AN ABSTRACT OF THE THESIS OF

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Hans van der Mars

The primary purpose of this study was to determine the effects of an interdependent group-oriented contingency on the MVPA levels of middle school students during the fitness portion of physical education lessons. Participants were randomly selected target students from three intact eighth grade classes.

A combination of a delayed multiple baseline and changing criterion design was implemented to determine the effects of the intervention on students' MVPA levels (dependent variable). MVPA levels were measured using momentary time sampling with definitions from the System for Observing Fitness Instruction Time.

The independent variable consisted of an interdependent group-oriented contingency program. When target students reached a physical activity level criterion, for a specified number of days, the whole group was rewarded with a choice of activities.

Inter-observer agreement, using the scored-interval method (during 20% of the lessons), for students' MVPA levels was 95% (range 91-100%) and 86% (range 74-94%) for the teacher's instructional behaviors. Visual analysis of graphic data was used to demonstrate the functional relationship between the intervention and MVPA levels. The overlap of data points, mean level changes, trends, variability within and between conditions, and number of days that the criteria were attained by the target students were used to establish the experimental effects.

A higher level of student MVPA was demonstrated in all classes, during all three units when the initial criterion level of the intervention was implemented. During the second level of intervention, higher MVPA levels were demonstrated in one of three units. Across all three units, when the intervention was in effect, target students attained the MVPA criteria 21 of the 27 days (78%). Post-checks, conducted three weeks after the withdrawal of the

contingency program, revealed that MVPA levels decreased slightly while remaining above the level observed during baseline.

The Effects of an Interdependent Group-oriented Contingency on Middle School Students' Physical Activity Levels during Physical Education

by

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Joel M. Schuldheisz, Author

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CHAPTER 1

INTRODUCTION

The recent release of the Surgeon General's report (U.S. Department of Health and Human Services [USDHHS], 1996), *Physical Activity and Health*, reflects decades of education encouraging young Americans to develop physical fitness and reports the health benefits of participation in regular, moderate-intensity activities. According to the Surgeon General's report, more than 60% of American adults are not regularly active, 25% of American adults are not active at all. Unfortunately, nearly half of America's youth, ages 12-21, are not vigorously active on a regular basis. The trend of decline in physical activity occurs during adolescence (Saris, Elvers, van't Hof, & Binkhorst, 1986; Verschuur & Kemper, 1985). It appears that "childhood and adolescence may thus be pivotal times for preventing sedentary behavior among adults by maintaining the habit of physical activity throughout the school years" (USDHHS, 1996, p. 6).

Substantial evidence of a relationship between physical activity and the reduction of coronary heart disease, decreases in hypertensity, diminished risk of colon cancer, reduction of obesity, and decreases in non-insulin-dependent diabetes has been demonstrated (Blair, 1993; Freedson & Rowland, 1992; Kuntzleman & Reiff, 1992; Rowland, 1991; Sallis & Patrick, 1994). By promoting physical activity, cardiovascular disease (CVD), responsible for more deaths in the United States than any other disease (Sallis & McKenzie, 1991), can be reduced as children adopt a lifestyle of activity that transfers to adulthood (Freedson & Rowland, 1992; Rowland, 1991; Sallis & Patrick, 1994; Simons-Morton et al., 1990).

Since physical inactivity has recently been acknowledged as a risk factor for CVD, McKenzie and Sallis (1996) hold that engaging elementary, middle, and high school students in "physical activity and teaching them behavioral skills related to developing and maintaining appropriate physical activity could help to prevent future generations of adults from becoming sedentary" (p. 224). Studies disclosing that 97% of elementary school children and 50% of high school youth are enrolled in physical education (Ross, Dotson, Gilbert, & Katz, 1985; Ross, Pate, Corbin, Deeply, & Gold, 1987) led

Sallis and McKenzie (1991) to argue that physical education programs in schools are the primary institutions responsible for physical activity promotion.

Since students typically are required to take physical education for nine years, schools should focus on health-related physical education (HRPE) (McKenzie & Sallis, 1996). According to Pate and Hohn (1994) the main goal of HRPE is to prepare children and adolescents for a lifetime of physical activity. This is not a new goal of physical education, however, it may require the "implementation of both curricular and instructional strategies that are substantially different from those in traditional fitness and sports-orientated programs" (McKenzie & Sallis, 1996, p. 224).

A rekindled focus on the benefits of moderate-intensity physical activity programs in schools and the community (USDHHS, 1996), combined with the potential to impact a majority of American children, has given impetus to physiological, pedagogical, and psychological investigations. Research confirming the benefits of physical activity for adults has been influential in calling for changes in school physical education curriculums (Sallis & McKenzie, 1991; Simons-Morton, Parcel, O'Hara, Blair, & Pate, 1988).

A more recent shift from focusing on fitness outcomes to emphasizing physical activity is consistent with the goal of increasing children's activity patterns and promoting transfer to active lifestyles in adults (Freedson & Rowland, 1992; McKenzie, Sallis, Faucette, Roby, & Kolody, 1993; Sallis & McKenzie, 1991; Sallis & Patrick, 1994). Freedson and Rowland (1992) agreed that teachers have placed too much emphasis on physical fitness testing and argued that more efforts should be focused on increasing physical activity. Their argument is not for the elimination of testing, but rather for increased physical activity and promotion of positive feelings and attitudes towards well-being.

The shift from reaching fitness standards to promoting physical activity is more than a subtle shift of emphasis. This change reflects a paradigm shift from the Exercise Prescription Model (EPM), advocated since the fitness boom began in the 1960s, to the Lifetime Physical Activity Model (LPAM) (Blair, Kohl, & Gordon, 1992; Corbin, Pangrazi, & Welk, 1994). The goal of the LPAM is to accumulate 30 minutes of moderate to vigorous physically activity (MVPA) "over the course of most days of the week" (Corbin, Pangrazi, & Welk., 1994, p. 3). This goal is in line with the *Healthy Children 2000*

objectives (USDHHS, 1991) that call for increasing both physical activity levels of youth and the percentage of children who are active at their MVPA levels during school-based physical education classes.

In addition to the recommendation to accumulate 30 minutes of MVPA daily, Corbin, Pangrazi, and Welk (1994) suggest that physical education and youth sport programs teach basic motor skills and components of health-related fitness by encouraging and promoting lifetime physical activities. By emphasizing the importance of walking to school or riding bicycles to practice, children are "afforded opportunities to begin developing skills that lead to lifetime physical activity" (Corbin, Pangrazi, & Welk, 1994, p. 6).

Research on effective teaching in classrooms and physical education has examined accountability mechanisms that help students to stay on-task (Doyle, 1979b; Evertson & Emmer, 1982; Fisher et al., 1981; Kounin, 1970; Rink, 1996). Teacher monitoring appears to be one of the critical elements of maintaining order and focusing students on academic work (Doyle, 1986; Fisher et al., 1981; Kounin, 1970). Monitoring (active supervision) is the process of keeping track of student progress and plays a central role in holding

students accountable for instructional tasks. Active supervision is characterized by several observable indicators, including scanning, providing feedback, and circulating around the room (Doyle, 1979b; Fisher et al., 1981).

Active supervision is based on the premise that it "is teachers' professional responsibility to influence students in ways that are educationally valuable" (Siedentop, 1991, p. 66). In describing the ecology of the classroom, Doyle (1979a) acknowledged, and began to examine, the influence that students have on the teaching and learning process. The ecological model was first applied to the physical education setting by Tousignant and Siedentop (1983). Others have applied the ecological model or task structure to physical education at the elementary level, elite sport situations, and physical education student teaching environments (Jones, 1992; Hastie & Saunders, 1992; Tinning & Siedentop, 1985).

The ecology of physical education can be viewed as a series of managerial, instructional, and student-social task systems (Tousignant & Siedentop, 1983). Doyle (1981) defines a task as a, "set of implicit or explicit instructions about what a person is expected to do to cope successfully with a situation" (p. 2). In studies

of instructional tasks, Jones (1992) and Lund (1990) found that task congruence was high during instructional periods where students were held accountable (e.g., active supervision of on-task behavior and public recognition). According to Siedentop (1991), it is accountability that drives the instructional task system in physical education. Accountability, according to Skinner (1974), occurs when one person is "keeping an account of the behavior of another to see whether it meets specifications" (p. 84). One instructional task that physical educators present to their students is to engage in regular physical activity and to develop lifetime physical activity behaviors. To accomplish this instructional task it is important that teachers hold students accountable by closely or carefully monitoring their physical activity levels.

Increases in physical activity levels and promotion of HRPE goals can be realized by two approaches; changes at the curricular level or modifications to the instructional strategies (McKenzie & Sallis, 1996). Applied behavior analysis techniques have successfully been used as instructional strategies in both the classroom (Kazdin, 1989) and the physical education setting (Siedentop, 1991). By targeting physical activity behaviors, physical educators can have an

influence on the development of lifetime physical activity patterns (Hayward, 1991; Sallis & McKenzie, 1991).

Applications of applied behavior analysis in the classroom and physical education setting are based on the principles of behavior modification procedures outlined by Skinner (1969, 1974). Implementation of a contingency management system can be employed to promote student accountability on tasks related to the goals of HRPE. Numerous individual and group-oriented strategies have been used in classrooms and gyms.

One particular strategy, group-oriented contingency management, has been used extensively in classroom settings (Cooper, Heron, & Heward, 1987; Kazdin, 1989). Recent investigations of dependent (Williamson, Williamson, Watkins, & Hughes, 1992), independent (Brantley & Webster, 1993), and interdependent group contingencies (Davis & Chittum, 1994) have provided effective means of improving performance of students in regular classrooms as well as those with destructive behaviors or traumatic brain injuries.

Application of group-oriented contingency systems in the physical education setting is limited. Group-oriented contingency programs have been used to increase the percentage of students

dressing out for high school physical education class, improving instruction, taking behaviorally or emotionally disturbed boys, and increasing the percentage of on-task behavior time of behaviorally disordered students in physical education (Paese, 1982; Vogler, Fenstermacher, & Bishop, 1982; Vogler & French, 1983).

In summary, given the importance of health-related fitness and the established effectiveness of the interdependent group-oriented contingency, it is critical to examine interventions that increase students' accumulation of physical activity.

Statement of the Problem

The purpose of this study was to determine the effects of an interdependent group-oriented contingencies on the MVPA levels of middle school students during the fitness instruction time and the skills practice/games portion of physical education lessons.

The rationale for this study is based on the importance of improving HRPE, the strong support for using group-oriented contingencies and the lack of investigations that manipulate the variables associated with active supervision. Examination of programs that can implement physical activity behavior

accountability systems is vital to the immediate and long-term health of school-aged children.

Research Hypotheses

The research hypotheses for this study were:

1) The percentage of time middle school students were engaged in MVPA during the fitness instruction time can be increased as a result of the use of an interdependent group-oriented contingency.

2) The percentage of time middle school students were engaged in MVPA, during the skills practice/games time, can be increased as a result of the use of an interdependent group-oriented contingency.

Definitions

The following definitions were used in this study:

1. Accountability: "Accountability referred to the practice teachers use to establish and maintain student responsibility for appropriate conduct, task involvement, and outcomes" (Siedentop, 1991, p. 69).

2. Exercise: "Exercise is a subset of physical activity that is planned, structured, and repetitive bodily movement done to

improve or maintain one or more components of fitness" (Sallis & Patrick, 1994, p. 303).

3. Interdependent group-oriented contingency: An interdependent group-oriented contingency involves the application or loss of a reinforcer (operationally defined in this study as student choice of physical activity) to the entire group on the basis of the performance of an individual student or small group within the group (Cooper, Heron, & Heward, 1987).

4. Moderate to vigorous physical activity (MVPA): MVPA is movement described as walking or very active; it is a combination of System for Observing Fitness Instruction Time (SOFIT) (McKenzie, Sallis, & Nader, 1991a) categories four and five. For middle school students, MVPA corresponds to heart rates of 140 beats per minute or greater.

5. Momentary time sampling: Momentary time sampling (van der Mars, 1989) is a systematic observation technique where the behaviors of a certain student or small group of students (typically no more than three) are observed and recorded at consistent (1 second to two minutes) or random intervals. The behavior that is

occurring at the moment of observation is coded by the teacher or researcher.

6. Monitoring: Monitoring is an active supervision strategy that involves keeping track of students' progress and holding the students accountable for instructional tasks by scanning, providing feedback, and circulating around the room (Doyle, 1979b; Fisher et al., 1981).

7. Physical activity: "Physical activity is a broad term that describes any bodily movement produced by skeletal muscles that results in energy expenditure" (Sallis & Patrick, 1994, p. 303).

8. Physical Fitness: "Physical fitness is a set of attributes that people have or achieve that relates to the ability to perform physical activity. Health-related physical fitness components are cardio-respiratory endurance, muscular endurance, muscular strength, body composition, and flexibility" (Sallis & Patrick, 1994, p. 303).

Assumptions

The following were assumed to be true and pertinent to the study:

1. The participants in the study were representative of other middle school teachers and students.

2. The presence of the investigator did not alter the actions of the teachers and the students.

3. Students were familiar with the activities used during fitness instruction.

Delimitations

The following were delimitations of the study:

1. The subjects were in eighth grade co-educational physical education classes in Corvallis, Oregon.

2. Data were collected during January, February, March, and April of 1997. Content and context variables may have been influenced by weather conditions.

Limitations

The following were limitations of the study:

1. Factors associated with students' motivation were not assessed.

2. The students' past experiences or out of class engagement in physical activity, were not surveyed or controlled.

3. The context of the lesson (location and content of skill practice) was not controlled.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

The focus of this study was to examine the impact of teacher monitoring and group-oriented contingencies on middle school students' activity levels during physical education. An increased interest in public health promotion has focused attention toward improving effectiveness, status, and support of school physical education programs (Sallis & McKenzie, 1991). Recently, the release of the Surgeon General's report (USDHHS, 1996) has raised the public's consciousness toward improving physical activity levels.

This chapter overviews the benefits of physical activity and highlights the research pertaining to the changing fitness paradigm. A brief review of classroom research, and research of active supervision in physical education, provided the contextual background for this investigation. Finally, the behavioral approach to changing behavior, a review of group-oriented contingencies in the classroom and physical education settings, and an overview of

literature pertaining to motivation toward physical activity provided a theoretical framework for this study.

Benefits of Physical Activity

The recent release of the Surgeon General's report (USDHHS, 1996) has highlighted the association of physical inactivity and CVD, as well as the numerous benefits of maintaining physical activity habits. National public health goals, presented in the *Healthy People 2000* (USDHHS, 1990) and *Healthy Children 2000* (USDHHS, 1991), have also focused on the importance of increasing physical activity, decreasing sedentary behavior, and providing a preventive means of addressing our nation's health-related issues. In a revised version of these goals (USDHHS, 1995), special attention has been centered on increasing the amount of time adults and students are physically active.

In general, physical activity seems to have beneficial effects on many physiological systems (Bouchard, Shepard, & Stephens, 1994). Specifically, the Surgeon General's report on *Physical Activity and Health* (USDHHS, 1996) documents that regular activity is associated with lower mortality rates for older and younger adults, decreased

risk of coronary heart disease, reduction in blood pressure, decreased risk of colon cancer, lower risk of developing non-insulin-dependent diabetes militias, reduction of obesity, and improved mental health.

Recent studies have begun to examine the health-related benefits of physical activity in children (Pate, Dowda, & Ross, 1990; Raitakari et al., 1994; Sallis, McKenzie, & Alcaraz, 1993; Suter & Hawes, 1993). In a six-year study Raitakari et al. (1994) reported that triglyceride levels, adiposity, and levels of smoking were significantly lower in those participants who were physically active. Suter and Hawes (1993) also found a relationship between physical activity and the total ratio of cholesterol.

The association between physical activity and fitness in children has also been investigated. Sallis et al. (1988) examined the associations of physical activity and cardiovascular fitness with cardiovascular disease risk factors. The evidence suggested that those individuals who were more physically active had more favorable risk profiles. Physical activity was also found to be an important predictor of cardiovascular fitness in samples with high adiposity (Taylor & Baranowski, 1991). In a study that observed fourth-grade children, Sallis, McKenzie, and Alcaraz (1993) found

that physical activity was associated with five fitness components (mile run, skin-fold test, pull-ups, sit-ups, and sit-and-reach test).

With the shift toward emphasizing physical activity, the focus for teachers should be on improving the quantity and quality of time spent engaging in physical activity and the development of lifetime physical activity behaviors. This shift in emphasis, from reaching fitness outcomes to the process of physical activity, is a recent occurrence.

The Changing Fitness Paradigm

Physical fitness testing has been a part of schools since the late 1800s (Corbin & Pangrazi, 1992). Results of the Kraus-Weber test (Kraus & Hirschland, 1954) revealed the extent to which Americans lagged behind several European countries. These findings appear to have provided the impetus for the development of national fitness programs (Corbin & Pangrazi, 1992). The President's Council on Physical Fitness and Sports was formed by President Eisenhower in 1956 to promote youth fitness.

During the last three decades, fitness testing has evolved from a sports skills orientation to measurement of factors influential to

good health. The development of AAHPERD's Health-Related Fitness Test (1976), AAHPERD's Physical Best Test (1988) and the Fitnessgram (Institute for Aerobics Research, 1987) reflect this change in emphasis (Blair, 1992; Corbin, 1987; Kuntzleman & Reiff, 1992).

The primary objective of fitness testing is to assess fitness levels and promote a lifetime of physical activity (Corbin, 1986; Corbin & Pangrazi, 1992; Dennison, Straus, Mellits, & Charney, 1988). Changes in the tests, testing procedures, and standards have made it difficult to accurately compare changes in fitness levels (Blair, 1992).

Although there is much debate over the current level of fitness, few would argue against the benefits of increasing activity levels of American children (Bar-Or, 1987; Blair, 1992; Corbin, 1987; Corbin & Pangrazi, 1992; Freedson & Rowland, 1992; Kuntzleman & Reiff, 1992; Simons-Morton et al., 1987). Corbin and Pangrazi (1992) support this proposition by arguing that an over emphasis on norm-referenced testing may actually have a detrimental effect on promoting fitness in youth. They concluded that a criterion-referenced approach, based on health-related standards, would be more appropriate and reasonable for middle school children.

The shift away from emphasizing fitness to focusing on physical activity is gaining considerable momentum (Freedson & Rowland, 1992; Sallis & McKenzie, 1991; Simons-Morton et al., 1990). Freedson and Rowland (1992) have urged the promotion of active lifestyles rather than focusing on fitness testing. An emphasis on enjoyable physical activity during childhood, rather than quantifying fitness levels, appears to be a viable method of establishing lifetime physical activity patterns (Dennison et al., 1988; Freedson & Rowland, 1992).

