studies using elementary aged peers to assess performance in physical education while Mangus et al. (1986) used peer tutors to administer token reinforcement. In each case, the peers were able to assess and/or reinforce with a high degree of accuracy. The current study combines these to

examine the accuracy with which elementary aged students can both perform a peer assessment and administer reinforcement based on the results of the assessment.

## **Method**

### **Participants**

All participants were chosen from an intact second grade physical education class. Informed consent was sought from each student's legal guardian while informed assent was obtained from each student. The physical education teacher characterized each student's skill level as at the pre-control, control, or utilization level, as based on the Generic Levels of Skill Proficiency (Graham, Holt/Hale, & Parker, 2007). From the class, nine students (4 girls and 5 boys) were selected as participants. Ten participants were initially selected, but one withdrew from the study due to an injury she suffered outside of the confines of the study and the school. The study was originally intended to include only students at the pre-control or control levels (i.e., lower skilled students; those in most need of additional skill development). Not enough potential participants were labeled by the teacher as at the pre-control or control levels so the study was expanded to include one student who was characterized as at the utilization level. Table 1 shows participants' demographic data, including gender and age as well as each participant's skill level as rated by the teacher. All participants were given pseudonyms.

### **Setting and personnel**

Most of the ten total sessions were conducted in the gymnasium of a suburban elementary school located in the southeastern United States. However, several sessions had to be moved outside to the school's outdoor tennis courts due to events being held in the school's gym (e.g., book fair, school assembly, etc.). The class had physical education

instruction approximately once per week (occasionally, the school's rotating schedule allocated the class to meet twice in a single week).

Personnel involved in the implementation of the study included the physical education teacher who implemented the token economy and conducted all sessions and the researcher who was present during all sessions to collect relevant data. It was apparent that the presence of the researcher during physical education classes did not impact the typical behavior of the students. The school in which the study was conducted is located across the street from a large university. Therefore, the students are accustomed to frequent visitors and observers during classes.

Table 1. Participant information and Generic Level of Skill Proficiency as Rated by the Teacher

Participant	Gender	Age	Skill Level
Alexis	Female	7	Control
Connie	Female	7	Control
Carly	Female	8	Control
Mary	Female	7	Pre-control
Arthur	Male	7	Pre-control
Larry	Male	7	Utilization
Jack	Male	8	Control
Paul	Male	7	Pre-control
Chris	Male	7	Control

*Note.* Generic Level of Skill Proficiency was rated for each participant by the teacher prior to the onset of the study.

### **Data collection and equipment**

Each of the 10 sessions was recorded using a Kodak Zi6 Pocket video camera (the backup camera, a Sony Handycam DCR-SR47 digital video camera, was used once, during session one, due to a low battery in the primary camera). Additional equipment included five bean bags for each student in the class, tokens (i.e., 3/4 inch Bingo “coins”) to be distributed during the intervention, a personalized container (i.e., 4 inch square plastic containers, each with a removable lid with a one inch hole for easy token administration) for each student’s tokens, and a selection of back-up reinforcers (e.g., balls, yo-yos, glow sticks, stickers, etc.) available for purchase in the token store.

### **Experimental design and procedures**

A multielement design was used to evaluate the effectiveness of the token economy. In a multielement design, a single-subject design variation, treatment conditions are implemented on an alternating schedule to assess whether levels of the target behavior are different under the varying conditions. A functional relation can be determined if response differentiation occurs between the two conditions (Kennedy, 2005).

**Experimental conditions.** The following section describes the two experimental conditions: baseline and token economy. Two sessions were conducted each day the class met, one at the beginning of the class and one at the end, with a condensed version of the teacher’s physical education lesson in between. Before the class entered the gym, the researcher randomly selected which condition was to be implemented at the beginning of the class. The opposing condition was then executed at the end of the class. For example,

if a token economy session was conducted at the beginning of the class, a baseline session was held at the end.

**Baseline.** The teacher gave instruction on the proper technique of performing an overhand throw as she usually would during a typical physical education class. All students in the class were then divided into pairs. While one member of the pair performed five trials of the overhand throwing task, the partner used a peer process assessment to assess the form his/her partner used to perform the skill. The process assessment consisted of two components: (1) side to target and (2) step toward target with opposite foot (Graham et al., 2007). On the assessment sheet, the partner placed an “X” next to the component(s) the thrower performed correctly for each of the five trials during the session (see Appendix C). After each participant performed five trials, the partners switched roles and the process was repeated, giving each student in the class the chance to perform five throws as well as conduct the peer assessment. Each session took approximately 5 minutes.

During the activity time, the teacher only gave feedback to the observers who were conducting the assessment regarding the accuracy with which the assessment was being conducted as per the Reciprocal teaching style (Mosston & Ashworth, 2002). Corrective or positive feedback was not given to the students who were performing the overhand throw task. The teacher only gave a minimal amount of feedback regarding the accuracy of the assessment; the participants were able to understand the assessment process quickly and accurately.