A majority of the guidelines for physical activity among children, written in the past 30 years, have been acquired from the adult-oriented, exercise prescription model (EPM) (Corbin, Pangrazi, & Welk, 1994). The EPM focuses on higher intensity and shorter duration activities. The American College of Sports Medicine (ACSM, 1978) outlined the EPM by describing the frequency, intensity, duration, and mode of exercise. The ACSM guidelines were based on research designed to promote fitness in adults. The major concern of the EPM has focused on improvement of cardiovascular fitness, rather than the reduction of health risk factors (Corbin et al., 1994).

Blair, Kohl, and Gordon (1992) were some of the first to coin the term "lifetime exercise model". The lifetime exercise model emphasizes the importance of regular physical activity as opposed to improved fitness in adults. The U.S. Centers for Disease Control and Prevention and the American College of Sports Medicine (in Corbin, Pangrazi, & Welk, 1994) have stressed the need for regular physical activity in health promotion. Most recently, a new model, the Lifetime Physical Activity Model (LPAM), has emerged as a result of this emphasis.

The development of the LPAM has paralleled the shift of emphasis from fitness testing to stressing regular engagement in physical activity. The LPAM recommends an accumulation of 30 minutes of moderate intensity physical activity most days of the week (Corbin, Pangrazi, & Welk, 1994; Sallis, Patrick, & Long, 1994). The emphasis in the Children's LPAM is twofold: introducing children in schools to a wide range of activities; and getting them to see physical activity as habitual behavior (as opposed to striving for improvements on fitness tests - Morrow & Freedson, 1994). Since the latter are highly dependent on children's genetic endowment (Pangrazi & Dauer, 1995), the focus for children should be on the

accumulation of a high volume of moderate to vigorous physical activity during physical education classes and throughout the school day (Sallis & Patrick, 1994).

According to Hayward (1991), the goal of an active lifestyle in adulthood is realized by the development of skills and the opportunities to be physically active. "Turning children on to physical activity" (Rowland, 1995, p. 118), is believed to be a key to developing a lifestyle of activity (Corbin, Pangrazi, & Welk, 1994; Hayward, 1991; McKenzie & Sallis, 1996; Sallis et al., 1992). Age-appropriate activities and sequential lessons, along with effective teaching methods and strategies, are vital to the promotion of healthy lifestyles in children.

In an effort to apply the LPAM, Corbin, Pangrazi, and Welk (1995) have used the "HELP" acronym to emphasize the new approach to promoting health and physical activity. The "HELP" philosophy includes lifestyle activities that promote health (H), activities that are enjoyable and positive for everyone (E), activities that would typically occur throughout one's lifetime (L), and activities that meet the students' specific and unique needs (personal - P). Development of a lifestyle that includes physical activity

behavior will enable students to reap the related benefits of increased physical activity.

The increased focus on physical activity, as opposed to fitness training, has produced new developments in the methods of assessing physical activity.

Measuring Physical Activity

A variety of methods have been used to assess physical activity. These techniques include direct observation, heart rate monitors, motion sensors, interviews, and self-report questionnaires (McKenzie, Sallis, & Nader, 1991a). While the apparatus (heart rate monitors and motion sensors) have proven to be reliable and valid measures of physical activity, their expense and inability to measure contextual variables appear to be their primary limitations (McKenzie, Sallis, & Nader, 1991a).

Systematic observation provides a method by which researchers can chart activity, live or from video records. One of the more common instruments used to assess student engagement in physical education, developed by Metzler (1979) and refined by Siedentop (Parker, 1989), is the Academic Learning Time-Physical

Education instrument (ALT-PE). The main emphasis of the ALT-PE is to measure students' opportunities to practice physical skills (Godbout, Brunelle, & Tousignant, 1983; Phillips & Carlisle, 1983; Placek & Randall, 1986; Silverman, 1985b). However, research involving the ALT-PE instrument failed to take intensity levels of physical activity into account (McKenzie, Sallis, & Nader, 1991a).

McKenzie, Sallis, and Nader (1991a) have developed an instrument for assessing childrens' activity levels through direct observation. The System for Observing Fitness Instruction Time (SOFIT) is a "momentary time sampling and interval recording system designed specifically to quantify factors believed to promote health-related physical activity" (McKenzie, Sallis, & Nader, 1991a, p. 196). SOFIT has been validated for use with elementary children and middle school children by correlating activity level data with heart rate data (McKenzie et al., 1991b; Rowe, van der Mars, & Schuldheisz, 1997). SOFIT has been used extensively in observational investigations that measure student activity levels and teacher positioning (Faucette, McKenzie, & Sallis, 1992; McKenzie et al., 1993, McKenzie, Sallis, & Nader, 1991a).

With the development of valid and reliable instruments and apparatus for measuring physical activity, researchers have been able to more accurately measure physical activity patterns. Goals for increasing the percentage of time children are active in physical education, such as one objective in *Healthy Children 2000* (USDHHS, 1991) that calls for students to be active at least 50% of the class period, can be realized by employing effective program offerings and instructional strategies. Much of what we know about the latter in physical education programs is based on teaching research in classroom settings.

Classroom Research

Prior to 1960, research of teacher effectiveness was primarily limited to analysis of characteristics of teachers (Fisher et al., 1981). Educational research changed from "simply mindless following of formulae and folklore" to a period of "descriptive and experimental inquiry" (Doyle, 1979b, p. 42). After a period of inconclusive research that focused on comparing teaching methods, efforts began to shift toward systematic analysis of student and teacher behaviors in the classroom.

Jacob Kounin's (1970) systematic observation and videotaping of kindergartners provided the groundwork for developing group management principles. Kounin found that teachers demonstrating "withitness" (directing a desist to the correct student in a timely fashion) and "overlapping" (ability to attend to many issues at the same time) skills had students who spent more time on-task and were engaged with the content. Moreover, Kounin reported that effective teachers challenged students to be actively engaged in the content and were constantly aware of factors that can impede student progress.

Anderson, Evertson, and Brophy (1979) examined what teachers do in the classroom (process of teaching), what students do in class (process of learning), as well as how students perform on achievement tests (products of learning). Effective teachers established routines for the daily tasks and developed a positive atmosphere that enabled the students to focus on the task at hand. In examining 55 process variables involved in teaching, Anderson, Evertson, and Brophy (1979) found that students achieve more when given the opportunity to learn, when they were monitored, and when

they received feedback. Classroom management was identified as the key ingredient allowing implementation of instruction.

The development of an atmosphere for learning comes with the realization that the classroom is a complex and multidimensional environment. Investigations of this environment have led to identification of skills and behaviors that can be shared with those getting started in the profession. Many studies have singled out active supervision as an integral part of effective teaching and student achievement (Berliner, 1979; Evertson & Emmer, 1982; Kounin, 1970). In studying 13 junior high mathematics and English teachers, Evertson and Emmer (1982) found that critical teacher behaviors employed at the beginning of the school year included monitoring student compliance with the rules and maintaining task-orientation. Monitoring student behavior and performance is reflected in skills, such as prompting, providing feedback, teacher positioning, and teacher movement (Berliner, 1979; Doyle, 1979b, 1980, 1984; Evertson & Emmer, 1982; Kounin, 1970).

One of the dangers of observational and analytical tools used in teacher effectiveness research is fragmentation and a tendency toward narrow definitions of student or teacher variables (Doyle,

1985). The study of classrooms within their contexts reflects the emerging ecological lines of research. This ecological viewpoint focuses on environment-behavior relationships and the dual directional influences exhibited between students and teachers (Doyle, 1979a).

The ecological paradigm has influenced subsequent research on teaching in classrooms. Long term observations, descriptions of the classrooms within the framework of surrounding events, and focus on the participants' perspectives are characteristics of ecologically grounded research (Doyle, 1981). Teacher and student behaviors, as well as measures of effectiveness or learning, must be studied and applied within their respective contexts (Brophy, 1979; Brophy, 1983; Doyle, 1985).

Research on Teaching Physical Education

Much of the teacher effectiveness research in physical education has been influenced by the studies conducted in the classroom (Silverman, 1991). Qualities obtained from the study of effective classroom management and optimal learning conditions can

be applied to physical education teachers (Rink, 1993; Siedentop, 1991).

In the 1995 American Alliance of Health Physical Education Recreation and Dance Alliance Scholar Lecture, Siedentop (1995) outlined the three major phases of teacher effectiveness research. These three phases, process-product paradigm, mediating-process phase, and ecological paradigm, in general, parallel similar lines of research conducted in the classroom.

The development of the ecological paradigm in classroom research, described by Doyle (1979a), has been applied to physical education (Jones, 1992; Hastie & Saunders, 1992; Tinning & Siedentop, 1985; Tousignant & Siedentop, 1983). According to Siedentop (1991), there are three basic task systems that comprise the ecology of physical education. The managerial, instructional, and student-social systems each influence and determine the ecology of physical education.

Within the context of the task structure, Doyle (1979a) pointed to accountability as a critical component. Accountability is defined as those strategies which (physical) educators use to develop and "maintain student responsibility for appropriate conduct, task

involvement, and outcomes" (Siedentop, 1991, p. 69). The means of accountability indicates the importance or significance of the overall task to the operation of the classroom (Doyle, 1985). Teacher effectiveness researchers in physical education have begun to investigate the dual directional factors that influence the establishment of accountability to instructional tasks.

One objective of teacher effectiveness research that stems from increased emphasis on accountability has been to identify those skills that distinguish more effective teachers from less effective teachers. Several teachers have employed behaviors such as eye contact, scanning, physical location and movement, proximity to students, prompting, and providing feedback as strategies to keep students on task (Rink, 1993; Sariscsany et al., 1995; Siedentop, 1991). Siedentop reports that monitoring or supervising accounts for 20-45% of teachers' time in physical education (Siedentop, 1991).

The importance of active supervision, where the teacher moves in an unpredictable pattern, reinforcing on-task behavior, desisting inappropriate behavior, and providing prompts and feedback, has been recognized frequently in the professional literature (Graham, Holt-Hale, & Parker, 1993; Pangrazi & Darst, 1997; Pangrazi & Dauer,

1995; Rink, 1993; Siedentop, 1991). Most recently, attention has been directed toward describing active supervision patterns (Hastie & Saunders, 1990; Sariscsany, 1990; Sariscsany et al., 1995; van der Mars et al., 1994a; van der Mars et al., 1994b; van der Mars et al., 1995).

Further research by van der Mars et al. (1994b) focused on students' physical activity levels and teachers' active supervision patterns during fitness instruction. Using the SOFIT instrument van der Mars et al. (1994a, 1994b) found that longer periods of time spent in the periphery and higher rates of corrective feedback correlated with higher MVPA levels and lower levels of behaviors demonstrated by students. On the contrary, the more the teacher was in the middle sector the more standing behavior the students demonstrated. Similar results have been found in a follow-up study that examined the physical activity levels of students with disabilities (van der Mars et al., 1995).

Research from both the classroom and physical education has documented the role of teacher monitoring. A deeper understanding of active supervision and its part in holding students accountable for conduct and task involvement is crucial to our children's health and

the integrity and viability of the school-based physical education programs (Sallis & McKenzie, 1991).

The growing body of knowledge in teacher effectiveness can assist in the realization of the health-related goals established by the *Healthy Children 2000* (USDHHS, 1991). Specifically, contingency management programs, that have proven to be effective in the classroom, can be utilized as a means of holding students accountable to MVPA levels in physical education class. The teacher's monitoring of students' MVPA levels communicates the importance of this behavior and demonstrates that a priority has been placed on the development of habitual physical activity.

The Behavioral Approach to Changing Human Behavior

A general goal of science is to describe, explain, predict, and control the phenomena under investigation (Cooper, Heron, & Heward, 1987). Applied behavior analysts have been particularly interested with experimentally determining the effects of environmental manipulation on socially important behaviors. Methods of behavior analysis are selected for their ability to increase the "believability that the change in the behavior was caused by the

variable experimentally manipulated and was not the result of some uncontrolled or unknown factor" (Cooper, Heron, & Heward, 1987, p.144). By effectively and ethically manipulating either the antecedents or the consequences or both, an applied behavior analyst demonstrates that changes in the target behavior are a function of the presence or absence of the treatment.

The determination of a functional relationship is based on several assumptions. First, behavior is defined as, "an organism's interaction with the environment" (Cooper, Heron, & Heward, 1987, p. 145). Realization that behavior is an individual phenomenon does not preclude the generality of the findings; generalization, external validity, is accomplished by replication of the treatment across settings, subjects, or behaviors. Second, "behavior takes place in and changes over time" (Cooper, Heron, & Heward, 1987, p. 145). Since behavior is a continuous phenomenon, its measurement, over time, produces the most accurate record. Third, behavior, according to the positivistic paradigm, is determined. According to Johnson and Pennypacker (1980), the occurrence of specific behavior is governed by its functional relationship to other events. Fourth, variations in behavior are extrinsic to the organism. In other words, behavioral

variability in an investigation is a result of "some uncontrolled or unknown aspect outside the experiment" (Cooper, Heron, & Heward, 1987, p. 146).

These assumptions about behavior and the question of interest impact the selection and implementation of research designs. "The investigator must not get locked into design formats that entail a priori assumptions about the nature of the functional relations that are sought and that may be insensitive to unanticipated changes in behavior" (Cooper, Heron, & Heward, 1987, p. 151). A variety of effective and flexible experimental designs have been used to demonstrate a functional relationship between the targeted behavior and the manipulation of both antecedent stimuli and consequences within the environment. There now exists a rich repertoire of behavior change strategies that have broad-based research support and are based on the principles of behavior as developed and refined by Skinner (1953) and his colleagues.

A strategy that has been frequently implemented by applied behavior analysts is the group-oriented contingency. A group-oriented contingency is defined as "one in which the presentation, or loss, of a reinforcer is contingent upon the behavior of an individual

within a group, a segment of the group or the group as a whole" (Cooper, Heron, & Heward, 1987, p. 500). Litow and Pumeroy (1975) are careful to distinguish between "group contingency" and "group-oriented contingency". Since groups do not perform behaviors, it may be "more precise to describe group behavior management techniques in terms of 'group-oriented' contingencies" (p. 342).

There are several reasons for using group-oriented contingencies. First, group-oriented contingencies save time by allowing the researcher or practitioner to apply a consequence to all members of the group at the same time. This is an effective and economical strategy that requires fewer persons, and less time, to implement (Litow & Pumeroy, 1975). A second advantage, according to Cooper, Heron, & Heward (1987), is that the "practitioner can use a group-oriented contingency in a situation where it is impractical to initiate an individual contingency" (p. 500). Third, the influence of peers can be incorporated to maximize the group-oriented contingency. Caution, however, should be exercised to reduce scapegoating, and other detrimental effects of peer pressure (Cooper, Heron, & Heward, 1987).

In reviewing the literature, Litow and Pumeroy (1975) categorized three basic types of group-oriented contingencies. In the first strategy, the dependent group-oriented contingency, the reinforcer for the group depends upon the performance of one student or a small group of students (Kazdin, 1989). Furthermore, the dependent strategy involves the public disclosure of the target students. In the second approach, the independent group-oriented contingency, the contingency is presented to all members of the group. However, the "reinforcement is delivered only to those individuals who meet the criterion outlined in the contingency" (Cooper, Heron, & Heward, 1987, p. 504). In the third group-oriented contingency, interdependent, all of the individuals must meet the criterion before any member earns the reinforcement. There are several procedural variations of the interdependent strategy (i.e., the entire group meets the criterion, a group average, or randomly selected student or mean of a small group) that have been successfully employed in classroom settings. In the interdependent approach, the identity of the target students is not disclosed, thus reducing the potential for negative effects of scapegoating or exorbitant peer pressure.

Group-oriented Contingencies in the Classroom

Several studies have compared the effectiveness and acceptability of various group-oriented contingency programs. Shapiro and Goldberg (1986) reported that students rated the acceptability of the independent contingency higher than other group-oriented approaches. Elliot, Turco, and Gresham (1987) and Tingstrom (1994) found the "Good Behavior Game" (GBG), a form of interdependent group-oriented contingency, to be as acceptable as individual strategies (i.e., positive reinforcement and response cost programs). Williamson et al., (1992) showed that group-oriented reinforcement was associated with superior estimation accuracy (solving mathematics problems) and higher degrees of cooperation among students than individual reinforcement.

In classroom contexts group-oriented contingencies have been effectively used in a variety of settings. Baer and Richards (1980) implemented an interdependent group-oriented contingency to improve the math and English performance of five elementary-aged students. Spletz, Shimamur, and McReynolds (1982) applied an interdependent group-oriented strategy, with designated and

randomly selected students, to increase levels of positive social interaction of four academically delayed students with learning disabilities.

The GBG, an adaptation of the interdependent group-oriented contingency (Barrish, Saunders, & Wolf, 1969), was demonstrated to be an effective method of decreasing disruptive behaviors during math and reading. Swain, Allard, and Holborn (1982) modified the GBG with first and second graders. The "Good Toothbrushing Game" improved oral hygiene during the intervention and, nine months later, during the post-check period.

More recently, Davis and Chittum (1994), implemented an interdependent group-oriented contingency and graphic feedback program to increase activity levels of residents of a group home for persons with traumatic brain injury. Results indicated that the contingency, a weekend activity of the group's choice, was associated with increases in four of the six participants in the intervention.

Group-oriented Contingencies in Physical Education

Although not to the same extent as classroom research, group-oriented contingency research has also been employed in physical

education and sport. An independent contingency system was used by Siedentop and Dawson (1978) to increase skill performance and improve team attitude. McKenzie (1972) used an interdependent group contingency system to decrease inappropriate behavior during swimming practice.

Paese (1982) examined the effect of an interdependent group-oriented contingency system on high school students' "dressing out" behavior. An interval of two to three days and a goal (percentage of total number of students dressed out) was established for each class. The results of implementing a multiple baseline and changing criterion design revealed that all three classes improved their dressing out behavior. Post-checks revealed that the dressing out behavior was maintained after the intervention had been withdrawn.

Vogler, Fenstermacher, and Bishop (1982) outlined a program to reduce disruptive behavior of 10 juvenile offenders in a recreation setting. An interdependent, group-oriented system was suggested to reduce wild running in the woods, failure to put up tents, and mistreatment of cooking and sleeping equipment. Recommendations were offered on how to successfully apply contingencies in a meaningful and appropriate manner.