**Token economy.** During the intervention phase, the participants followed a similar procedure as was followed during the baseline sessions, with the addition of the

administration of token reinforcement. Each participant performed five trials of the skill while his/her partner performed the process assessment. After each trial, if the participant performed both of the components of the skill correctly, the partner picked up two tokens (i.e., one token for each correctly performed component of the skill) from a plastic cup that contained a large amount of tokens and placed them in the thrower's personalized token container that was located on the ground near where the task was being performed. Dropping plastic tokens into a plastic container provided each participant with multiple stimuli (i.e., visual and auditory) to be associated with token reinforcement. If only one of the components was performed correctly, one token was awarded. No tokens were given for incorrect performance of both components. Participants had an opportunity to earn up to 10 tokens during each token economy session.

Throughout the study, the participants did not remain with the same partner. Pairs were exchanged four times, resulting in each participant having five different partners throughout the study.

Students had an opportunity approximately once a week to exchange their tokens for a variety of back-up reinforcers in the "token store." The store consisted of four bins, each containing a variety of back-up reinforcers of different value: 5, 10, 15, or 20 tokens. Larger items, such as glow sticks and yo-yos, cost 20 tokens each, while smaller items, such as small stickers and erasers, cost 10. Students also had the option to retain their tokens for a later date in order to save up for more "expensive" items. Throughout the duration of the study (i.e., slightly less than two months), the operation of the store cost approximately 38 cents per student per month.

**Teacher training.** Prior to the onset of the intervention, the researcher conducted several training sessions with the physical education teacher regarding the procedures of the study. Training sessions included verbal instructions and modeling of the procedures. The teacher's competency of the study was assumed when she was able to completely describe the steps in the implementation of the components of the study with complete accuracy.

**Token training.** Prior to the implementation of the intervention, the teacher and researcher conducted a short token training session with the physical education class. According to Cooper, Heron, and Heward (2007), token training with typically developing children can mainly consist of verbal instructions and modeling. Therefore, the teacher and researcher discussed with the class how they could earn tokens, modeled to them how tokens were to be distributed, and gave them an opportunity to see what was available for purchase in the token store.

**Assessment training.** The teacher conducted two assessment training sessions with the students, each lasting approximately five minutes. These sessions consisted of a verbal description of how the assessment was to be conducted paired with a demonstration of correct and incorrect execution of the assessment. Training sessions also included the teacher performing the overhand throw skill while the students completed an assessment of the teacher's performance. The accuracy with which the participants assessed the teacher's performance was evaluated by comparing the participants' completed assessments to the researcher's assessments of the teacher's performance. All participants were able to achieve the criterion of 80% accuracy within two training sessions.

**Social validity.** After the close of the intervention, a questionnaire was given to the physical education teacher to evaluate her perception of the intervention as well as her opinion regarding the practicability of using token economies in a physical education setting (see Appendix E). The questionnaire also inquired of the teacher's perception of the costs of implementing the token economy as well as her intentions of implementing a token system in her future physical education classes.

### **Data Analysis**

Overhand throw technique was evaluated using the following criteria, adapted from Graham et al. (2007): (1) participant positions his/her body perpendicular to the target with the side of the body opposite of the throwing arm facing the target (side to target), (2) participant takes a long contralateral step toward the target with the foot opposite of the throwing arm (step with opposite foot), (3) throwing arm moves in a rotational motion back with the hand behind the head, then toward the target with the elbow at or slightly above shoulder level (arm way back and throw), and (4) after the ball is released, the arm should continue in an arc and end up near the knee (follow through). The researcher observed video recordings of each session in slow motion, analyzing the overhand throw technique based on the criteria described above. For each of the four components of the skill performed correctly, the researcher gave one point; a total of four points were possible per trial (i.e., one per component of the skill). Each session consisted of 5 trials. A total of 20 points was possible for each session (see Appendix D).

For each trial, the distances thrown were evaluated via video data. The students were instructed to try to throw the bean bag as far as they could while maintaining correct technique. In the gymnasium, strips of tape were placed at one foot intervals along the

side of the wall. While observing each session in slow motion, the researcher paused the video at the point where the bean bag initially hit the floor. The bean bag's location was then compared to the markings on the gym wall and rounded to the nearest foot. A similar technique was used during outside sessions. Cones were placed at regular intervals along the side of the tennis court. The location of the bean bag was compared to the marker cones and rounded to the nearest foot. Distances for each trial as well as the average distance per session were recorded (see Appendix D).

Data analysis was ongoing throughout the study, thereby allowing the researcher to observe behavior changes (i.e., changes in the overhand throw technique of the participants) on a continuous basis rather than only at the conclusion of the study (Cooper et al., 2007). The intervention was stopped when both the baseline and token economy conditions showed a consistent and stable response pattern as evidenced by visual analyses of the graphs (Cooper et al.).

**Interobserver agreement.** Interobserver agreement (IOA) was assessed for approximately 27% of the sessions. While watching the recorded videos, a trained independent observer coded each of the four components of each practice trial as correct or incorrect. Percentage agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. Overall agreement was 91.8%. Additionally, the observer recorded the distance thrown for each trial and calculated the average distance per session for each participant. The mean difference between the researcher's and second observer's distance per session was less than two feet (i.e., 1.6 feet per session).

**Treatment integrity.** For each token session, the researcher determined if the treatment was administered correctly by calculating the absolute percent error (APE) of token distribution; APE was calculated by subtracting the criterion amount (how many tokens the participant should have received for the session) from the actual amount (how many tokens the participant actually received), dividing by the criterion amount and multiplying by 100. The resulting APE represents the percent error with which tokens were administered to each participant for each individual session. The mean absolute percent error (MAPE) was then calculated for each participant, providing insight into the accuracy with which tokens were administered across all sessions. Only one participant, Mary, received tokens with greater than 10% error. All other participants were administered tokens with a high degree of accuracy. Table 2 displays the mean absolute percent error (MAPE) for each participant across all token sessions.

**Assessment accuracy.** The accuracy with which participants were assessed by their peers was analyzed for all sessions, including baseline and token economy sessions. Accuracy was calculated for each participant for each session by dividing the number of correctly assessed components of the overhand throw by the correctly assessed components plus incorrectly assessed components and multiplying by 100%.

## **Results**

The following results are divided into four sections. First, the response differentiation (i.e., the technique with which participants performed the overhand throw) between baseline and token sessions is described. Next, the distances participants threw the bean bags are assessed for both baseline and token sessions. Third, the accuracy with which assessments were performed and tokens were distributed is reported. And finally,

the results of the social validity questionnaire are reported, revealing the physical education teacher's perceptions of the token system.

### **Overhand throw components performed correctly**

Visual analyses of the line graphs reveal that six out of nine participants showed response differentiation between baseline and token economy sessions. Mary, Paul, and Arthur were the exceptions; their graphs did not indicate response differentiation. Figures 1 and 2 display each participant's total number of overhand throw components performed correctly per session based on condition.

Additionally, with the exception of Paul, all participants increased their mean number of overhand throw components performed correctly per session by at least two components when compared to baseline sessions. Within these participants, mean improvement ranged from an increase of a mean of 2.0 correctly performed components per session (i.e., Carly and Chris) to a mean of 5.0 (i.e., Jack). This represents a range of improvement within the participants included in the study from 10 to 27% from baseline to token conditions. Based on the response differentiation evident in the graphs as well as the differences present in the number of correctly performed overhand throw components during token sessions, it can be determined that a functional relation between the administration of token reinforcement and an improvement in overhand throw performance is evident in six of nine participants.

### **Distance thrown**

All nine participants showed an increase in mean distance thrown during token sessions as compared to baseline sessions. Mean improvement ranged from an increase in 0.3 feet per throw (i.e., Larry) to 7.0 feet per throw (i.e., Arthur). The differences in the

mean distance the participants threw the bean bags based on session type are represented in the bar graphs in Figures 1 and 2. Additional analysis reveals that the increase in distance may also be related to the collective number of components correctly performed over time. Figure 3 shows a cumulative account of the number of overhand throw components correctly performed across each trial set against the backdrop of a bar graph of the distance the bean bag travelled for each trial throughout the duration of the study. With the exception of Larry and Paul, the participants' data show a trend in the distance thrown that increased as the cumulative record of overhand throw components increased.

#### **Assessment and token distribution accuracy**

Table 2 shows the accuracy with which each participant was assessed throughout the duration of the study. Across all sessions, no participant was assessed with less than a mean of 85% accuracy. Although there may have some instances where a singular session's assessment accuracy was low (e.g., Arthur and Chris' session one and Mary's sessions seven and eight), the overall accuracy was very high (i.e., above 85%). Assessment accuracy tended to be higher during token economy sessions (i.e., ranged from 88.0 to 100.0% accurate) than during baseline sessions (i.e., ranged from 80.0 to 100.0% accurate).

With the exception of Mary, the participants tended to receive tokens with a high degree of accuracy as well. The mean absolute percent error of token administration was calculated for each participant (Table 2). These data reveal that token distribution was completed with little error. More than half of the participants (i.e., Alexis, Connie, Carly, Paul, and Chris) received tokens with complete accuracy (i.e., 0% error) throughout all

token economy sessions while the remaining participants, Arthur, Larry, and Jack, received tokens with 10% error or less.