In another study, Vogler and French (1983) investigated the effects of a group-oriented contingency on 12 behaviorally disordered students. The students were divided into two groups and a modification of the GBG was implemented. Each group was to try and win or earn the opportunity to participate in an assortment of pre-selected activities at the end of each class period. Significant differences in on-task behavior from baseline to treatment condition (ABAB design) were reported for both groups of students.

A common thread in each of the interdependent group-oriented programs used in the physical education environment is the use of physical activity as a reinforcer. In Paese's (1982) "dress out" study, reinforcement consisted of choice of aerobics or weightlifting activities. Vogler and French (1983) used free activity time at the end of each period and "free activity Fridays" to reinforce on-task behavior. Other studies (LaCoste, 1982; Young, 1973), have also successfully used activity as reinforcement for skill and behavior improvement in fourth and second grader physical education classes.

The use of activity as a reinforcer provides a meaningful and powerful reinforcer of the target behaviors. Physical activity is an effective reinforcer for reducing off-task behavior and increasing

appropriate behavior. A carefully planned program that uses activity as reinforcement not only serves as a reward but has the potential to improve students' skill performance and physical activity levels (Lavay, 1984). Implementation of group-oriented contingency programs that reduce inappropriate behavior and reinforce physical activity can prove to be an effective management system for physical educators.

The development of physical activity patterns in children that carry over to a lifetime of activity are influenced by a variety of factors. This broader perspective recognizes that, "No one variable or category of variables is expected to account for most of the variance in children's physical activity" (Sallis et al., 1992, p. S248).

Summary

Teacher supervision and accountability are two key factors in the development of an ecological balance in the classroom (Siedentop, 1995). However, it is critical to recognize the complex and multidimensional nature of the teaching-learning environment. Student learning, specifically the quality and quantity of work

performed, is one measure of teacher effectiveness and the degree to which learning (Siedentop, 1995).

Classroom research and studies in physical education have demonstrated that teachers who actively supervise will minimize students' off-task behavior. Application of the results, garnered from teacher effectiveness research, will lead to the development of an environment supportive of optimal learning.

Through careful experimental design, influential factors associated with active supervision and group-oriented contingency management can be further understood. Teacher positioning and movement, providing feedback, scanning, and other active teaching skills can be a means of promoting a variety of physical activity behaviors.

The shift to the LPAM comes at a time when our schools are faced with limited resources and scrutinization of all marginal aspects of the curriculum. In light of fiscal austerity, and the obligation to promote healthy lifestyles for our children, it is urgent that effective activity promotion interventions which "hold promise for improving present and future health of our children" (Sallis et al., 1992) be designed and implemented.

Group-oriented contingency programs have proven to be effective and efficient means of improving on-task behavior and academic performance in the classroom. In the physical education settings these strategies, although limited, have also proven to be effective. The development of group-oriented contingency programs, specifically designed to increase students' MVPA levels, have yet to implemented. As a means of increasing accountability and improving physical activity levels in physical education, it is reasonable and important to apply group-oriented contingency management techniques in physical education settings.

CHAPTER 3

METHODS

Introduction

The primary objective of this study was to examine the effects of an interdependent, group-oriented contingency on students' MVPA levels during fitness instruction. A secondary objective was to assess the generalizability of the intervention in fitness time to the skills/game portion of the lesson. This chapter delineates participant and setting characteristics, informed consent procedures, the dependent and independent variables, procedures, experimental design, data collection, observer reliability, and data analysis techniques.

Participants and Setting

Students in grade eight from three intact physical education classes, in which health-related fitness activities were taught, participated in the study. Each class was comprised of 25-30 students; the total number of students was 84, 36% (30) were female (see Table 1). All students were required to participate in daily

physical education classes. A wide range of physical abilities and fitness levels were found in each class (see Table 2). Eighth grade classes were grouped in cohorts according to those participating in an advanced math, science, and humanities curriculum.

Table 1: Class Sex and Age Composition

Class	Female	Male	Total	Age (SD)
1	10	19	29	13.6 (0.5)
2	11	14	25	13.6 (0.6)
3	9	21	30	13.6 (0.5)
	Total 30	54	84	13.6 (0.5)

Table 2: Class Fitness Profiles

Class	Mile Run (SD) (min.: sec.)	Push Ups (SD) (#/min.)	Sit Ups (SD) (#/min.)	Sit & Reach (SD) (rating 1-3)
1	9:01 (1:31)	15.4 (11.0)	40.5 (12.3)	2.42 (0.9)
2	9:20 (1:48)	13.4 (10.0)	32.5 (11.9)	2.4 (0.9)
3	8:32 (1:39)	15.3 (10.5)	35.4 (11.1)	2.6 (0.7)

The middle school was located in a small city, that has a rural boundary, and lies within two miles of a large public university. Site selection was based on the experience level of the teachers, co-educational classes, curricula and setting representative of a larger population, and the physical education faculty's willingness to participate in educational research.

The socio-economic status of the school student population can be described as middle to upper middle class. Of the 690 students in the school, 65 (9.4%) qualify for the National School Free Lunch Program (See appendix A for the U.S. Department of Agriculture's criterion). Another 20 (2.9%) qualify for the reduced-price program. The school was 52.6% female (59.4% and 47.8% females seventh and eighth grade, respectively) was comprised of approximately 95% Caucasian students with the remainder a mixture of Hispanic, African-American, Asian Pacific, American Indian, and other ethnicities (see Table 3).

The teacher used a multi-activity based curriculum aimed at introducing middle school-aged students to a broad spectrum of health related fitness content (Pangrazi & Darst, 1997). The underlying philosophy of this program encourages children to

become familiar with the process of engaging in regular physical activity. The teacher balanced the content across activities aimed at cardio-vascular fitness with those targeting muscular strength, muscular endurance, and flexibility.

Table 3: School Ethnicity

Ethnicity	Number	Percent
Caucasian	660	95.6
African American	6	0.9
Hispanic	6	0.9
Asian/Pacific Island	12	1.7
American Indian	2	0.3
Other	4	0.6
Total	690	100

A typical physical education lesson began with a brief introduction and stretching session, and was followed by seven to 10 minutes of fitness instruction. This was followed by focusing on individual or team sport skills or games and concluded with a brief cool down and reflection period.

During fitness instruction time the teacher utilized a variety of activities (e.g., stations, obstacle course, interval running, mystery card, etc.) that were designed to sustain physical activity levels of the students. The content and context of the skill instruction time also varied from day to day depending upon the unit of instruction. Units of instruction (10-11 days in length) during the investigation were cooperative games, badminton, and recreational games.

This study took place between January and April, 1997. Due to the fact that the study occurred in the winter and early spring, a majority of the classes were conducted indoors. However, when weather permitted a portion of the lesson or the entire lesson was conducted outdoors. Indoor teaching stations consisted of the main gymnasium (80' by 120'), the upper gym (60' by 100'), the mat room (30' by 50'), and the cafeteria (40' by 60'). Outdoor fields included a full-sized football field surrounded by a quarter mile oval track. Two adjacent soccer and softball fields were also available for the teacher to use.

Informed Consent

Prior to initiation of the study, approval of the Institutional Review Board (IRB) was received (see Appendix B). Upon approval, the researcher met with school district personnel and the building principal to obtain clearance and discuss the study. Formal approval from the school district was also granted (see Appendix C). Next, the teacher's informed consent forms were completed (see Appendix D) and additional meetings were conducted to overview the study and address the teacher's questions and concerns.

Dependent Variable

The percentage of intervals of MVPA during fitness instruction constituted the dependent variable. MVPA was movement described as students' walking or "very active" (activities that result in heart rates of 130-140 or greater); it is a combination of SOFIT (McKenzie, Sallis, & Nader, 1991a) categories four and five. There are essentially two health-related reasons for adolescents to be engaged in MVPA. First, MVPA promotes physical and mental health during adolescence, and second, it is believed that "adolescents who develop a habit of participating in activities that can be carried over into

adulthood will be more likely to remain active" (Sallis & Patrick, 1994, p. 306).

Intervention

The independent variable consisted of an interdependent, group-oriented contingency. This program consisted of the presentation of reinforcement based on the accumulation of MVPA of two secret students observed by the researcher and two secret students observed by the teacher.

On the basis of activity levels observed in the baseline period, a criterion was established for the first level of the intervention. The criterion consisted of the percentage of intervals the four secret students accumulated MVPA levels and the number of days the four students (randomly selected each day) sustained the target MVPA levels.

The criteria were established by the teacher and the researcher. An evaluation of the results from the baseline period enabled the teacher and researcher to establish MVPA goals that challenged the class to be more active, yet provided a realistic opportunity to be successful in attaining the goal. At the end of each

class, during the intervention phase, the attained MVPA levels were announced. However, the identity of the four secret students was not disclosed.

A survey of activities was taken to develop a menu of possible activities that could be used as powerful reinforcers. Prior to distributing this menu of options, the teacher reviewed and approved the list (see Appendix E). Upon demonstration of MVPA levels for the specified number of days, a class reinforcer was presented. Reinforcement included free choice activities that students chose from a menu of activities.

Once a class reached the first level of MVPA criterion (intensity and number of days) a new criterion was established. The second level of the intervention involved higher MVPA intensity levels in which the target students were to demonstrate MVPA levels.

Each day secret students were randomly selected prior to each lesson (selection was stratified so that one male and one female were randomly selected - representative of the school population). Consequently, several students were selected more than once while some students were never selected (throughout the three units 26 students were never selected, 37 were selected once, 14 were

selected twice, and four were selected three times). The teacher did not know the identity of the two students the researcher was observing nor did the students know the identity of any of the secret students. At no time during the investigation were the identities of the target students disclosed to the class.

Procedures

This investigation consisted of the orientation, baseline, intervention, and post-check phases. The orientation phase enabled the teacher and students to get accustomed to the presence of observers in the classroom. In addition to reducing participant reactivity, the orientation phase enabled the researcher to collect pilot data on student activity levels and selected instructional behaviors of the teacher.

During the baseline phase the independent variable, interdependent group-oriented contingency, was not employed. The baseline provided a basis for evaluating the effects of the independent variable and insight into setting initial criteria for reinforcement (Cooper, Heron, & Heward, 1987).

The intervention consisted of implementing the interdependent group-oriented contingency with three classes across three instructional units. The introduction of the independent variable was staggered across the first two classes. The third class, which remained in baseline for the entire unit, served as a control group.

Finally, the post-check phase consisted of an evaluation of the dependent variable after the independent variable had been removed. The post check took place after the completion of the third unit. Nine lessons were observed three weeks after the intervention had been withdrawn.

Phase One - Orientation

A system that enabled the researcher to identify the target (secret) students without the assistance of the teacher was developed. Dice were used to randomly select target students. The first dice rolled indicated the roll call line (there were six role call lines) and the second number indicated the target student. For example, a die combination of "1" and "4" indicated role call line number one, fourth person.

Two weeks prior to the beginning of the baseline phase, the researcher observed classes and systematically charted target students' activity levels and selected instructional behaviors of the teacher (e.g., teacher's use of time and interaction rates). The orientation phase also provided an opportunity for the researcher to complete the training of observation techniques to be used by the teacher.

The teacher participated in a momentary time sampling (MTS) training program (see appendix F) and practiced MTS techniques in two classes that were not part of the study. After two training classes the teacher was comfortable and reliable in implementing the MTS observation system.

The teacher was also asked to informally survey students for potential meaningful activity reinforcers. The informal survey consisted of the teacher asking students what type of "free choice" activities or other reinforcers were meaningful to them. Based on this informal survey a written questionnaire was assembled (see Appendix E). The orientation phase also afforded an opportunity for additional observers to complete their observer training (see Appendix G).

The orientation phase also provided the researcher and teacher with time to discuss the unit content, sequence and frequency of fitness activities. A block plan of fitness activities was developed for each unit to assure a reasonable balance of activities across conditions. In the cooperative games unit, conducted in the mat room, the teacher rotated three or four basic fitness activities throughout the unit. The activities included Fitness Scramble, Exercise Stations, Obstacle Course, Mystery Cards, and Snake in the Grass. Exercise Stations, Follow the Leader, Mystery Cards, and Interval Running were alternated for fitness activities during the badminton unit. In the recreational games unit the teacher utilized Autobahn, Mystery Cards, Basketball Skills Circuit, and Blob Tag for the fitness activities. Table 4 summarizes the sequence and frequency of the various fitness activities. Fitness activities were variations or modifications of activities outlined by Pangrazi and Dauer (1995).

Phase Two - Baseline

Prior to each Class Two students were selected to observe. The target students' MVPA levels were coded throughout the entire

lesson. However, the focus of the intervention was just on the fitness portion of the lesson. The SOFIT cue tapes (teacher's - one minute intervals; researcher's - 10 second intervals) were started as soon as the target students were identified and distinguishing clothing or physical characteristics were noted.

Phase Three - Staggered Implementation of the Intervention

Prior to the beginning of the first intervention lesson, the teacher discussed the importance of MVPA and explained that four secret students were selected for observation during the fitness portion of the lesson. The class was then informed of their baseline MVPA level (as determined by watching target students). The criterion level for MVPA activity (i.e., percentage of intervals demonstrating MVPA and number of days) and reinforcer were then announced. When the mean MVPA of the target students reached the criterion, the entire class was allowed to select from the menu of choice activities. Each individual was able to select the activity they wanted to participate in during the free choice day (the teacher limited the choices to only those activities that could be safely supervised).

Table 4: Sequence and Frequency of Fitness Activities

Day	Unit 1	Unit 2	Unit 3
1	Fitness Scramble	Stations	Autobahn
2	Stations	Follow the Leader	Mystery Cards
3	Obstacle Course	Badminton Circuit	BB Circuit
4	Fitness Scramble	Stations	Autobahn
5	Stations	Follow the Leader	Mystery Cards
6	Obstacle Course	Mystery Cards	BB Circuit
7	Mystery Cards	Stations	Autobahn
8	Snake in Grass	Follow the Leader	Mystery Cards
9	Obstacle Course	Mystery Cards	BB Circuit
10	Fitness Scramble	Stations	Blob Tag
11	Interval Running		

Phase Four - Post Checks

Three weeks after the withdrawal of the intervention three post checks were made of each class involved in the intervention. The post checks followed the same procedures used during baseline. Three days were randomly selected for observation.

Experimental Design

Several research paradigms have been used in sport pedagogy. Primarily, the approaches can be categorized as quantitative or qualitative. Quantitative research typically includes descriptive, correlational, and experimental research. Two major categories associated with quantitative experimental research in the classroom and physical education setting are group and single-subject (N = 1) designs (Thomas & Nelson, 1990).

Researchers using an applied behavioral analysis approach typically employ single-subject designs (Alberto & Troutman, 1995). Repeated observation and recording of behavior, under varying conditions, enables assessment of the effectiveness of the independent variable. If the manipulation of the independent variable results in changes in the dependent variable, a functional relationship has been established (Cooper, Heron, & Heward, 1987). This research tradition is rooted in the experimental analysis of behavior, as developed by Skinner (1969).

Several designs have been used to demonstrate experimental control in classroom and physical education settings. The reversal,

commonly known as the ABAB design, involves the sequential application and withdrawal of an intervention (Alberto & Troutman, 1995). By continually comparing baseline data to data collected from the repeated application of the intervention the researcher can determine whether there is a functional relationship between the dependent and independent variables. The original ABAB design has since been adapted to include other designs, such as multiple baseline design and changing criterion designs.

The multiple baseline design is an effective means of investigating the impact of an instructional program (Cooper, Heron, & Heward, 1987). The multiple baseline design is a "highly flexible technique that enables the researcher to analyze the effects of an independent variable across multiple behaviors, settings, and/or subjects without the necessity of withdrawing the treatment variable in order to reverse improvements in behavior" (Cooper, Heron, & Heward, 1987, p.195). There are three basic types of multiple baseline designs: multiple baseline designs across behaviors, across settings, and across subjects. This study employed a multiple baseline across settings design.

A changing criterion design is used to assess the effectiveness of gradual and systematic increases in students' performance levels (Hartmann & Hall, 1976). By gradually and systematically changing the criterion for reinforcement, the students' behavior progressively moves from the baseline levels to a terminal objective (Alberto & Troutman, 1995). This particular design is especially suited for effective shaping of a particular behavior.

This study employed a combination of a multiple baseline and a changing criterion design to determine if there was a functional relationship between interdependent group-oriented contingencies and students' MVPA levels. Each type of design, multiple baseline and changing criterion, has been frequently used in single subject (N=1) research separately (Ulman & Sulzer-Azaroff, 1975). The combination of the two designs provided the opportunity to examine the effect of the independent variable across three different eighth grade classes, in three different units of instruction, and three different activity settings. An important feature of the multiple baseline and changing criterion designs is that functional relationships can be demonstrated without withdrawal of a successful intervention. A strong functional relationship between the

intervention and changes in behavior allows "the behavior analyst to employ a powerful form of inductive reasoning called baseline logic" (Cooper, Heron, & Heward, 1987, p.154).

The components of baseline logic include prediction, verification, and replication (Cooper, Heron, & Heward, 1987). Once a stable baseline has been established the prediction is made that similar levels of the behavior will occur if the environment is held constant. In other words, it is assumed that the baseline would remain unchanged if the independent variable had not been introduced (Cooper, Heron, & Heward, 1987).

In a reversal design there are multiple opportunities for prediction, verification, and replication. Verification increases the likelihood that the baseline would have remained unchanged if the independent variable had not been introduced (Cooper, Heron, & Heward, 1987). This approach allows the students or class to serve as their own control.

In a multiple baseline design, verification of a functional relationship, unlike the reversal design, is not demonstrated by having the students or class serve as their own control. Rather, verification in the multiple baseline design is established by

simultaneously applying the intervention across settings, behaviors, or subjects. The lack of a direct functional relationship has caused some to consider this a weaker design for demonstrating experimental control (Cooper, Heron, & Heward, 1987). However, the supposed weakness of direct verification is compensated for by "the multiple opportunities to verify or refute numerous predictions made within a multiple baseline design" (Cooper, Heron, & Heward, 1987, p. 198).

Replication involves repeating the previously observed change with applications of the independent variable across additional subjects, behaviors or settings (Cooper, Heron, & Heward, 1987). Replication of the intervention accomplishes two objectives. First, it reduces the chance that a variable, other than the independent variable, was responsible for change in the dependent variable, and second, it indicates that the targeted behavior is changeable (Johnson & Pennypacker, 1980). After the initial intervention was initiated, the start of subsequent interventions were staggered across other classes.

In this study, baseline was extended for three to four days. Following a brief baseline, the intervention was phased in

sequentially. Class One began the experiment first; upon demonstration of reaching the targeted MVPA criterion, Class Two began the intervention. Class Three remained in baseline during the entire duration of the first unit.