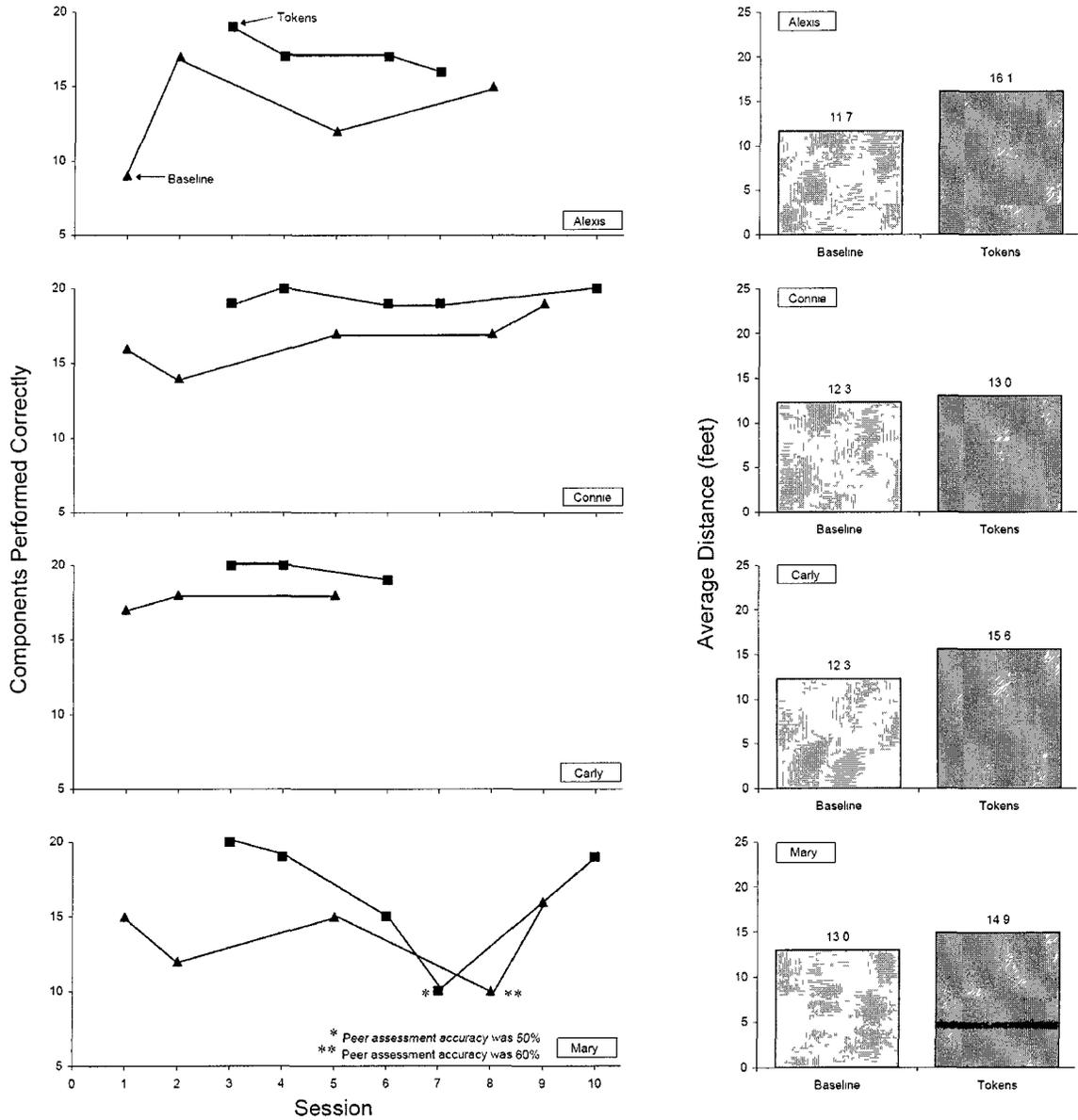


Figure 1. Number of girls' overhand throw components performed correctly per session and the mean distance (in feet) of all throws based on session type

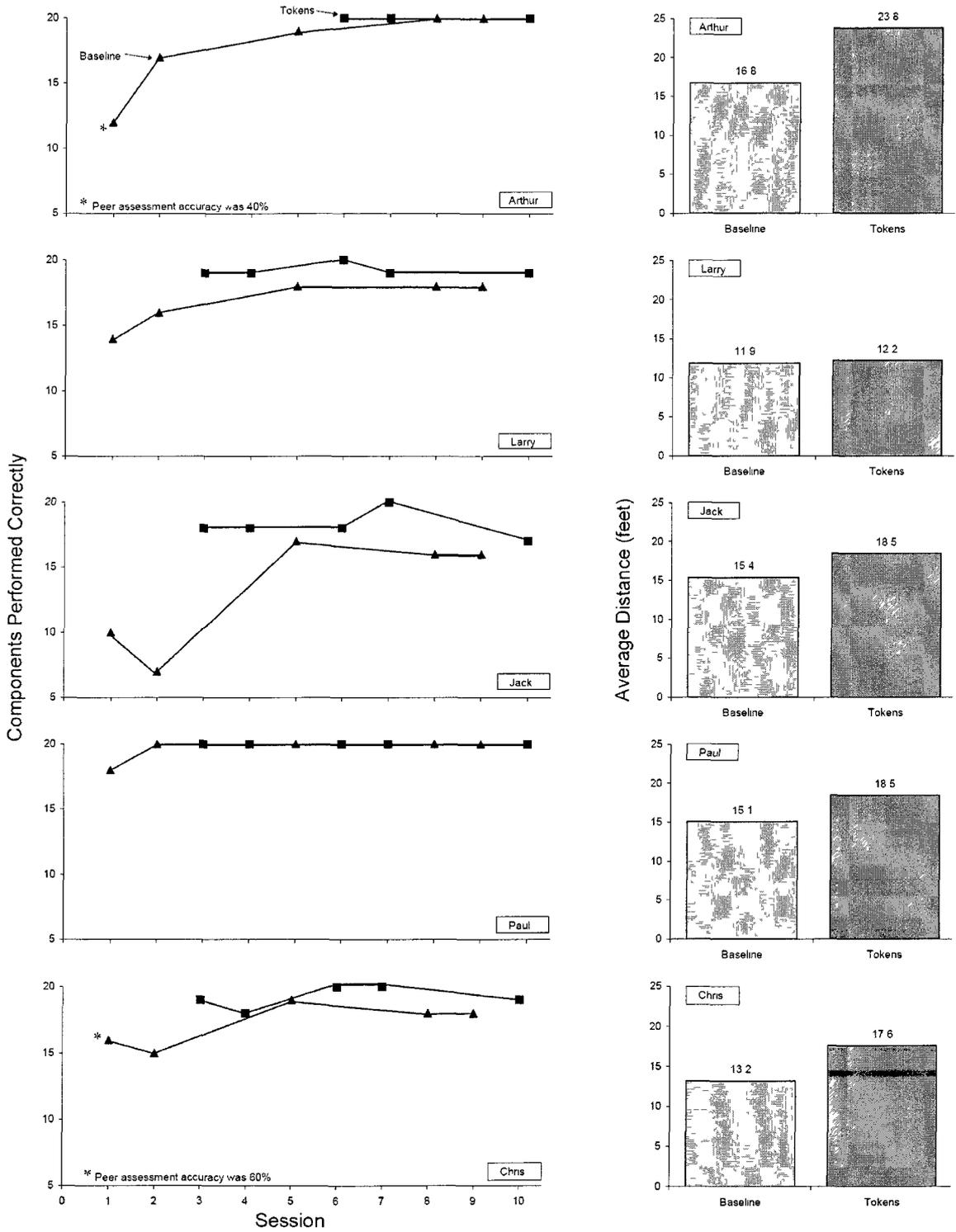


Figure 2. Number of boys' overhand throw components performed correctly per session and the mean distance (in feet) of all throws based on session type

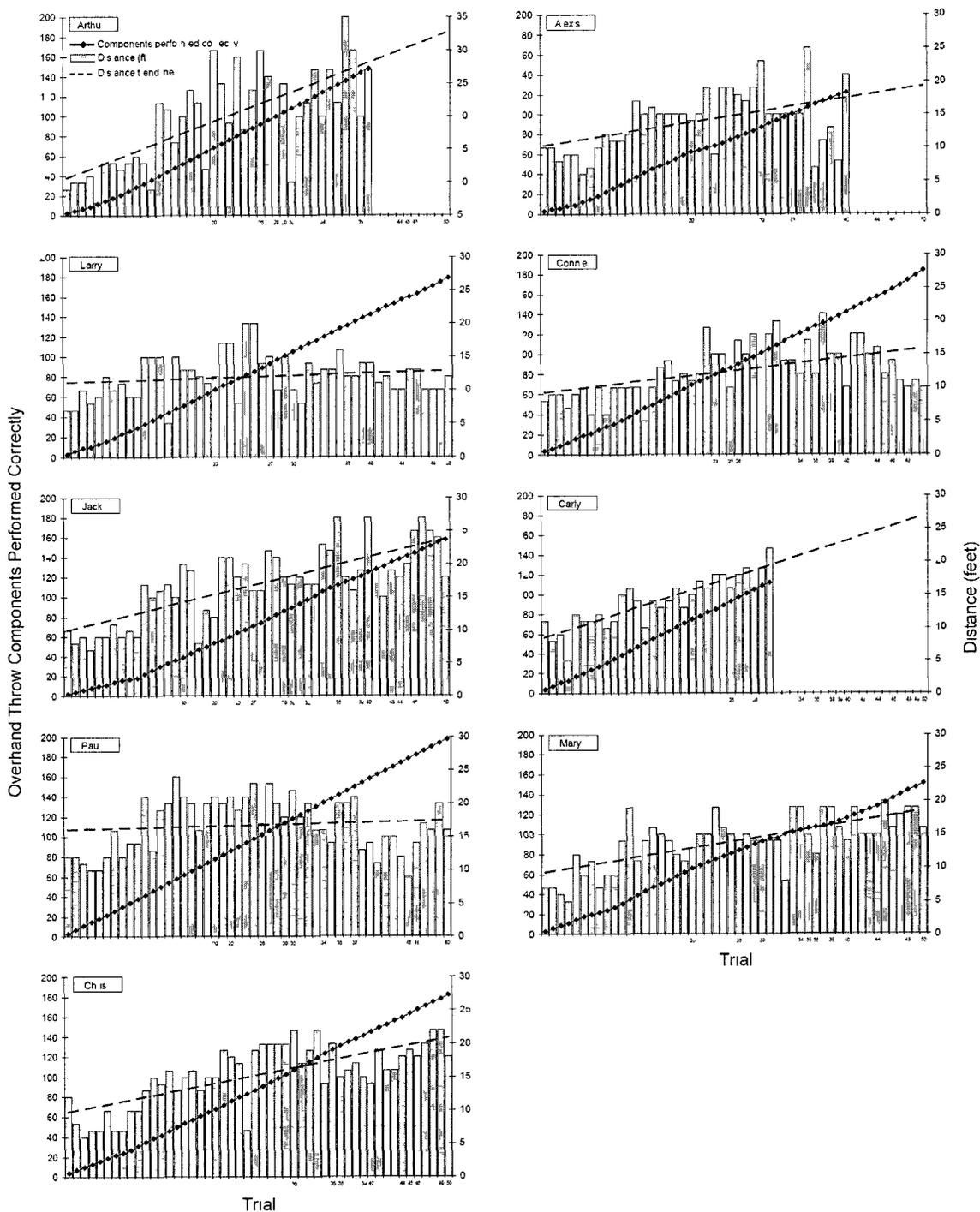


Figure 3 Cumulative record of overhand throw components performed correctly across the duration of the study (left axis, line graph) and distance bean bag travelled each trial (right axis, bar graph)  
 Note Trend line for distance (bar graph) added

### Social validity

The physical education teacher responded to the social validity questionnaire with consistently favorable remarks. She felt that the token economy system was both “very effective” in helping her students improve overhand throw skills and “very easy” to implement. Although she stated that the benefits of the token system was worth the cost of its implementation, she was only “somewhat likely” to use a token economy in the future due to the costs associated with the upkeep of the token store.