Since the lesson content and location changed with each unit (10-11 days) a rotational pattern was established for the replication of the intervention. This pattern allowed for each class to receive two levels of the intervention.

A series of post checks was initiated three weeks after the withdrawal of the intervention for the purpose of determining whether changes in behavior were maintained. The post checks followed procedures outlined during baseline data collection and continued for two weeks. Each class was observed at least three times on randomly selected days.

Data Collection

Data were collected on four randomly selected "secret" students (two by the researcher and two by the teacher) over a period of three instructional units (90 lessons spanning two and a half

months). The System for Observing Fitness Instruction Time (SOFIT) developed by McKenzie, Sallis, & Nader (1991a) was modified and used to collect MVPA levels (dependent variable). SOFIT is a momentary time sampling and interval recording system designed to quantify determinants postulated to promote health-related physical activity. The SOFIT instrument has been used as a research tool, both during live observation or video tape replay.

There are three phases or levels of decisions the observer must make when using SOFIT. The first phase involves an assessment of the children's level of physical activity or engagement level. Second, the investigator must determine lesson context. Finally, the teacher's behavior (promoting fitness, demonstrating fitness, instruction, managing, observing, and off-task) must be coded. Teacher behavior data were collected to monitor the level of teacher interactions and to verify that changes in students' MVPA level resulted from the intervention, as opposed to changes in teacher behavior (see Appendix I for SOFIT operational definitions of activity levels, lesson contexts, teacher behaviors).

The SOFIT activity levels are coded on a scale of 1-5. Codes 1 to 4 represent different body positions (lying down, sitting, standing,

walking) and code 5 (very active) describes the students' expenditure of energy that is greater than ordinary walking. In a sixth category, MVPA is computed by summing those values coded as level 4 or 5. Previous studies have validated the coding system (McKenzie et al., 1991b; Rowe, Schuldheisz, & van der Mars, 1997) and energy expenditure categories by correlating them with heart rates and energy expenditure estimates of children and adolescents (Bar-Or, 1983). Mean heart rates for SOFIT levels 4 and 5 are 140 beats per minute or greater (66-68% of maximal heart rate for middle school students).

Original coding procedures for activity level decisions were modified to be coded dichotomously. In other words, activity coded as SOFIT levels 1, 2, or 3 were charted as "N" for non-MVPA and activity coded as SOFIT levels 4 or 5 were recorded as "Y". This modification was based on two rationales. First, the primary focus of the intervention was on increasing MVPA behavior (not distinguishing whether the students were walking, standing, sitting, or lying down). Second, observer reliability percentages in pilot studies were higher with dichotomous coding.

The researcher systematically observed two secret target students using the SOFIT instrument developed by McKenzie, Sallis, and Nader (1991a). A cue tape prompted the researchers to observe students' activity levels every 10 seconds. At the end of each 10-second interval, students' activity behavior, lesson context, and teacher behavior were circled on the coding form. Interval recording allowed the researcher to sample the occurrence or non-occurrence of student and teacher behaviors throughout the entire lesson.

During the lesson the teacher coded two randomly selected students using an adapted SOFIT protocol and MTS technique. The teacher wore a tune belt and microcassette recorder with earphone to facilitate the cueing of observing target students. A cue tape with pre-recorded one-minute observation intervals was developed to prompt the teacher to observe target students at regular intervals. A coding card was developed for the teacher to carry in her pocket (see Appendix J). In order for the class to attain the criterion, the average of the four targeted students' MVPA had to meet or exceed the targeted criterion.

Observer Reliability

In order to accurately reflect what happened during the baseline, intervention, and post check phases, observers were required to demonstrate consistency in their observations. The presence of a second observer enabled the researcher to check for consistency in data collection and strengthen the argument for a functional relationship between the intervention and changes in the dependent variable. According to van der Mars (1989) accuracy in observing and recording behaviors is influenced by the observer's skill, complexity of the task, and length of the interval.

To assure observer reliability in coding two target students, observers were required to complete the training program outlined in the Appendix G. During video and live training sessions, an activity log and list of coding rules was developed (see Appendix H). The activity log and coding rules were placed on a sheet and attached to the observers' clipboard for easy reference. All three reliability observers had an opportunity to practice their systematic observation skills live prior to the beginning of the baseline period. Observers were able to achieve the 90% interobserver criteria during these live training sessions.

The most common method for determining observer reliability is to determine the percentage of agreement between two observers. Inter-observer agreement was measured using the Scored-Interval Method (Hawkins & Dotson, 1975). The Scored-Interval method of estimating observer agreement is the most rigorous procedure for interval data (van der Mars, 1989). "Scored intervals are those for which either both or one of the observers recorded the occurrence of a behavior" (van der Mars, 1989, p. 64). The formula for percentage of agreement among observers was calculated by dividing the number of observer agreements by the total number of observer agreements and disagreements and then multiplying by 100 (Cooper, Heron, & Heward, 1987).

During inter-observer coding the two observers were situated at least six feet apart. By implementing the use of a "Y-adapter" and six-foot earphone cords, observers were cued simultaneously, yet seated far enough apart (approximately 10-12 feet) to maintain independence (van der Mars, 1989). To minimize observer reactivity, a total of 32% (29) of the lessons were observed; 23% (21) of the observed lessons were randomly selected for inter-observer reliability checks.

Data Analysis

Analysis of the effects of interventions in applied behavior analysis typically involves the visual inspection of graphs depicting the data points across the various phases or conditions of the investigation (Parsonson & Baer, 1992). Data coded on the SOFIT form were entered into a Microsoft Excel 5.0 for analysis and a 1.2 version of Cricket Graph software was used for graphing. Visual analysis of the plotted intervention conditions was used to examine the association between the independent and dependent variables (Ulman & Sulzer-Azaroff, 1975). Functional relationship (experimental control) was strengthened when there was replication of the effect and when there was minimal data overlap between conditions.

Specific attention was given to data trends, levels of performance in a phase, rapidity of behavior change, degree of variability, and presence of data overlap between conditions as presented in the plots. Plotting the means of the data within each phase facilitated the visual inspection of the data (Kazdin, 1982). Evaluation of the level of performance (increase or decrease) from

one phase to another was analyzed using the steps outlined by Twaney and Gast (1984). By identifying the last data point of a condition and the first point of the next condition, and subtracting the smallest value from the largest value, the magnitude and direction of change can be evaluated.

Three components of baseline logic essential for experimental analysis, prediction, verification, and replication (Cooper, Heron, & Heward, 1987) were incorporated into the visual analysis of the data. Each target student's MVPA level was plotted graphically and analyzed visually to determine the functional relationship with the monitoring system and interdependent group-oriented contingency.

CHAPTER 4

RESULTS AND DISCUSSION

Introduction

This chapter includes a discussion of observer reliability results for student activity levels and teacher's instructional behaviors. Furthermore, descriptive data pertaining to the context and content are reported. Results from each of the three instructional units are also discussed. Student MVPA levels and teacher's instructional behaviors during fitness and the skills/games portion of the lessons are explicated and depicted in graphs.

Observer Reliability

The measure of observer reliability provides an indication of the degree to which the researcher's and observers' observations agree. Data resulting from systematic observations, if reliable, accurately reflects what happened in the teaching-learning environment (van der Mars, 1989). The Scored-Interval Method was used to assess inter-observer agreement (IOA). IOA using the Scored- Interval Method was calculated by dividing the total number

of agreements by the number of agreements and disagreements. Prior to data collection, observers were required to demonstrate an IOA of 90% off a video-based observation.

The IOA was assessed in two categories, student activity level and teacher behavior. The student activity levels were measured by charting intervals in which MVPA was demonstrated. The five-point SOFIT activity level system (1 = lying down, 2 = sitting, 3 = standing, 4 = walking, 5 = very active) was reduced to a "Y" (MVPA) or "N" (non-MVPA). Teacher behavior was recorded by charting the intervals in which the teacher promoted fitness, demonstrated fitness, provided general instruction or was engaged in other behaviors (observing, setting up or putting equipment away, taking attendance, etc.).

To maintain ecological validity and reduce the intrusive nature of the intervention, reliability data on the teacher's observation of target students was not collected (to do so would have required additional microphones and a third observer). Furthermore, during observer training, with classes not involved with the intervention, the teacher reached sufficiently high inter-observer agreement percentages (mean 88%) with an independent observer.

Student MVPA Levels

Reliability observations on student activity levels were recorded in 29 (32%) lessons. To reduce the effect of observer reactivity 21 (23%) of those lessons were randomly selected for reliability assessment. Of the lessons that were randomly selected, eight were from the intervention condition and 13 were from the baseline condition. An asterisk on the "X" axis of Figures 3, 5, and 7 indicates which lessons were randomly selected for IOA.

The mean percentage of IOA for student MVPA levels was 95% (SD = 2.0, range = 91-100%). IOA was also calculated for each unit of instruction. The mean percentage of agreement for the cooperative games unit was 95% (SD = 2.2, range = 91-100%); for the badminton unit the mean IOA was 95% (SD = 1.2, range = 93-97%); for the recreational games unit the mean IOA was 94% (SD = 2.16, range = 91-96%).

To assess for differences between experimental conditions IOA was also calculated by condition. During baseline the IOA was 95% (SD = 2.0, range 93-100%) and during intervention the IOA was 96% (SD = 2.0, range 91-98%). There were no significant differences in the

IOA during each of the experimental conditions (see Table 5 for a summary).

Teacher's Instructional Behaviors

The same lessons that were randomly selected for IOA assessment of student MVPA levels were used for assessment of teacher's instructional behaviors (with the exception of unit one,

Table 5: Inter-observer Agreement Students' MVPA Levels

Unit	Mean%	Range %	SD
Cooperative Games	95	91-100	2.2
Badminton	95	93-97	1.2
Recreational games	94	91-96	2.2
Baseline	95	93-100	2.0
Intervention	96	91-98	2.0
Average	95	91-100	2.0

Table 6: Inter-observer Agreement Teacher's Instructional Behavior

Unit	Mean%	Range %	SD
Cooperative Games	80	67-93	8.8
Badminton	87	74-94	6.8
Recreational games	84	78-93	6.9
Baseline	86	80-94	4.0
Intervention	85	74-94	8.0
Average	85	67-94	7.0

Class Two, day four - no teacher instructional behaviors were recorded on that day; see asterisk on "X" axis of Figures 4, 6 and 8). The mean percentage of IOA for the teacher's behavior was 85% (SD = 7.0, range = 67-94%). IOA was also calculated for each unit of instruction. The mean percentage of agreement for the cooperative games unit was 80% (SD = 8.8, range = 67-93%); for the badminton unit the mean IOA was 87% (SD = 6.67, range = 74-94%); for the recreational games unit the mean IOA was 84% (SD = 6.75, range = 78-93%).

As was the case with student MVPA levels, IOA was also calculated across experimental conditions for teacher's instructional behaviors. During baseline the IOA was 86% (SD = 4.0, range 80-94%) and during intervention the IOA was 85% (SD = 8.0, range 74-94%). There were no significant differences in the IOA during each of the experimental conditions (see Table 6 for a summary).

Context and Content

Each unit of instruction during the investigation was comprised of 10 to 11 lessons. The three units of instruction during the investigation consisted of a cooperative games unit in the mat room, badminton in the main gym, and recreational games in the upper gym. Each lesson consisted of an introduction (stretching, managerial details), fitness time, and time for skill drills or game and a cool down or reflection period.

Allocated Time

In addition to charting the activity levels and teacher's instructional behaviors, the lesson context was also recorded. Categories of lesson context included management time, instructional

time, transitional time, fitness time, and skills or game time. These categories were combined into three basic areas, 1) fitness, 2) skills or games, and 3) other (times when students did not have the opportunity to be active, namely, management, instructional, and transitional time).

During the cooperative games unit 20.8% (SD = 4.02) of the allocated time in the lesson was dedicated to fitness activities, 34% (SD = 13.2) was devoted to sport skills or games, and 45.2% (SD = 10.13) was comprised of managerial, instructional, or transitional time. In the badminton unit 18.5% (SD = 2.47) of the allocated time in the lesson was dedicated to fitness activities, 53.4% (SD = 16.8) was devoted to sport skills or games, and 28.1% (SD = 14.8) of the time was comprised of managerial, instructional, or transitional activities. In the recreational games unit 18.8% (SD = 4.14) of the allocated time in the lesson was dedicated to fitness activities, 36.4% (SD = 19.9) was devoted to sport skills or games, and 44.8% (SD = 10.1) of the time was comprised of managerial, instructional, or transitional activities. Figure 1 depicts the allocation of time across the three instructional units.

Activity Levels during Allocated Time

Activity levels during each of the respective portions of the lesson were also recorded. The values reported reflect the average MVPA demonstrated across the entire unit (during both baseline and intervention conditions). During the cooperative games unit, the target students MVPA were 63.8% (SD = 20.2) of the fitness time, 15.8% (SD = 12.4) of the skill and games time, 1.8% (SD = 2.5) of the managerial/instructional time, and 18.3% (SD = 6.8) for the entire lesson. In the badminton unit, target students MVPA were 64.2% (SD = 18.6) of the fitness time, 5.9% (SD = 4.9) of the skill and games time, 3.8% (SD = 5.0) of the managerial/instructional time, and 15.1% (SD = 4.0) for the entire lesson. In the recreational games unit, target students MVPA were 65.1% (SD = 18.4) of the fitness time, 11.5% (SD = 9.1) of the skill and games time, 1.0% (SD = 1.3) of the managerial/instructional time, and 15.4% (SD = 5.3) for the entire lesson. Figure 2 illustrates the activity levels during the different

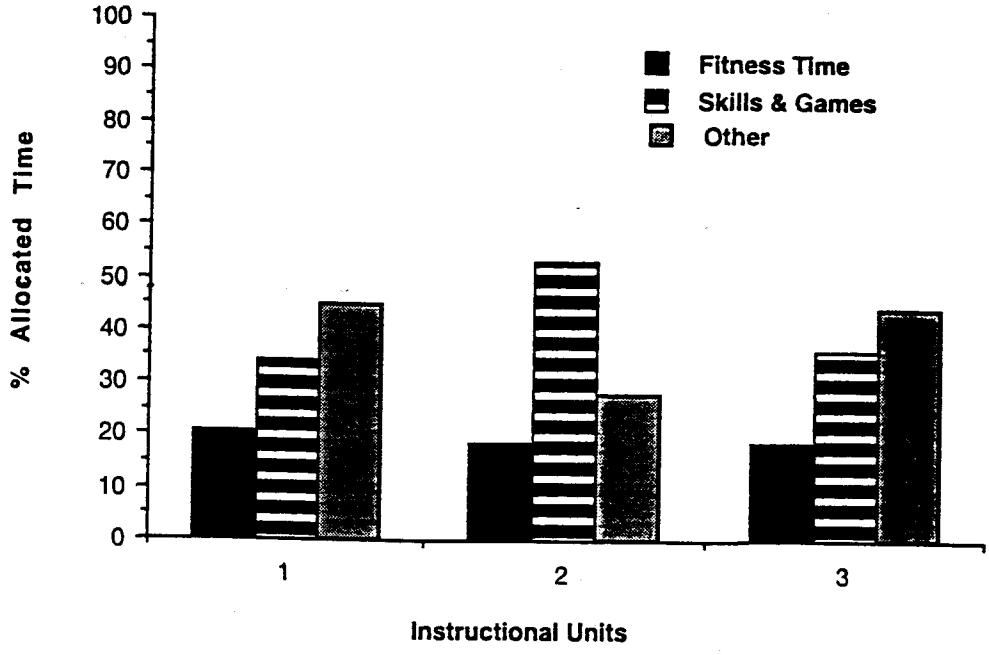

Figure 1: Allocated Time during Three Instructional Units

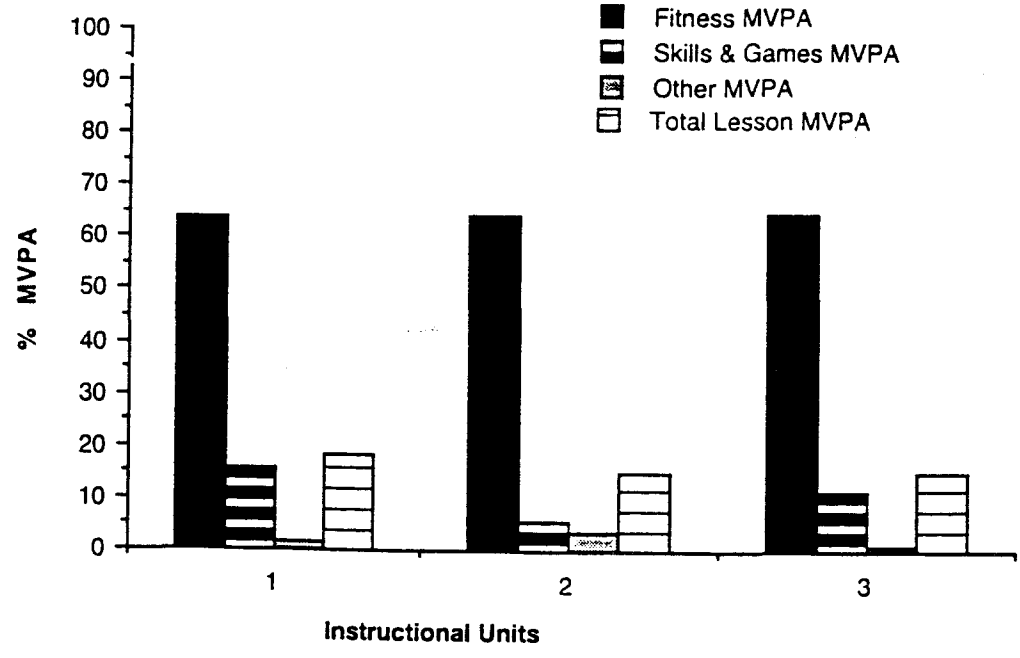

Figure 2: Student MVPA Levels during Allocated Time

portions of the lesson as well as students' total MVPA throughout the lesson.

For each of the three instructional units (i.e., cooperative games, badminton, recreational games) the data are presented in the following manner. First, student MVPA levels during fitness time and the skills/games portion of the lesson are reported. MVPA levels were visually analyzed for data path trends, overlapping data points, means by condition, and whether or not the students achieved the established criterion. The figures were arranged to illustrate the experimental design (delayed multiple baseline and changing criterion) across classes. The top tier depicts the class that was introduced to two levels of the intervention. The middle tier illustrates the class that was introduced to one level of the intervention. Finally, the bottom tier illustrates the class that remained in baseline the entire unit, and, as such, served as a control group.