Table 2. Accuracy with which Participants were Assessed and Administered Tokens

Participant	Token Sessions Assessed Accuracy (%)	Baseline Sessions Assessed Accuracy (%)	Assessed Accuracy (%) across all Sessions	MAPE (%) of Token Administration
Alexis	100.00	92.50	96.25	0.00
Connie	100.00	92.00	96.00	0.00
Carly	100.00	96.67	98.33	0.00
Mary	88.00	80.00	84.00	32.00
Arthur	96.67	80.00	86.25	3.33
Larry	90.00	86.00	88.00	10.00
Jack	94.00	80.00	87.00	6.00
Paul	100.00	100.00	100.00	0.00
Chris	100.00	88.00	94.00	0.00

*Note.* MAPE = mean absolute percent error

## Discussion

The main purpose of the current study was to examine the effectiveness of peer-administered token reinforcement on the technique second grade physical education students used to perform an overhand throw skill. Results indicated that six of the nine participants showed response differentiation between baseline and token sessions. Based on the visual analysis of the graphs, it can be determined that the implementation of the token economy had a positive impact on the overhand throw behavior of the aforementioned six participants. The existing literature supported the use of token economies with children in physical activity settings across several capacities (DeLuca & Holborn, 1985, 1990, 1992; Reitman et al., 2001; Trocki-Ables et al., 2001). The results of the current study further these findings by extending the use of token systems into a physical education class with typically developing children. Several recommendations for the use of token economies in physical education were available (Lavay et al., 2006; Rushall & Siedentop, 1972), but the literature lacked empirical evidence for the use of these systems in physical education classes. The current study reveals that the implementation of a token economy in a physical education class can positively impact the skill behavior of its students.

As mentioned previously, six out of nine participants showed an improvement in overhand throw technique during the token condition; Mary, Arthur, and Paul were the three exceptions (see Figures 1 and 2). Mary was assessed with a high degree of error during sessions seven and eight (i.e., with 50 and 60% accuracy, respectively). During session seven, Mary received tokens despite performing the skill incorrectly. Then, during session eight, she received incorrect feedback (i.e., from her partner based on the

peer assessment); that is, despite her incorrect performance of the skill, she was given positive feedback regarding her engagement in the components of the overhand throw. These two incidences exemplify what Cooper et al. (2007) label the “arbitrariness of the behavior selected,” which states that despite the intended result, the behavior that immediately precedes a reinforcing consequence will be strengthened. In the current example, because Mary’s behavior (i.e., incorrect skill execution) was immediately reinforced with tokens and/or with positive feedback via the assessment, the behavior continued. It wasn’t until the proper behavior was reinforced during session nine that the correct execution of the overhand throw skill increased. Additionally, Arthur and Paul did not show response differentiation between baseline and token conditions (see Figure 2). In these cases, despite being characterized as low skilled (i.e., pre-control) by the teacher, they both reached the maximum number of possible components performed correctly (i.e. 20) during baseline sessions. Therefore, when the first token session was introduced, based on the operational definitions confining the study, they had no room for improvement. The reinforcing properties of the assessment (e.g., positive feedback via the assessment sheet, social attention from peer, etc.) conducted during baseline sessions may have served to help these two participants achieve the maximum performance level; then when the tokens were introduced, even if the tokens and back-up rewards were reinforcing, there was not additional opportunity for improved performance for the overhand throw based on the confines of the study.

The secondary purpose of the study was to examine the effect the reinforcement of the technique participants used to perform the overhand throw had on the outcome of the throw (i.e., distance the bean bag travelled). The preliminary analysis indicated that

sessions in which participants were reinforced with tokens for performing the skill correctly resulted in an improved product; that is, participants threw the bean bags farther when they received tokens for their correct performance. However, a more in-depth examination showed that the improvement in the product may have been more of a result of the cumulative number of appropriate responses (i.e., cumulative number of overhand throw components performed) over time. Figure 3 shows that as the number of most participants' correctly performed components accumulated, the trend in the distance the bean bags were thrown increased as well. Several studies have demonstrated the relationship between practice trials using correct technique and student achievement in physical education settings (Ashy, Lee, & Landin, 1988; Buck, Harrison, & Bryce, 1990; Silverman, 1985); however, these studies used whole correct practice trials as the variable for examination. The results of the current study provide a preliminary indication that an accumulation of correctly performed components of a skill may aide in producing an improvement in student achievement.