Second, teacher's instructional behaviors are reported. Techniques used in analysis and graphing of data for student MVPA levels are also used in presentation of the teacher's instructional behavior data. The three tier format, illustrating the teacher's

promoting and demonstrating of fitness across classes and conditions, will be used to describe and analyze the data from all three units.

Following the description and analysis of student MVPA levels and teacher's instructional behaviors, the discussion focuses on the ability of the intervention during fitness time to generalize to other portions of the lesson.

Unit One

The first unit of instruction was conducted in the small mat room. Class One was randomly selected to receive two levels of the intervention. Class Two received one level of the intervention and Class Three remained in baseline the entire unit. Figure 3 illustrates the sequence and timing of the intervention for each class.

Unit One - Student MVPA Levels

Student MVPA Levels during Fitness Time. During the first unit, student MVPA levels for Class One (top tier) averaged 63.3% during baseline, 82.8% during the first level of intervention, and 61.5% during the second level of the intervention (Figure 3). During

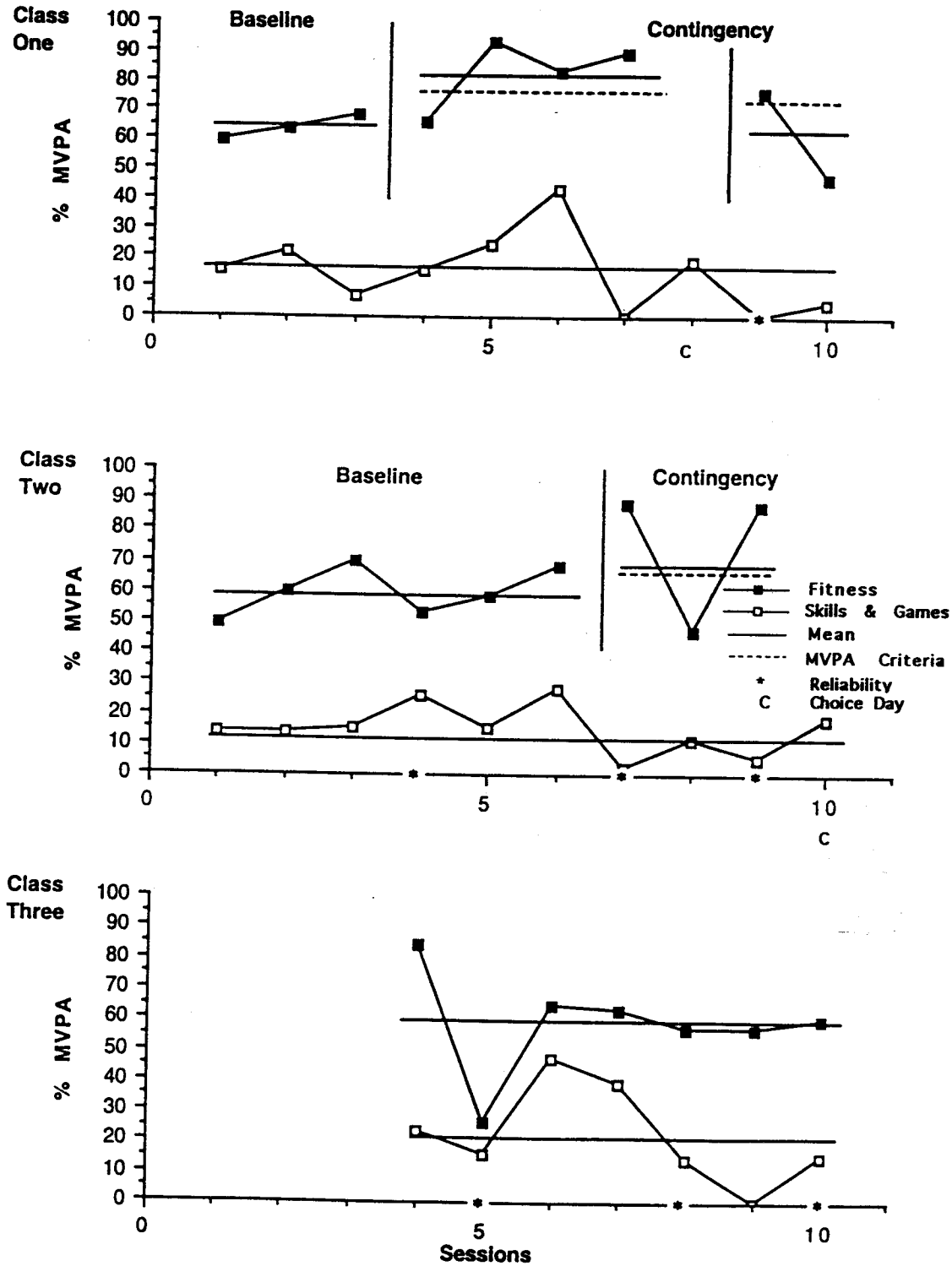

Figure 3: MVPA Levels during Fitness and Skills/Game Time Across Classes and Conditions - Unit One

baseline there was a slight increasing trend in the data path. Following an initial adjustment to the introduction of the intervention (day four) there was a significant increase in MVPA levels. The mean difference between MVPA levels in baseline and first intervention was 19.5%. There was a minimal overlap with the first data point (day four) in intervention and data points in the baseline. A relatively high (83%) MVPA level during the first intervention may have made it difficult to observe further increases in MVPA during the second intervention.

Target students attained the 70% intensity level and sustained that level for three out of the four days (two criteria for that level of the intervention - see dotted line on Figure 3) during the first intervention. Furthermore, functional relationship was supported by increases in MVPA levels on days five, six, and seven (Figure 3, Class One - tier one) when no appreciable changes in MVPA were observed on the same days in Class Two and Class Three (Figure 3, Class Two - tier two and Class Three - tier three).

However, when the MVPA criterion was increased to a higher level (75% for two consecutive days - Figure 3), during the second intervention, target students failed to sustain the MVPA levels.

Target students attained the higher criterion on day nine, but dropped below the criterion on day 10. The contingency was not effective at increasing MVPA levels during the second intervention with Class One.

Class Two averaged 59.7% MVPA during baseline and 74.7% during the intervention (see second tier in Figure 3). Following a somewhat variable, yet relatively stable baseline, a quick change in level was observed with the introduction of the contingency. The difference between the first data point in intervention (Figure 3, tier two, day seven) and the last data point in intervention was 21%.

Target students were able to meet the criterion of demonstrating 70% (Figure 3) or higher MVPA levels for two out of three days during the intervention. Further evidence of a functional relationship was noted by comparing the MVPA levels of Class Two with Class Three on days seven, eight, and nine. During the intervention with Class Two's MVPA increased while Class Three, during that same time period, did not increase (remained relatively stable).

As can be seen in the graphs presented in Figure 3, experimental control was demonstrated as increases in MVPA

occurred only upon the introduction of the contingency, while MVPA levels of classes in baseline, during that same time period, did not change.

Student MVPA Levels during Skills and Games. In addition to assessing student activity levels during the fitness time, activity levels were recorded during the skills and games portion of the lesson. It was hypothesized that increased levels of activity during fitness would generalize to the remainder of the lesson.

The mean activity level of target students for all three classes (Figure 3), during the skills and games portion of the lesson, was 15.8%. The data paths show there were no appreciable changes in MVPA level in classes during intervention conditions. The lack of significant increase in MVPA levels across conditions does not support the hypothesis that an intervention during the fitness time generalizes to the skills and games portion of the lesson.

Unit One - Teacher's Instructional Behavior during Fitness Time

In addition to collecting data on students' activity levels, teacher's behavior was also recorded. The teacher's instructional

behaviors were charted to enable the researcher to measure whether differences in teacher behavior occurred during baseline and intervention phases of the investigation. If this were the case, it could be argued that changes in the teacher's instructional behavior should be considered as a confounding variable to the investigation. While there are a multitude of teacher behaviors that can impact student activity levels, the SOFIT instrument was used to measure teacher's promotion and demonstration of fitness, as well as the teacher's general instruction and other activities (observation, managerial tasks, etc.) during the lesson. Preliminary inspection of all four teacher behavior categories revealed that no clear patterns or trends were present with the teacher's "instructional" and "other" behaviors. Since the primary purpose of this intervention focused on fitness time, and little skill-related instruction typically takes place during this portion of the lesson, the teacher's promotion and demonstration of fitness were combined into one category and evaluated across experimental conditions.

In Class One (see tier one in Figure 4) the teacher's promoting and demonstrating of fitness during the baseline phase was 52.4%. A highly variable pattern with considerable overlapping of data points

emerged. In addition, the mean for teacher's instructional behavior during both intervention levels was lower (37.4% in the first phase and 17.1% in the second phase) than baseline.

In the second class (see the second tier in Figure 4), the teacher's instructional behavior was 40.4% during baseline and 24.5% during the intervention condition. Only one data point overlapped between the intervention and baseline conditions. The data from both units show a decrease in the teacher's promotion and demonstration of fitness during intervention conditions.

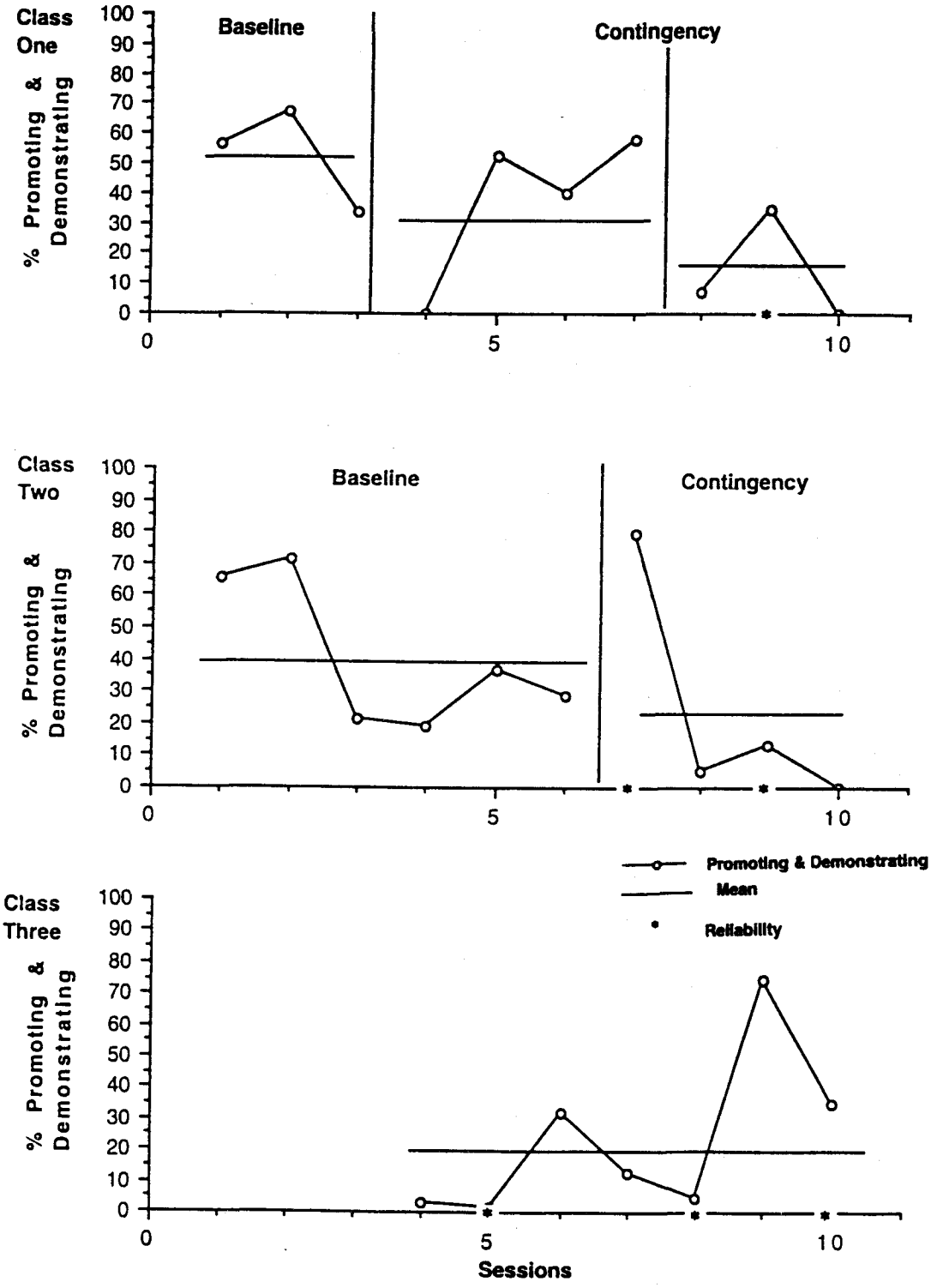

Figure 4: Teacher's Instructional Behaviors Across Classes and Conditions - Unit One

Unit Two

The second unit of instruction (badminton) was conducted in the main gymnasium. Class Two was selected to receive two levels of the intervention. Class Three received one level of the intervention and Class One remained in baseline the entire unit. Figure 5 illustrates the sequence and timing of the intervention for each class.

Unit Two - Student MVPA Levels

Student MVPA Levels during Fitness Time. During the second unit, student MVPA levels for Class Two (see the top tier in Figure 5) averaged 44.3% during baseline, 84% during the first level of intervention, and 74% during the second level of the intervention. The data path observed during baseline represented a slightly decreasing trend. A significant increase in MVPA from baseline to the first day of intervention was also observed. The difference between the last data point in baseline and the first data point in intervention was 41%. Further evidence of prediction is provided by the fact that MVPA levels were 39.7% higher, on average, during the first intervention level as compared to baseline phases.

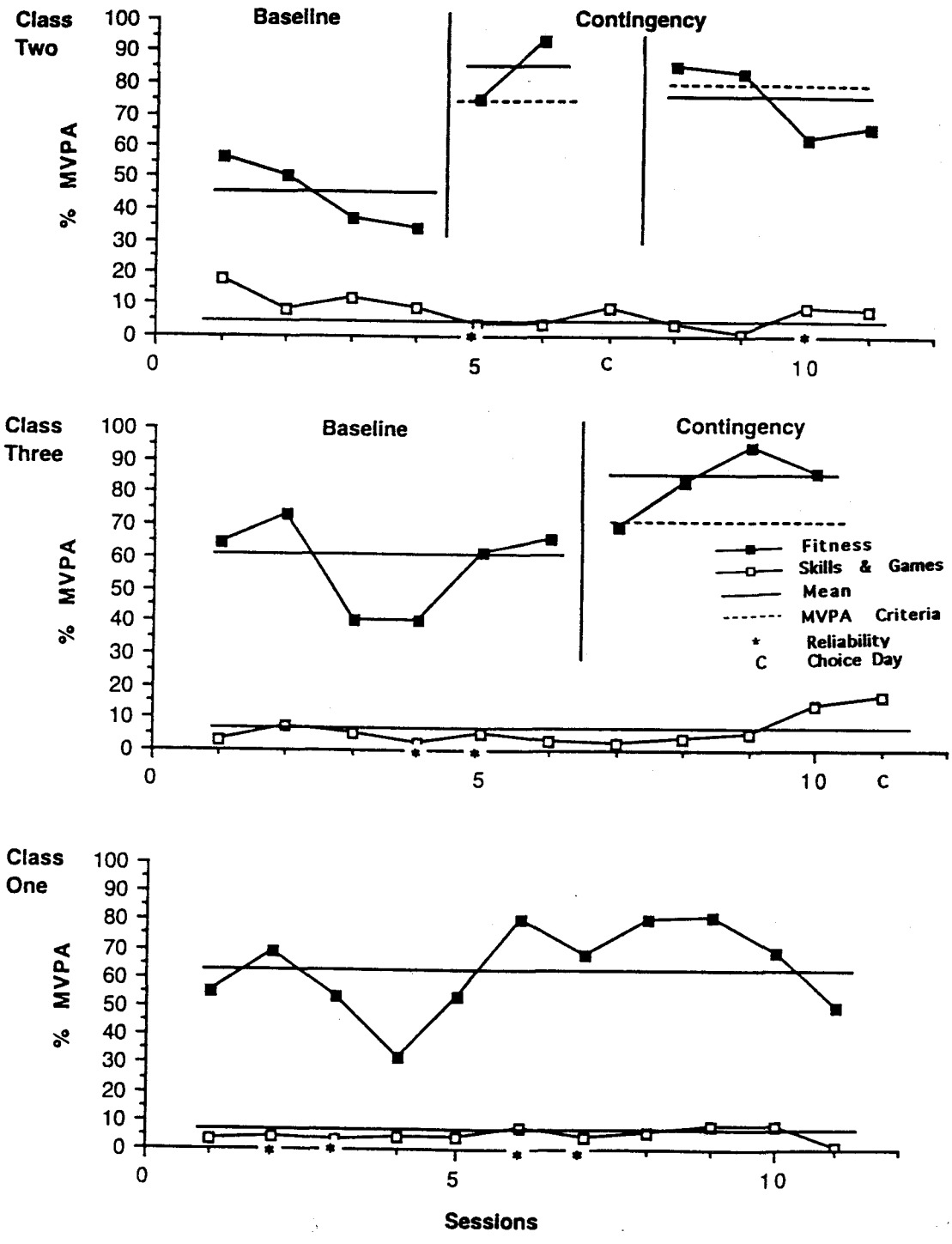

Figure 5: MVPA Levels during Fitness and Skills/Game Time Across Classes and Conditions - Unit Two

In addition to the dramatic change in level between baseline and intervention, further support for substantial change in behavior is provided by the fact that no data points overlapped between the baseline and intervention. Target students were also able to demonstrate MVPA levels higher than 70% (Figure 5 - criterion is depicted by the horizontal dotted line) for two consecutive days. Furthermore, when Class Two was in the first phase of the intervention (days five and six), MVPA levels increased, while MVPA levels in Class Three and one, on the same days, did not show as dramatic changes in MVPA levels. High levels during the first phase of the intervention, especially day six, may have created a ceiling effect (i.e., students could not reach higher MVPA levels).

During the second level of the intervention, Class Two failed to meet the criterion (75% MVPA level, for three out of four days - Figure 5). However, despite the failure to meet the criterion, the average MVPA during that second intervention was 29.7% higher than baseline. In addition, no data points overlapped between the second intervention and baseline.

Class Three (see the second tier in Figure 5) averaged 57.3% MVPA during baseline and 83% during the intervention. During

intervention the average MVPA was 25.7% greater than baseline condition. Following a moderately variable baseline target students in Class Three, unlike the dramatic change in Class Two, demonstrated a slight increase on the first day of intervention. This was their first exposure (day seven) to the contingency management program and follows a pattern (minimal change or learning effect) demonstrated by Class One in unit one. With the exception of the first day of intervention (day seven) no data points in the intervention overlapped with data points in the baseline.