A tertiary purpose of the current study was to investigate the accuracy with which second grade students could perform a peer process assessment as well as administer token reinforcement based on the results of the assessment. Within behavior analysis in physical education literature, there has been some evidence supporting the use of peer assessments (Crouch et al., 1997; Ward, Crouch, & Patrick, 1998; Ward, Smith, Makasci, & Crouch, 1998) and peer-administered token reinforcement (Mangus et al., 1986). However, the results of the current study indicate that students as young as second grade can effectively and simultaneously perform both a process assessment as well as dispense token reinforcement with a high degree of accuracy. Interestingly, the process of

assessment training was quite simple. Two five-minute sessions was all that was necessary to help all participants achieve the criterion of 80% accuracy during training. Then, throughout the duration of the study, with very few minor prompts and quick verbal reminders of how to conduct the assessment from the teacher, the students were able to accurately assess the technique their peers used to perform an overhand throw. These findings provide evidence that, with relatively little training, lower elementary aged students have the capability to assess and reward their peers' motor performance with accuracy. Therefore, all students in the class can get immediate and individualized feedback from their peers regarding their skill performance as well as receive reinforcement for the correct execution of the skill, which can have a positive impact on the achievement of the student within the physical education context.

Implementing token economy systems, however, are not without complication. Kazdin (1982) identified several barriers to the proper and effective execution of a token economy system, including issues related to administrative and organizational concerns. Despite the potential obstacles in its implementation, the token system in the current study was introduced with little difficulty, especially with the students administering the reinforcement. The responses the teacher provided on the social validity questionnaire indicated that the implementation of the token system was "very easy" and her perception was that it was "very effective" in helping her students learn the overhand throw skill. However, she was only "somewhat likely" to use a token system in future classes. In the open ended response section on the questionnaire, she revealed that the major barrier to her future use was related to the costs associated with the token store's upkeep. She explained that although 38 cents per student per month seemed sensible, when

multiplying that by the hundreds of students she sees weekly, the costs exceed what she considers reasonable. After a short discussion on this topic, she was willing to try a token system again in the future if more “inexpensive” back-up reinforcers (e.g., line leader privileges, free choice time, choice of activities, as well as other free items) were used to stock the store.

The main limitation associated with the current study is related to the amount of improvement participants showed over the baseline condition. Although most participants improved, one may argue that the difference between baseline and token session performance was not enough to make the token system worthwhile. This may have been more of a function of the boundaries confining the study. More specifically, the maximum performance participants could achieve during any given session was set at 20 points (i.e., 20 components performed correctly across five practice trials); therefore, a greater difference may not have been as evident as it may have been if a target behavior was selected that did not have a maximum performance level (e.g., throw distance).

Further investigation into the implementation of token economies in physical education needs to be conducted. The token economy implemented in the current study was shown useful with second grade students. However, additional token economy research should be conducted with an older population, such as middle or high school physical education students. Also, the current study revealed preliminary evidence that an accumulation of correctly executed components of a skill performed over time may be associated with achievement; further examination is needed to confirm this result.

## **Conclusions**

The results of the current study indicate that peer-administered token reinforcement can be effective in helping typically developing elementary aged students learn skills and increase achievement in physical education. Also, the implementation of a token economy can be done with relative ease in a second grade physical education class. Taken together, these two results indicate that the token economy can be an effective and appropriate tool for physical educators.

The study also reveals that students as young as second grade can accurately perform a process assessment on their peers' motor performance which has implications outside of token economy research. Teachers can use peer assessments with children in physical education with the assertion that students will be receiving a relatively accurate assessment of their performance.

### Chapter IV References

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## CHAPTER V

### Overall Conclusions

The development of teaching tools and techniques that can aide in physical education instruction can be invaluable to teachers. One tool, the token economy, had the potential to be a “best practice” based on several recommendations for its implementation. However, empirical support for its use in physical education was lacking. Therefore, the main purpose of the present study was to implement a token system into physical education and examine its effectiveness on participants’ motor skills. The following provides a summary of each manuscript’s conclusions as well as overall conclusions that were drawn from the series of studies as a whole.

Manuscript one, entitled *Implications for the Use of Token Economies in Physical Education: A Literature Review*, presented a review of the published research examining token economies in physical activity settings. Based on the results of the published studies, token systems appeared to be quite effective in aiding participants in improving motor skills and exercise behaviors. The main conclusion drawn from manuscript one, however, was there was a clear lack of empirical evidence of the effectiveness of token reinforcement specifically within physical education settings. Manuscript one provided the main impetus and rationale for conducting the research inquiries presented in manuscripts two and three.

In the second manuscript, entitled *The Effects of Peer-Administered Token Reinforcement on Jump Rope Behaviors of Elementary Physical Education Students*, the

results provided evidence that the introduction of the token economy system was effective in increasing the amount of successful jump rope practice trials of the participants. Distinguishable differences in successful jump rope practice trials between baseline and token economy sessions were clearly evident. Based on these findings, it was concluded that token economy systems may be an effective pedagogical tool for physical educators.

And, in the third manuscript, entitled *Effects of Peer-Administered Token Reinforcement on Second Grade Physical Education Students' Overhand Throw Performance*, results provided evidence for three main conclusions. First, the implementation of a token economy can be an effective tool to aide in the skill acquisition of second grade students. Second, the token system can be implemented with minimal difficulty, necessitating little student training or maintenance of the system. And third, the results provided evidence that students as young as second grade are able to conduct process assessments and distribute tokens based on the results of the assessments with a high degree of accuracy.