Class Three also met the criterion of 70% MVPA level for three out of four days. Furthermore, while Class Three's MVPA level was increasing on day eight, nine, and 10, MVPA levels in Class One, in the corresponding days, did not demonstrate significant changes in MVPA level. Also a downward baseline trend was reversed during the intervention phase.

Class One (see bottom tier of Figure 5), which remained in baseline the entire unit, averaged 62.7% MVPA. The MVPA levels of Class One reflect a variable pattern.

The second unit provides continued support of the functional relationship between the intervention and changes in MVPA

behaviors of the students. As can be seen in the graphs presented in Figure 5, experimental control was demonstrated as substantially greater changes in MVPA occurred upon the introduction of the contingency. MVPA levels of classes in baseline, during that same time period, did not change. Replication of the increases in MVPA, in a second unit, within a different context and curricular content provides additional evidence of the effectiveness of the contingency management program.

Student MVPA Levels during Skills and Games. The activity levels in Class Two (Figure 5, top tier) during the skills and games portion of the lesson averaged 7% during the badminton unit. In Class Three the mean MVPA during skills and games was 6% during the badminton unit. The reward day (Figure 5, middle tier, day 11) was the highest data point in both baseline and intervention conditions. Finally, the mean MVPA for Class One (in baseline the entire unit) was 4% (Figure 5, bottom tier).

The data do not suggest significant increases in MVPA levels of students during the badminton unit. Thus, the intervention effects in

the fitness time did not generalize to the skills and games portion of the lesson.

Unit Two - Teacher's Instructional Behavior during Fitness Time

Data on teacher's promotion and demonstration of fitness behaviors were also collected and analyzed in unit two. In Class Two (Figure 6, top tier) the data paths, across baseline and intervention conditions, are relatively stable. The teacher's instructional behaviors in Class Two during baseline averaged 42.6%. During the intervention conditions, however, the teacher's promoting and demonstrating decreased to a mean of 25.8% and 21%, respectively.

In Class Three (Figure 6, middle tier) the data paths in both baseline and intervention conditions are highly variable. Despite the high degree of variability, the mean promoting and demonstrating of fitness decreased from 36% in baseline to 30.4% during intervention. Class One, which was not exposed to an intervention (Figure 6, bottom tier), also had a highly variable data path. The teacher's promoting and demonstrating of fitness averaged 32.5% during the badminton unit.

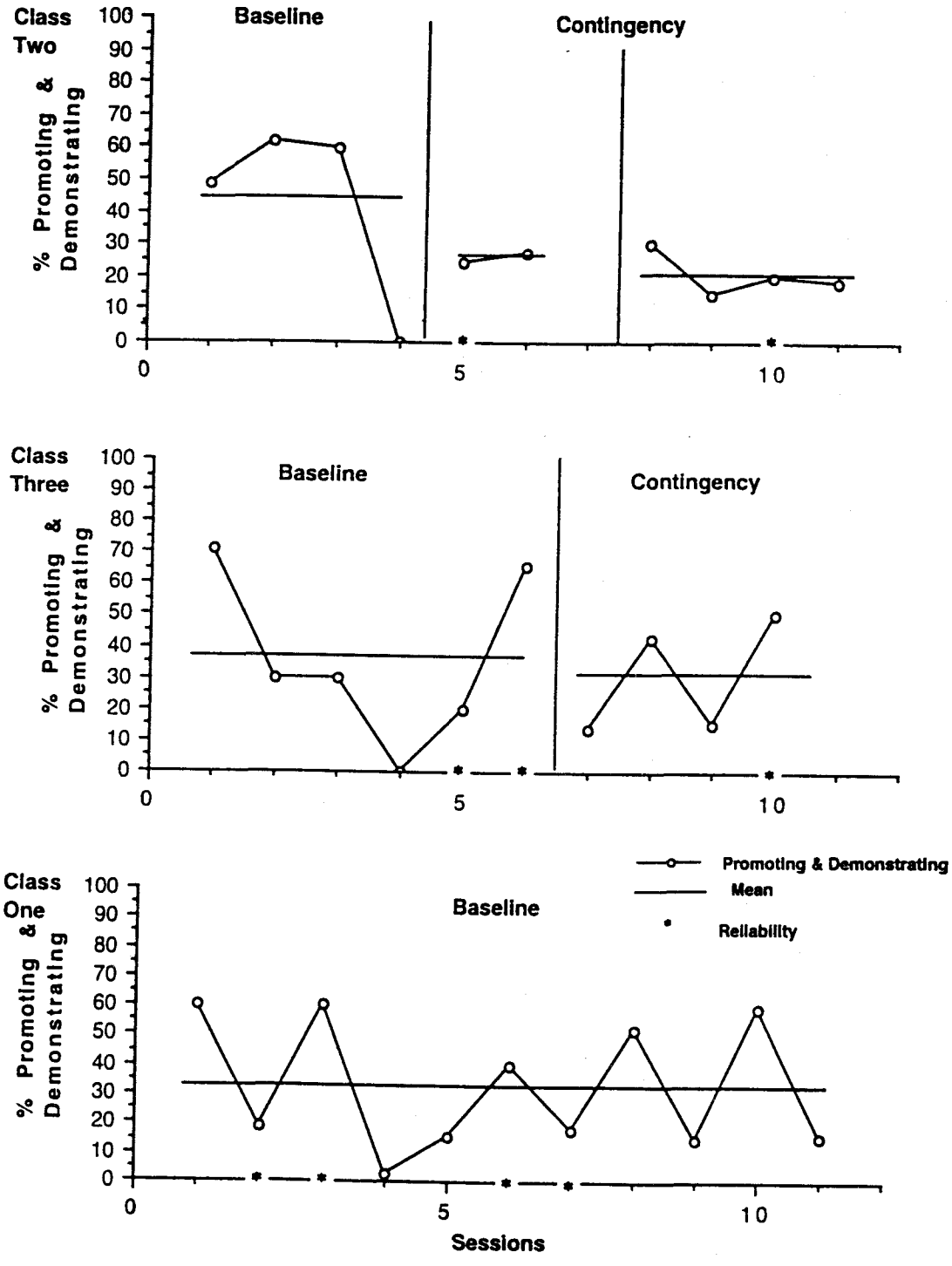

Figure 6: Teacher's Instructional Behaviors Across Classes and Conditions - Unit Two

These data provide further support for the argument that the teacher's promoting and demonstrating of fitness did not create a confounding variable in this investigation.

Unit Three

The third unit of instruction, recreational games, involved a variety of group activities ("Quadball", Medic Dodgeball, Steal the Stick) that were conducted in the upper gymnasium. Class Three was selected to receive two levels of the intervention. Class Two received one level of the intervention and Class One remained in baseline the entire unit. Figure 7 illustrates the sequence and timing of the intervention for each class.

Unit Three - Student MVPA Levels

MVPA Levels during Fitness Time. MVPA intensity criteria during this unit, as was the case in previous units, were established on the basis of baseline data. In this unit, however, a variable pattern in activity levels was observed across all three classes. To compensate for this variation in MVPA levels, associated with different fitness activities (three-day cycle of Autobahn, Mystery

Cards, Basketball Circuit), the MVPA goal changed with each day's activity.

MVPA levels for Class Three (see Figure 7, top tier) averaged 64.7% during baseline, 77.7% during the first level of intervention, and 84% during the second level of the intervention. The difference in mean MVPA levels from baseline to the first intervention was 13% and the difference in the second intervention was 19.3% (Figure 7, top tier).

A closer inspection of student MVPA levels in Class Three reveals a minimal overlap in data points between the intervention and baseline conditions. When the three-day cycle of fitness activities is taken into account (compare days one and three to days four and six), a dramatic change in level was observed.

In addition to the mean increases in MVPA levels in both intervention phases, students successfully reached the MVPA criterion in all five days of the contingency program. During the first level of the intervention the MVPA goal ranged from 65% to 80% (Figure 7 top tier). Students were challenged to further demonstrate those MVPA levels for three consecutive days. In the second level of intervention, the range for the MVPA goal was increased to a range

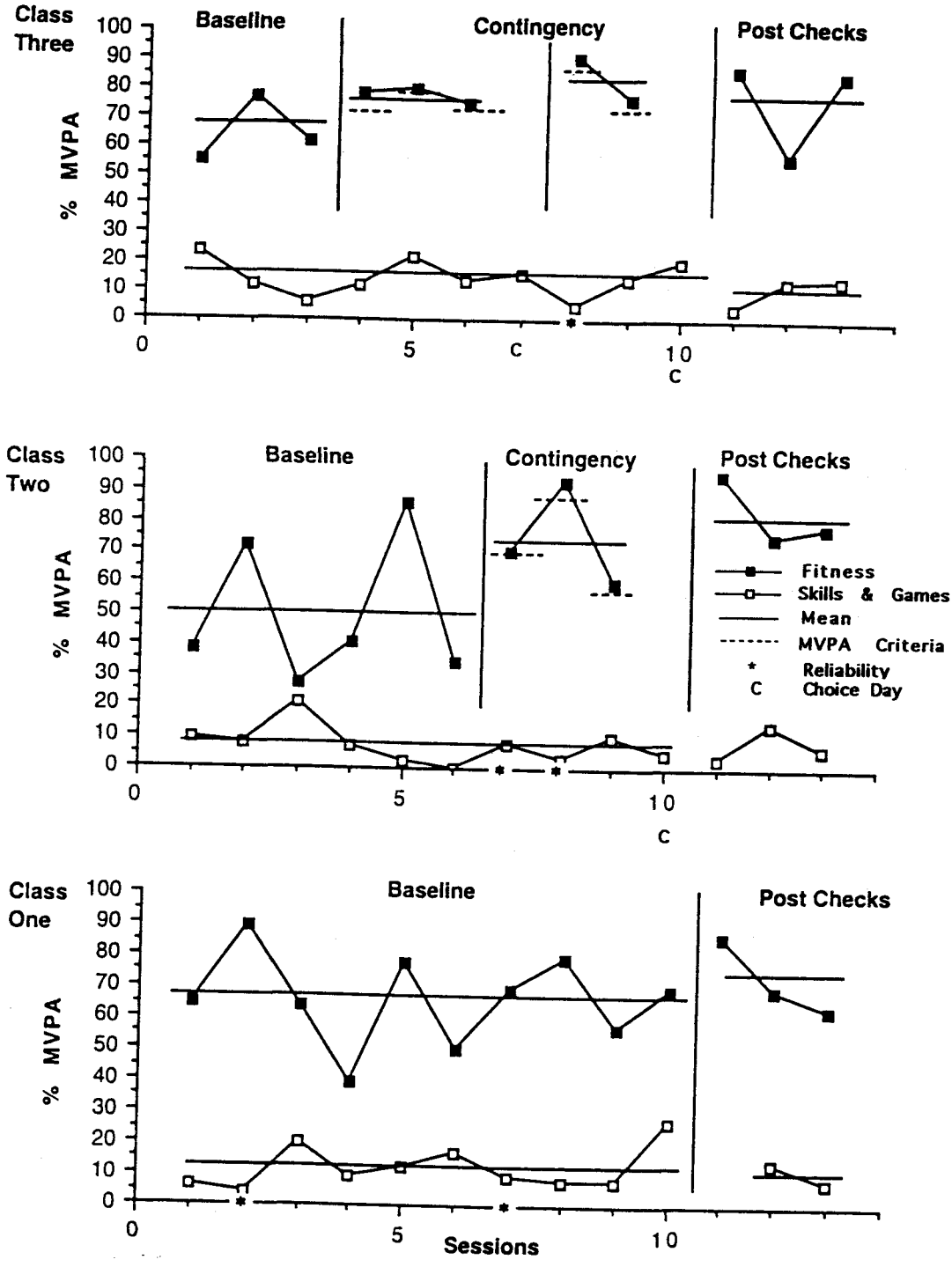

Figure 7: MVPA Levels during Fitness and Skills/Game Time Across Classes and Conditions - Unit Three

of 75% to 85%; the criteria also included two consecutive days of attaining the MVPA levels.

Further support for a functional relationship between the contingency program and increases in MVPA levels was demonstrated by comparing the activity levels across classes. On days four and six the MVPA levels in Class Three are significantly higher than the MVPA levels on the corresponding days in classes two and one. When days eight and nine from Class Three are compared with the same days in Class One (held in baseline the entire unit), the pattern of higher activity levels in intervention was also observed.

Class Two (Figure 7, middle tier) averaged 49.7% MVPA during baseline and 74.3% during the intervention. As was the case with Class Three, highly variable MVPA levels (following the three-day cycle of fitness activities) and a slightly increasing trend were demonstrated during baseline. A 24.6% increase from baseline to intervention condition, represented a substantial increase in MVPA levels. Further evidence for the effectiveness of the intervention was supplied by the dramatic change in level (compare day six of

baseline with day seven of intervention) from baseline to intervention.

As was the case with Class Three, the overlapping data points in Class Two should be examined within the context of the activities (a three-day cycle), the data for each fitness activity in the intervention phase did not overlap with the respective activities in the baseline condition.

In addition to demonstrating an increase in MVPA levels during the contingency program, Class Two target students also attained the criterion. Students in Class Two were successful in meeting the criterion (variable MVPA levels for three consecutive days ranged from 55 to 80%) during the intervention condition. Further evidence supporting the functional relationship between the contingency program and increases in MVPA levels was demonstrated by once again comparing activity levels across classes. Absence of significant increases in MVPA levels for Class One during the intervention phase of Class Two points to the contigency management program as the cause for the increase in MVPA levels in Class Two.

Class One, which remained in baseline the entire unit, averaged 65.9% MVPA throughout the recreational games unit. Class One demonstrated a decreasingly variable, and slightly decreasing trend in MVPA pattern throughout the unit (Figure 7, bottom tier). In addition to the peaks and valleys that were noted in classes three and two, a slight downward trend in activity levels, over the course of the unit, was apparent.

A third replication of the intervention in unit three provided further evidence supporting the functional relationship between the intervention and increases in MVPA behavior. As can be seen in the graphs presented in Figure 7, experimental control was once again demonstrated as increases in MVPA occurred upon the introduction of the contingency. As was the case in the previous two units, MVPA levels of classes still in baseline, although highly variable, during that same time period, did not increase as dramatically. Replication of the increases in MVPA, in a third unit, within a different context and curricular content provides further evidence of the effectiveness of the interdependent group oriented contingency.

Student MVPA Levels during Skills and Games. In unit three the activity levels in Class Three (Figure 7, top tier), during the skills and games portion of the lesson, averaged 15%. In Class Two (Figure 7, middle tier) the mean MVPA during skills and games during the recreational games unit was 7%. Finally, the mean MVPA for Class One, in baseline the entire unit (Figure 7, bottom tier), was 12%.

MVPA during the skills and games portion of the lessons in both classes (three and two) do not demonstrate significant increases during intervention conditions. Furthermore, the relatively stable data paths of MVPA levels for both classes imply that generalization from the fitness portion of the lesson to levels skills and games did not occur.

Post Check of Student MVPA Levels

Three weeks following the withdrawal of the contingency program a series of post checks were taken. The purpose of the post checks was to assess whether the students' MVPA levels during fitness were maintained in the absence of the intervention.

Student MVPA Levels during Fitness Time. During the post check lessons Class Three (Figure 7, top tier) averaged 76% MVPA levels during the fitness time. While the mean MVPA level was lower than the two intervention averages (77.7 and 84%, respectively), it did remain higher than the baseline MVPA level of 64.7%

The post checks of MVPA levels in Class Two (Figure 7, middle tier) averaged 83%. The post check MVPA mean was 8.9% higher than the intervention MVPA mean and 33.3% higher than the baseline MVPA mean.

Finally, the mean MVPA post check data for Class One, which was not exposed to the intervention in the previous two units, was 73%. Although this represents a 7.1% increase over the mean MVPA levels demonstrated during baseline, there is complete data overlap. Compared with a downward trend in the data path, it suggests that MVPA levels for this group did not change appreciably.

The data indicate that post check MVPA levels, in the absence of the intervention, were maintained at higher levels than the baseline. This implies that the contingency program effects generalized at least on a short term basis.

Student MVPA Levels during Skills and Games. Student MVPA levels, during the skills and games portion of the lesson at the time of the post checks, were also recorded and analyzed. Class Three (Figure 7, top tier) averaged 10% in the post check assessment. Class Two (Figure 7, middle tier) MVPA levels, during skills and games post check assessment, was 8%. Finally, Class One (Figure 7, bottom tier) MVPA level, in skills and games, also remained about the same as the previous unit (11% as compared to 12%).

The relatively low MVPA levels during the skills and game portions of the lesson, that was demonstrated while the intervention was being conducted, persisted in the post check lessons. The data do not suggest any significant changes in MVPA levels in the skills and games portion of the lesson once the intervention had been withdrawn.