Overall, the aforementioned conclusions have some important implications for physical educators. First, token reinforcement systems can be an effective means of aiding in student skill acquisition; token economies may be considered a “best practice” for use in a physical education learning environment. One of the main arguments against the use of token systems is the difficulty in their implementation. However, the token systems within the present studies were introduced with very little complexity. Therefore, this “best practice” may be utilized in physical education with little difficulty and minimal maintenance. And second, both studies used student peers to administer token

reinforcement. In both cases, tokens were administered with a high degree of precision. Additionally, in manuscript three, peer assessments were completed with high accuracy as well. These studies provide evidence for physical educators that their students can, with little training, administer reinforcers to peers as well as provide accurate feedback (i.e., via peer assessments) on each other's motor skill performance. Overall, based on the findings of these studies, the use of token economy systems in physical education now has empirical support; token economies can be an effective teaching tool for use in physical education.

## General References

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**APPENDICES**

## APPENDIX A

### IRB Approval

September 8, 2010

Mr. Andrew E. Alstot  
Department of Health and Human Performance

Protocol Title: "The Effects of a Token Economy on Selected Motor Skills in Physical Education"

Protocol #: 11-039

Dear Investigator(s),

The MTSU Institutional Review Board, or a representative of the IRB, has reviewed the research proposal identified above. The MTSU IRB or its representative has determined that the study poses minimal risk to participants and qualifies for an expedited review under 45 CFR 46.110 Category 7.

Approval is granted for one (1) year from the date of this letter for 21 participants, pending that the IRB receive a formal letter of approval from the school districts and school principals of schools involved in the study.

According to MTSU Policy, a researcher is defined as anyone who works with data or has contact with participants. Anyone meeting this definition needs to be listed on the protocol and needs to provide a certificate of training to the Office of Compliance. **If you add researchers to an approved project, please forward an updated list of researchers and their certificates of training to the Office of Compliance (c/o Emily Born, Box 134) before they begin to work on the project.** Any change to the protocol must be submitted to the IRB before implementing this change.

Please note that any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918.

You will need to submit an end-of-project report to the Office of Compliance upon completion of your research. Complete research means that you have finished collecting and analyzing data. **Should you not finish your research within the one (1) year period, you must submit a Progress Report and request a continuation prior to the expiration date.** Please allow time for review and requested revisions. Your study expires **September 8, 2011**.

Also, all research materials must be retained by the PI or faculty advisor (if the PI is a student) for at least three (3) years after study completion. Should you have any questions or need additional information, please do not hesitate to contact me.

Sincerely,

Emily Born  
Office of Research Compliance





## APPENDIX C

## Overhand Throw Peer Assessment Sheet

Your Name \_\_\_\_\_

Thrower's Name \_\_\_\_\_

Your partner will throw the bean bag 5 times as far as he or she can. Every time your partner throws the bean bag, you will make sure he or she is throwing the right way.

Put an X next to each part of the skill your partner does correctly. Leave it blank if he or she does not do that part of the skill.

	CUES	Throw 1	Throw 2	Throw 3	Throw 4	Throw 5
	Side to target					
	Step toward target with opposite foot					

## APPENDIX D

### Overhand Throw Data Collection Sheet

Participant: \_\_\_\_\_

Date: \_\_\_\_\_

- Write an **X** in the space provided if the component of the skill is performed correctly
- Write an **O** in the space provided if the component of the skill is not performed correctly
- After each trial, record the distance the bean bag travelled

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
<b>Component 1:</b> participant positions his/her body perpendicular to the target with the side of the body opposite of the throwing arm facing the target (side to target)					
<b>Component 2:</b> participant takes a long contralateral step toward the target with the foot opposite of the throwing arm (step with opposite foot)					
<b>Component 3:</b> throwing arm moves in a rotational motion back with the hand behind the head, then toward the target with the elbow at or slightly above shoulder level (arm way back and throw)					
<b>Component 4:</b> after the ball is released, the arm should continue in an arc and end up near the knee (follow through)					
<b>Product:</b> How far did the bean bag travel (measured in feet)?					

TOTAL # of Xs: \_\_\_\_\_

Average Distance: \_\_\_\_\_

## APPENDIX E

### Social Validity Questionnaire

Please circle the most accurate response regarding your perception(s) of the intervention.

1. How effective do you think the token economy was in helping students improve jump rope skills?

Not at all effective	Somewhat ineffective	Neutral	Somewhat effective	Very effective
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2. How effective do you think the token economy was in helping students improve overhand throwing skills?

Not at all effective	Somewhat ineffective	Neutral	Somewhat effective	Very effective
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3. How difficult/easy was it to implement the token economy in your class?

Very Difficult	Somewhat difficult	Neutral	Somewhat easy	Very easy
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4. Taking into consideration the total cost of implementing the token economy and the benefits of its implementation, were the effects worth the cost?

Yes	No
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5. After this participating in this study, how likely are you to implement a token economy in your class in the future?

Not at all likely	Somewhat unlikely	Neutral	Somewhat likely	Very likely
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6. Please provide any additional comments you would like to share.