Unit Three - Teacher's Instructional Behavior during Fitness Time

The teacher's promoting and demonstrating of fitness during Class Three (Figure 8, top tier) was 16.2% during the baseline, and 26.7% and 14.8% during the two intervention conditions. While a 10.5% increase in promoting and demonstrating behavior was noted

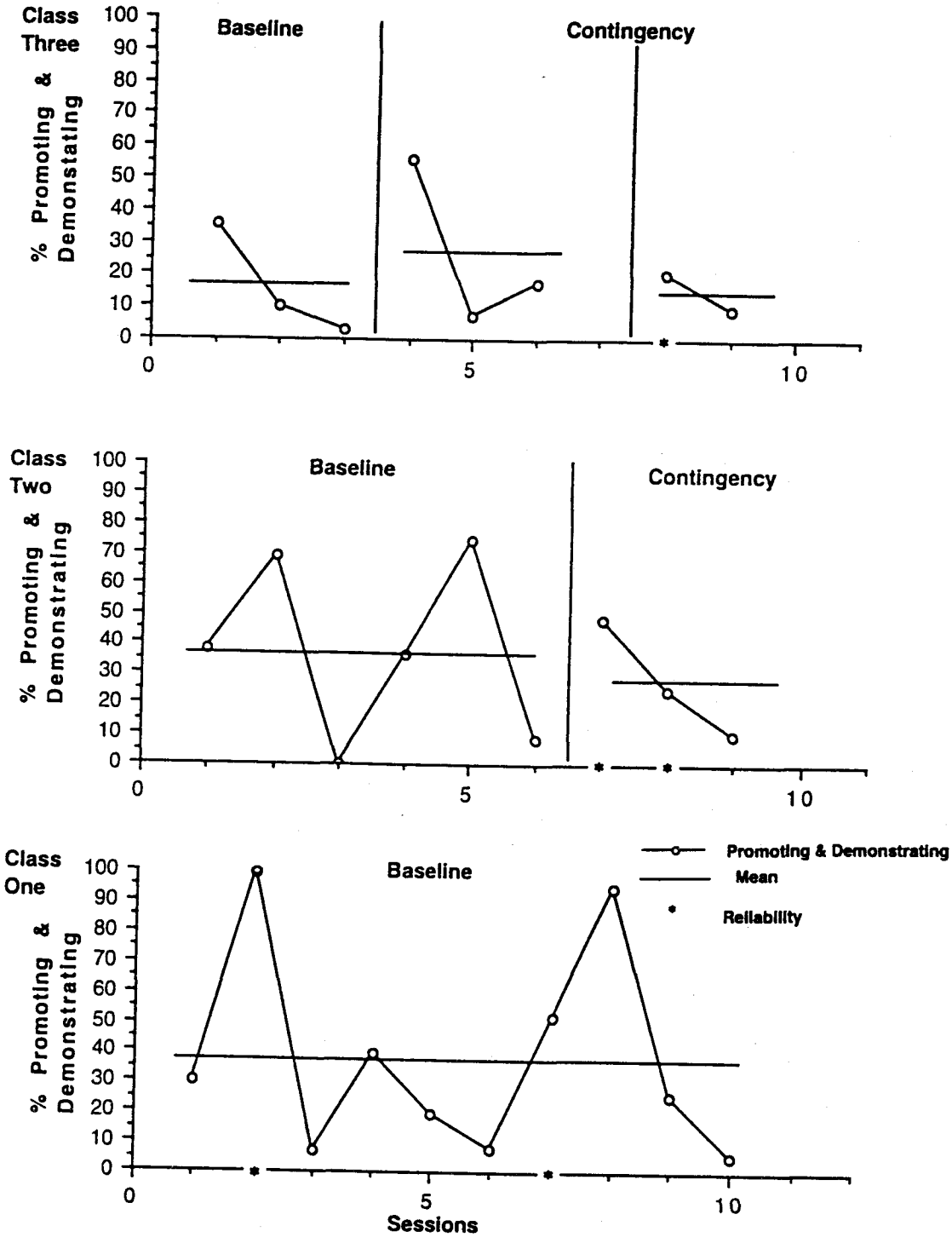

Figure 8: Teacher's Instructional Behaviors Across Classes and Conditions - Unit Three

in the first intervention condition, it should be noted that two of the three data points in the condition are below the mean for the baseline. Furthermore, the teacher's behavior in the second intervention was 1.4% lower than the baseline level.

In Class Two (Figure 8, middle tier) the teacher's promoting and demonstrating of fitness averaged 37.7% during baseline and 27.7% during the intervention. This represents a 10% decrease in teacher behavior and is consistent with the pattern observed in previous units.

Finally, the teacher's promoting and demonstrating of fitness in Class One (Figure 8, bottom tier) was highly variable. The average of the teacher's promotion and demonstration behavior in Class One, which was not exposed to the intervention, was 23.4%.

Despite the moderate increase in teacher's behavior in Class One the data do not represent a significant increase in promoting and demonstrating fitness across conditions. It can be convincingly argued, that since the teacher's promoting and demonstrating fitness behaviors did not increase during this investigation, it was not a confounding variable to the contingency program's effects.

Discussion

This investigation demonstrated that a contingency management program can effectively increase MVPA levels of middle school students in the fitness portion of their physical education lesson. Replication of the experimental effects across three instructional units provided support for the functional relationship between the intervention and changes in MVPA. As can be seen in the graphs presented in Figures 3, 5, and 7, experimental control was demonstrated as increases in MVPA occurred only upon the introduction of the contingency. MVPA levels of classes in baseline, during that same time period, did not change.

The data do not support the generalization of increases in MVPA during fitness time to the skills and game portion of the lesson. Furthermore, it was reported that the teacher's instructional behaviors across the experimental conditions did not increase, thus eliminating the selected teacher's instructional behaviors as a confounding variable.

The findings of this investigation are consistent with results of previous investigations on the efficacy of group-oriented contingencies in physical education (e.g., Paese, 1982; Vogler &

French, 1983). Mean MVPA levels, across all three units, were 13% to 39.7% higher during the intervention when compared to the baseline phase. In the three classes in which Paese (1982) introduced the intervention, changes in "dressing down" behavior were 10% to 26% higher during intervention. Vogler and French (1983) found that on-task behavior of behaviorally disordered students in physical education improved 42.9% to 51.6% when the interdependent group contingency, the "good behavior game", was implemented.

A changing criterion design is used to gradually shape and change behavior over a longer period of time. During the intervention condition of this experiment, students were able to attain the MVPA criteria 78% of the time. These results are similar to the findings of Paese's (1982) investigation, where students reached the criterion (dressing down class) 83% of the days.

Previous classroom studies (Baer & Richards, 1980; Spletz, Shimamur, & McReynolds, 1982; Swain, Allard, and Holborn, 1982) have demonstrated the effectiveness of group-oriented contingencies in classroom settings. Results from this study, along with Paese (1982) and Vogler and French (1983), provide evidence of the adaptability of this strategy to settings other than classrooms.

Vogler, Fenstermacher, and Bishop (1982) have suggested that a group-oriented contingency program may be effective in a variety of educational or therapeutic recreational settings. In this study, an interdependent group-oriented contingency was successfully implemented in one school, during three different instructional units that were conducted in three different locations. Although caution should be exercised in making generalizations to other settings, grade levels, or contexts, the data from this study further strengthen the point of view that group contingency management is an effective way to increasing MVPA behavior.

While confirming the effectiveness of the intervention across a variety of instructional units, this study also highlighted the generally low activity levels during physical education classes reported in previous research (McKenzie & Sallis, 1996; McKenzie et al., 1993; Ross et al., 1985; Ross et al. 1987; Siedentop, 1991). Throughout the three instructional units during this investigation, MVPA levels for the entire lesson ranged from 15.1 to 18.3%. Parcel et al. (1987) charted physical education classes taught by specialists and found students were vigorously active for only 2 minutes on average (less than 7% of the class time). Other observational studies

(Coates, Jeffery, & Slinkard, 1981; Faucette, McKenzie, & Patterson, 1990; McKenzie & Sallis, 1996) confirm this finding that children are rarely active at moderate to vigorous levels at school.

This study targeted an instructional strategy, the interdependent group-oriented contingency, as a means of increasing MVPA levels of students during physical education classes. Although the emphasis of this investigation was on an instructional strategy, the impact of curricular options and decisions was also observed. The choice of activities both in the fitness and skills/game portion of the lesson may have impacted the students' MVPA levels. Certain activities provided few chances to be active while others provided opportunities for the students to become "competent bystanders" (Siedentop, 1991). Students would appear to on-task and involved, however, they effectually demonstrated non-MVPA behaviors.

Furthermore, contextual variables, such as the amount of allocated time (minutes as well as the configuration, e.g., block periods versus standard periods), size and composition of the class, available equipment, size of the room or time of the day, can influence the students' MVPA levels. In addition to implementing effective teaching strategies, curricular decisions and contextual

variables should be evaluated and adapted to maximize the opportunities for students to be moderate to vigorously active.

Despite the overwhelming documentation of the benefits of increasing physical activity, both immediate and long-term, it appears that little has changed in physical education classes during the last decade. In *Healthy People 2000* (USDHHS, 1990), as well as *Healthy Children 2000* (USDHHS, 1991), the importance of increasing activity levels during physical education class was targeted as one of the major objectives. Objective 1.9 encouraged the development of quality physical education programs by challenging educators to increase to at least 50% the proportion of school physical education class time in which students are physically active. During this intervention, activity levels were significantly increased during the fitness portion of the lesson. The fitness portion of the lesson, however, only represented approximately 20% of the total time allocated for the lesson. Extending the intervention to other portions of the lesson, combined with curricular modifications, will move us closer to the attainment of the activity goal established by *Healthy Children 2000*.

In view of the findings of this study, the appropriateness of the goal of increasing the portion of the physical education lesson students are moderate to vigorously active to 50% should be questioned. It may well be that a goal of engaging the students at MVPA levels for 50% is unrealistic and inappropriate. Teachers must balance the instruction of skills, which are necessary for developing competency to be active, against activities that facilitate the accumulation or continuance of MVPA levels. While skill instruction and increased MVPA level are not always mutually exclusive, teachers must seek to find an appropriate balance that holds students accountable for both increased MVPA and skill levels during physical education class.

The findings of this study revealed that the increases in MVPA levels during fitness time did not generalize to the skills or game portion of the lesson. In many cases the students did not have the opportunity to be moderate to vigorously active during the skills and games time. The nature of the activity (badminton, beach ball volleyball, quadball, etc.), class size, room size, as well as available equipment, influenced the activity levels during the skills and game portion of the lesson.

Childrens, patterns of physical activity typically involve intermittent periods of activity, while adult patterns of activity usually involve longer sustained periods of activity (McKenzie & Sallis, 1996). The fact that middle school students are neither children nor adults, should impact the curricular decisions as well as the goals for activity levels during physical education classes. These observations are supported by Corbin, Pangrazi, and Welk's (1994) advocacy for the accumulation of moderate levels of physical activity (Lifetime Physical Activity Model) as opposed to sustaining high intensity levels (Exercise Prescription Model).

The significance of improving the quality of physical education is further underscored by the recent release of the Surgeon General's Report (USDHHS, 1996). The fact that only one half of U.S. young people (ages 12-21) regularly participate in vigorous activity points to the need to examine the curriculum and teaching strategies in our schools. Interventions that increase physical activity levels and promote a lifetime of physical activity provide a positive influence to the health of our nation (Sallis & McKenzie, 1991; Sallis, McKenzie, & Alcaraz, 1993).

In this investigation, post checks were made to assess whether MVPA levels attained during the intervention were maintained once the contingency management program had been withdrawn. The data revealed that increased MVPA levels were sustained once the intervention was withdrawn. While these levels were not as high as observed in the intervention, the levels did not return to levels recorded in baseline. The development of a contingency management program that becomes part of the regular curriculum, throughout the whole year, as opposed to instructional units, may be an effective means of shaping habitual moderate to vigorous physical activity behaviors in youth.

Finally, teacher's instructional behaviors were observed and analyzed to determine if increases in the teacher's instructional behaviors could be considered a confounding variable. In correlational studies at the elementary school level McKenzie, Sallis, & Nader (1991a) found that increases in the teacher's behavior were associated with higher MVPA levels. Also at the elementary school levels, Van der Mars et al. (1994a, 1994b) found that increases in teacher's corrective feedback were associated with higher MVPA levels. In this study the teacher's promotion and demonstration of

fitness behaviors remained stable or decreased from baseline to intervention.

CHAPTER 5

CONCLUSIONS

Summary

The purpose of this study was to determine the effects of an interdependent group-oriented contingency on the MVPA levels of middle school students during the fitness instruction and skills/games portions of physical education lessons. The participants were randomly selected, target students from three intact eighth grade classes. One teacher, a female with over 20 years teaching experience, volunteered to participate in the study. A combination of the delayed multiple baseline design and changing criterion design was selected as the experimental design for this study, in order to determine the effects of the intervention on students' MVPA levels. The independent variable consisted of an interdependent group-oriented contingency. The target students' MVPA levels became the determining factor for the group's (classes') opportunity to participate in free choice activities. Upon reaching the specified criterion (combination of the number of days and MVPA accumulation level) the class was given an opportunity to select from

a menu of free choices that the teacher and students had developed. The intervention was conducted during three units (cooperative games, badminton, and recreational games) in three different settings (mat room, main gym, and upper gym).

Nineteen lessons were randomly selected for observer reliability assessment purposes. Inter-observer agreement, using the scored-interval method, was calculated for student MVPA levels and selected teacher's instructional behaviors. Reliability data for MVPA levels in the three units of instruction ranged from 91-100% with a mean of 95%. The range for inter-observer reliability for teacher's instructional behaviors, during the three units, was 74-94% with a mean of 86%.

Visual analysis of graphic data was used to determine the functional relationship between the intervention and increased MVPA levels. The overlap of data points, trends, and number of days criteria was attained by the target students were used to determine the experimental control of the independent variable on the dependent variable.

A higher level of student MVPA was demonstrated in all classes during all three units when the first level of the intervention

was implemented. During the second level of intervention (criterion changed - increased MVPA levels), higher MVPA levels were demonstrated in one of three units. Failure to reach the criteria in the second phase could be attributed to the following factors. First, the fact that nearly half of the class was pulled out for a computer-based assessment program (with the school counselor) during one of the unit's intervention phases may have had significant influences. Second, the potential lack of reinforcer power or limited choices (inclement weather limited the students' free choice options). Third, students attained relatively high level of MVPA behavior during the first phase, producing an obvious ceiling effect. Despite the students' failure to reach the criteria in the second phase, across all three units, students attained the MVPA criteria 21 of the 27 days (78%).

Teacher behavior data were collected to ensure that changes in MVPA levels were a result of the intervention and not a result of changes in teacher behavior. Throughout the baseline and intervention conditions a highly variable pattern of selected teacher behaviors (promotion and demonstration of fitness) was observed. In a majority of the intervention conditions, the level of promotion and demonstration of fitness was at or below the baseline levels. Across

the three units, promoting and demonstrating fitness decreased as the group-oriented contingency was implemented. One possible explanation for the inverse relationship between the implementation of the contingency and the teacher's demonstration and promoting of fitness may be attributed to the time the teacher spent observing and charting target students.

Finally, activity levels during the skills and games portion of the lesson were examined to determine the ability of the intervention (applied during the fitness portion of the lesson) to generalize to the other parts of the lesson. Visual analysis of MVPA levels of target students, during the skills and games portion of the lesson, did not show significant changes in MVPA levels when the intervention was implemented. The contingency program was effective in increasing student MVPA levels during fitness time, however, this increase did not transfer to other portions of the lesson.

The importance of this study is that an interdependent group-oriented contingency program proved to be an effective means of increasing physical activity levels during fitness instruction time. It was shown that middle school students' MVPA levels were improved

as a result of this intervention, given that increases occurred only when the intervention was started. In addition, this study provided further evidence of generalizability in using applied behavior analysis strategies to increase appropriate behavior in physical education classes. This study also demonstrated the efficiency of a positive approach to developing physical activity habits in middle school students.

While this intervention was effective in increasing MVPA levels of middle school students, caution should be used in relying exclusively on a group-contingency approach. Ultimately, engaging and sustaining in regular MVPA levels must become a habitual behavior. A contingency management program can be instrumental in helping to develop the habit of regular daily physical activity.

This study was limited to three eighth grade classes at one school with one particular teacher. The dynamic, complex, and interactive nature of the classroom setting requires a close examination of content and contextual variables both within the class and within the school. A group-oriented contingency plan is one of many instructional strategies that can be employed to improve the quality of physical education. Furthermore, curricular decisions,

teacher's attitudes, and limitations of class location and size may also impact the effectiveness of changing students' activity behaviors.

Conclusions

In this investigation the interdependent group-oriented contingency program proved to be an effective and efficient means of increasing students' MVPA levels in three eighth grade classes during fitness time. However, the intervention did not generalize to the skills or games portion of the lesson.

Applied behavior analysis techniques were successfully implemented in a middle school physical education setting. While this intervention demonstrated that MVPA behavior can be increased we do not know the impact that these changes have on students' subsequent or lifetime physical activity behaviors. An interdependent group-oriented contingency program is one of many accountability mechanisms teachers can use to increase MVPA levels and improve physical activity behaviors in physical education classes.

Implications for Teachers

The successful implementation of a group-oriented contingency is dependent on numerous factors. The selection of the reinforcer, schedule of reinforcement, criteria level, and strategy for communicating results are some of the factors that can influence the realization of goals.

When selecting the reinforcers it is critical to choose something that is meaningful and rewarding to the students. Simply asking the students to list their favorite activities or appealing "rewards" is one way to identify those activities that are meaningful and important to the students. The more powerful the reward the greater likelihood the students will demonstrate the desired behavior in the group-oriented contingency. Just as "punishment should fit the crime" (Pangrazi & Darst, 1997), reinforcement should also not be too controlling or overwhelming. For example, giving students a 40-minute free choice day for reaching a goal during one day of fitness instruction (seven to 10 minutes) may not be appropriate. However, if students demonstrate appropriate behavior (at or above the criteria) for eight to 10 days, a 40-minute choice of activities may be appropriate. Other forms of reinforcement (primary - i.e., pizza party,

popcorn day, etc., or secondary - i.e., t-shirts, certificates, etc.) should be used carefully so not to create a situation where the reinforcer is to controlling or incongruent with the educational objectives of the group-oriented contingency.

In scheduling the reinforcement it is important to provide immediate reinforcement in the early stages of the behavior change program (Alberto & Troutman, 1995). After the students have received some early success it would be helpful to delay the application of reinforcement. Students can "bank" minutes or reward points toward a day later in the unit or at the end of the quarter. Delaying the reinforcement can be helpful in the development of lifetime behavior changes.

In this investigation the criterion were established by the researcher and the teacher. Involving the student on an individual basis or collectively may inspire the students to take more ownership or involvement in the process. When students perceived that they have control in the development of the criterion their motivation levels may be positively effected.

During this study results were publically announced at the end of the class period. However, over a longer period of time, public

posting, graphical displays, color coded charts, and other visual reminders (e.g., "Go for the Gold!" or "Strive for 80% MVPA!") could be helpful in positively influencing behavior changes.

Activity levels in physical education class and the development of physical activity behaviors is a complex and interrelated phenomenon. Many environmental and personal factors impact the development of physical activity behaviors. This investigation considered one small component of the intricate nature of physical activity behavior. The intervention demonstrated how modifications to the environment and accountability systems can improve MVPA levels of middle school students during fitness instruction time in physical education classes.

Recommendations

In addition to answering many questions about the effectiveness of a group-oriented contingency program, this study has raised numerous questions for further study. These questions revolve around: (a) the effectiveness of a contingency program in other settings, (b) the impact of an interdependent group-oriented contingency program on MVPA levels throughout the entire lesson,

(c) the feasibility of extending an intervention over the course of an entire school year or incorporating components into the curriculum, (d) the influence of students' involvement in the identification and selection of criteria, (e) the effect of increasing individual accountability on MVPA levels, and (f) the impact that students' preference for activities has on MVPA levels in fitness and skills/game portions of the lesson.

Since the findings of this study are limited to one school, involving one grade level, a logical extension would include the replication of this study in other grades in other settings. The setting of this current investigation included an administration that was strongly supportive of the physical education teachers and a curricular structure that held students accountable for instructional tasks. Replication of this study in other settings, where the administrative support and curricular expectations are not in place, may produce different findings.

The lack of generalization from fitness to the skills or games portion of the lesson raises another question. Extending the intervention to include the entire lesson, not just the fitness instruction time, is a logical progression. Concern over low activity

levels in physical education classes could be addressed by implementing a group-oriented contingency program throughout the entire class period. The trend toward increased class sizes and decreased support for physical education are paradoxically moving away from the goals established by *Healthy Children 2000* (USDHHS, 1991) and the focus of the recently released Surgeon General's report, *Physical Activity and Health* (USDHHS, 1996). Effective techniques, such as the interdependent group-oriented contingency program used in this investigation, could be implemented to counter the impact of these trends and inactivity in physical education classes.

In addition to extending and replicating this current study, additional modifications could also be made. The current study involved three units in which the intervention was implemented every day following a brief baseline period. A contingency program could be implemented over the course of an entire year with only certain days being selected for monitoring. The development of "Fantastic Fridays" or "Marvelous Mondays" could be used as part of a positive approach to increasing physical activity levels and developing habits of regular physical activity. Each Monday or Friday

a target MVPA could be established and target students could work toward a long term goal. Realization of the goal would provide students five minutes "credit" toward a forty-minute choice day or other reward activity. The thinning of the reinforcement schedule (i.e., delaying the onset of reinforcement) is a technique commonly used in applied behavior analysis.

In this investigation, the teacher and researcher took the responsibility of selecting the fitness activities and establishing the MVPA criterion. Providing an opportunity for students to choose the fitness activities and a forum for them to be actively involved in the establishment of MVPA criteria may have a positive impact on their activity levels. Students' motivation to be engaged at higher MVPA levels in physical education classes and to sustain physical activity throughout their lifetime may be impacted by the choices they are afforded while in school.

During this study the identity of the secret students was not disclosed. Developing a means that would increase individual accountability would reduce the potential for social loafing and the likelihood of students complying with behavioral (activity levels) expectations. Advances in technology and allocation of funding could

permit the use of heart rate monitors on all students in the class. Individual students could be randomly selected for assessment of heart rate data. Alternative group contingency programs, such as the dependent or independent strategies, could be implemented to increase individual student's accountability.

Further evaluation of students' perceptions and preference for fitness and lesson focus activities might provide valuable information for curricular and instructional planning. Developing a curriculum and instructional strategy based, in part, on student choice is not a novel idea. However, assessing the impact on physical activity levels and development of lifetime physical activity patterns as a result of those choices would provide important information.

In addition to assessing students' perceptions or cognitions, it would be valuable to measure the impact of a group-oriented contingency plan on the students' motivational levels. Evaluating the impact of extrinsic reinforcement, such as was utilized in the group-oriented contingency program during this investigation, may impact students' intrinsic motivation. Students' choice to be active in physical education class, their intensity levels, and willingness to

sustain physical activity behaviors are the result of a myriad of internal and external factors.

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APPENDICES

APPENDIX A

CORVALLIS SCHOOL DISTRICT 509J
Excellence in Education

Parent or Guardian Letter
for Free and Reduced-Price Meals
National School Lunch Program/School Breakfast Program
School Year 1996-97

Our school serves nutritious meals daily that meet patterns established by the U.S. Department of Agriculture. Lunch cost is $1.40 in Elementary Schools, $1.65 in Middle Schools, and $1.90 in High Schools. Breakfast cost for Elementary School is $ .75 and $1.10 for Middle and High Schools. Students may be eligible to receive school breakfast and lunch free or at a reduced price of $ .40 for lunch, and $.30 for breakfast. If you need help with the Confidential Application form, please call us at 757-5867.

Children may have free or reduced-price meals if:

- Their families submit a Notice of Eligibility from Adult and Family Services **(You do not need to complete a confidential application if you submit this notice.)** Please include student(s) school(s) and grade(s).
- Their families are on:
  - Food Stamps;
  - Aid for Dependent Children (ADC); or
  - Food Distribution Program on Indian Reservations (FDPIR) or
- Their families make less money than shown on the income chart below.

Household Size	Annual	Month	Week
-1-	14,319	1,194	276
-2-	19,166	1,598	369
-3-	24,013	2,002	462
-4-	28,860	2,405	555
-5-	33,707	2,809	649
-6-	38,554	3,213	742
-7-	43,401	3,617	835
-8-	48,248	4,021	928
For each additional family member add	+4,847	+404	+94

To apply for Free or Reduced-Price Meals: Complete and return the Confidential Application form.

Applications based on Food Stamps, Aid for Dependent Children (ADC) or the Food Distribution Program on Indian Reservations (FDPIR) need:

- The name(s) of your child(ren) (PART 1);
- Your Food Stamp, ADC, or FDPIR case number for each child (PART 2);
- The signature of the adult household member completing the confidential application form (PART 5);
- Mailing address with zip code and phone number, if available (PART 5); and
- Other benefits (PART 6) OPTIONAL.

Applications based on the money you make need:

- The name(s) of your child(ren) (PART 1);
- The names of all household members (PART 3);
- The amount of income each person in the household receives and its source (PART 3); If you and/or any family member(s) earn a living, your child(ren)'s eligibility is based on Gross Earned Income, which is money received on a regular, recurring basis. Gross Income means all money earned before deductions. Examples of Gross Earned Income are: wages, salaries, tips, and commissions. If you and/or any family member(s) own a business or farm, your child(ren)'s eligibility is based on Net Income, which is the total

income left after business or farm operating expenses are subtracted from gross receipts. You may use last year's income tax form Schedule C-1040 Profit or Loss Business Statement, Line 31, Net Income or Loss.
- The Social Security number of the adult household member signing the application, or write "none" if the adult household member does not have a Social Security number (PART 3);
- The signature of the adult household member completing the confidential application form (PART 5);
- Mailing address with zip code and phone number, if available (PART 5); and
- Other benefits (PART 6) OPTIONAL.

Application for a foster child:

- The name of the foster child (PART 4);
- The "personal use income" for the foster child (PART 4);
- The signature of the adult household member completing the Confidential Application form (PART 5); and
- Other benefits (PART 6) OPTIONAL.

Disabled: If your child(ren) have been determined by a physician to be disabled and the disability prevents the child(ren) from eating regular school meals, substitutions will be made as prescribed by a physician. If a substitution is needed, there will be no extra charge. Please contact the school regarding substitutions.

Verification: Your eligibility may be checked at any time during the school year. School officials may request information verifying that your child(ren) should receive free or reduced-price meals.

Fair Hearing: You may contact school officials if you do not agree with the school's decision regarding your application or the results of verification. A fair hearing may be requested by calling or writing:

Dr. Bruce Harter, Superintendent
P.O. Box 3509J
Corvallis, OR 97339
757-5841

Reporting Changes: If your child(ren) receives free or reduced-price meals based on income, you must inform the school if your household size decreases or your income increases by more than $50 per month or $600 per year. If your child(ren) receives free meals based on food stamps, ADC, or FDPIR, you must notify the school if benefits change. At that time, you may complete a confidential application form with income information.

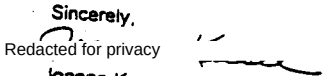
Confidentiality: The application information is used only to determine your child(ren)'s eligibility for free or reduced-price meals. Information on the confidential application may be released for the determination of other benefits in PART 6 on the application form.

Reapplication: You may apply for meal benefits at any time during the school year. If you do not qualify at this time but have a household change [decrease in household income; increase in household size; become unemployed; or receive food stamps, ADC, or FDPIR benefits for your child(ren)], complete a confidential application form at that time.

In the operation of the child feeding programs, no child will be discriminated against because of race, color, national origin, sex, age, or disability. If you believe you or anyone has been discriminated against, write immediately to the Secretary of Agriculture, Washington, DC 20250.

We will let you know when your application is approved or denied.

Sincerely,



Joanne Keesee, R.D.
Director of Food and Nutrition Services

nutr/schupdt/3425
Form 581-3426 (Rev. 5/96) page 2

APPENDIX B

APPLICATION FOR APPROVAL OF THE OSU INSTITUTIONAL REVIEW BOARD (IRB) FOR THE PROTECTION OF HUMAN SUBJECTS

Principal Investigator: Dr. Hans van der Mars

Department: Exercise & Sport Science **Phone:** 737 - 4649

Project Title: The effects of an interdependent group-oriented contingency on middle school students' physical activity levels during physical education

Present or proposed Source of Funding: none

Type of project: _____ **Faculty Research Project**

__X__ **Student Project or Thesis**
Student Name: Joel M. Schuldheisz
Mailing address: 125 c Langton Hall
Phone: 737-6808

Fax:

Type of Review Requested: _____ **Exempt** __X__ **Expedited** _____ **Full Board**

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1. Engaging in moderate to vigorous physical activity has important health benefits. Substantial evidence is available indicating that higher levels of physical activity are related to lower levels of blood cholesterol, reduced levels of blood pressure and lower incidence of obesity in both adults and children. Such evidence has become the basis for formulating the Surgeon General's Report on Physical Activity and the Healthy People 2000 goals related to physical activity in physical education classes.

Studies in the classrooms have indicated that teachers' monitoring were associated with increased academic performance and decreased time off-task (Berliner, 1979; Doyle, 1984; Evertson & Emmer, 1982). Similar investigations in physical education reported higher levels of on-task behavior when teachers' monitored students (Hastie & Saunders, 1990). In addition, Van der Mars et al. (1994) reported a correlation between selected active supervision behaviors and students' MVPA (moderate to vigorous physical activity) levels. The primary purpose of this study is to determine the effects of a group-oriented contingency program, as a process-oriented accountability system, on the physical activity levels of middle school students during the fitness portion of physical education lessons. This management strategy has a rich history of success in classroom and special education settings.

2. Intact 7th and 8th grade classes from a local public middle school will be systematically observed during physical education classes. Teachers will monitor two secret students' activity levels during each class. A cue tape will be used to prompt the teacher to observe the target students' activity levels. If students attain target activity levels (both percentage of time in classes observed and number of days in the interval) a reinforcer will be provided to the entire class (this constitutes the group-oriented contingency). Reinforcers will include a menu a free-choice activities approved by the teacher. Students' activity levels will be coded to determine the relationship to the group-oriented contingency program.

3. The group-oriented contingency system to be used in this intervention is a frequently utilized management and monitoring strategy employed by teachers in classroom contexts, special education, and physical education settings.

While teachers will not receive tangible benefits (e.g., remuneration) for their participation in this project, they will gain an understanding of how an instructional strategy can be implemented to improve physical activity levels of students. Furthermore, the resulting data will add to a knowledge base on teachers' accountability systems and their relationship to physical activity levels of middle school-aged students. Participation in this study does not involve more than the normal risk involved in learning a new instructional strategy. Teachers will be asked to wear a tune belt and wireless microphone to facilitate the recording of their interactions with students.

4. The subjects for this investigation include two teachers (one male, one female). Subjects will be requested to volunteer to participate in the study.

5. See attached copy of the teachers' informed consent form.

6. Through a letter to the principal, the teachers will be invited to participate in the study. Teachers will be asked to implement a group-oriented contingency management program in two of their classes. The primary investigator and/or project assistant will outline the basic nature of the project to the teachers during a meeting prior to the initiation of the investigation. Teachers will be provided with informed consent forms. The primary investigator will maintain all records pertaining to informed consent.

7. A coding system will be developed to protect the participants' anonymity and confidentiality. All collected data will be entered into a database using these code as the sole identifier. Participants in this study will be not be referred to by name during the research or publication process.

8. Not applicable.

9. Upon approval by OSU's IRB, approval will be sought by the investigator through the appropriate administrative channels, starting at the school district level (school district superintendent's office; school principal in the targeted school buildings, and the physical education teachers. The investigator will provide a written outline of the project (accompanied by a copy of the OSU IRB project approval notice) at each level of administration where approval is sought. Furthermore, at each of these levels of administration the investigator will request a written letter of approval on appropriate letterhead.

10. None

Signed: Redacted for privacy
Principal Investigator

Date: 1/14/97

INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS

OREGON STATE UNIVERSITY

COPY

Report of Review

TO: Hans van der Mars, ExSS

COPY: Joel Schuldheisz

RE: The effects of an interdependent group-oriented contingency on middle school students' physical activity levels during physical education

The referenced project was reviewed under the guidelines of Oregon State University's Committee for the Protection of Human Subjects and the U.S. Department of Health and Human Services. The committee has **approved** your application. The informed consent form obtained from each subject should be retained in program/project's files for three years beyond the end date of the project.

Any proposed change to the protocol or informed consent form that is not included in the approved application must be submitted to the IRB for review and must be approved by the committee before it can be implemented. The approval of this application expires upon the completion of the project or one year from the approval date, whichever is sooner. You should provide the following when requesting an extension of the expiration date:

a. Identification of the project as specified on the original application and most recent approval date.

b. Any changes to the methodology or protocol.

c. Any difficulties that you may have encountered, e.g., recruiting subjects, adverse events, withdrawal by subjects, and explanations for them.

d. Any information, including related literature, concerned with risks associated with this research.

e. A copy of the informed consent and assent documents currently being used for this project.

van der Mars-Schuldheisz, 02/06/97, page 2 of 2 pages

Redacted for privacy

Warren N. Suzuki, Chair
Committee for the Protection of Human Subjects
(Education, 7-6393, suzukiw@ccmail.orst.edu)

Date: 02/06/97

APPENDIX C

OREGON STATE UNIVERSITY
Department of Exercise & Sport Science *Hans van der Mars*
Corvallis, Or 97331-5802
Teleph (541) 737-4649 Fax (541) 737-4230
E-mail: VANDERMH@CCMAIL.ORST.EDU

December 2, 1996

Dear Mr. Starns:

We would like to invite your seventh and eighth grade physical education teachers to participate voluntarily in an approved research project we plan to conduct at Oregon State University (OSU). This project will take place during the first four periods of physical education class from January through April. A brief description of the study follows.

Engaging in moderate to vigorous physical activity (MVPA) has important health benefits. Substantial evidence is available indicating that higher levels of physical activity are related to lower levels of blood cholesterol, reduced levels of blood pressure, and a lower incidence of obesity in both adults and children. Such evidence has become the basis for formulating the Surgeon General's Report on Physical Activity and the Healthy People 2000 Goals.

The primary purpose of this study is to determine the effects of a reinforcement program on the MVPA (65% of maximal heart rates, 130-140 beats per minute for 7th and 8th graders) levels of middle school students during the fitness instruction time. Teachers will be trained to monitor students' activity levels in a systematic manner. The monitoring system the teachers will be using is similar to systems that have been used by classroom teachers and other physical educators. The primary researcher and teacher will randomly select a student using a numerical coding system. The students will be referred to by the assigned code throughout the entire study; their identity will not be recorded in any way.

Students will be rewarded with "choice minutes" for consistently reaching MVPA criteria. "Choice minutes" can be used to select activities from a "choice menu". All items on the "choice menu" will be approved by the teacher and awarded when the class meets the criterion. Teachers will designate an appropriate time in the instructional unit for "choice minutes" to be used. All activities on the "choice menu" are typical of a middle school physical education curriculum.

In addition to the teachers' observations, trained observers (OSU Exercise and Sport Science faculty and graduate students) will also systematically observe the classes. Observers will use the System for Observing Fitness Instruction Time (SOFIT) instrument. SOFIT is designed to assess student activity levels, lesson context, and teacher behaviors; SOFIT has been used extensively in school-based research. The SOFIT observation requires observers to rate student activity on a scale of 1 to 5 (levels 4 and 5 being MVPA), decide the context of the lesson (management, fitness, skill practice, game, etc.), and code teacher behaviors (promoting fitness, demonstrating fitness, instructing, observing, etc.). While observers will assist in data collection, only the researchers will have access to the data. Neither the teachers nor the students will be referred to by name.

While teachers will not receive tangible benefits (e.g., remuneration) for their participation in this project, they may gain a deeper understanding of their students' levels of physical activity levels. Furthermore, the resulting data will add to a knowledge base on teachers' accountability systems and its relationship to physical activity levels of middle school-aged students.

LETTER TO PRINCIPAL
Page 2

The OSU Institutional Review Board for Human Subjects has reviewed and approved the project. This study has also received clearance from the Corvallis School District Assistant Superintendent of Educational Services, Mike Howser. The attached Teachers' Informed Consent Form gives the specific details of the investigation.

We hope that the above outline provides you a clear overview of our planned project. If you have further questions now or at any point in time, or wish further explanation, please call us at 541-737-4649 or 541-737-5932. Please leave a message if no one is in the office and we will return your call as soon as possible. We thank you for taking the time to read this and for your cooperation with this study.

Sincerely,

Redacted for privacy

Dr. Hans van der Mars, Ph.D.

Oregon State University
Women's Building 107c
Corvallis, OR 97331
Phone: 737-4649

Redacted for privacy

Mr. Joel Schuldheisz, doctoral candidate

Oregon State University
Women's Building 4
Corvallis, OR 97331
Phone: 737-5932

Enc/

CORVALLIS SCHOOL DISTRICT 509J

Research Projects

Board policy regarding requests for permission to conduct research projects in the District will be based on the following considerations. Please respond to these considerations either on this sheet or attach your responses. Forward the completed form to the building principal(s) of the school(s) where you desire to conduct the research project.

1) Describe the purpose of the project, give an estimate of the timeline, and indicate the school(s) and class level(s) to be involved.

Please see attached for all question.

2) Describe the time, resources, and energies of District personnel who may be involved in the project.

3) Describe the value of the results of such project to the educational goals in general and those of the District in particular.

4) Describe how the project may serve the needs of the District, particularly in the areas of learning, instruction, leadership, and school facilities.

5) Describe the degree to which such project would interfere with normal classroom operations.

Name of Person(s) Requesting Research Project: Ir Hins van der Mars Joel M. Schuldheisz

Mailing Address: Oregon State University

Phone Number(s): 737-5932

Date: 12/5/96

1) Applicant completes form and forwards to building principal(s)
2) Building principal(s) sign below indicating acceptance/non-acceptance of project
3) Building principal(s) forward signed form to Assistant Superintendent for Educational Services.

☒ Project is accepted 12-5-96 ☐ Project is not accepted

Building Principal Signature Redacted for privacy Date

Building Principal Signature Redacted for privacy Date 12/5/96

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APPENDIX D

OREGON STATE UNIVERSITY
Department of Exercise & Sport Science
Corvallis, OR 97331

Effects of Interdependent Group-oriented Contingency on Middle School Students' Physical Activity Levels

INFORMED CONSENT FORM

1. Dr. Hans van der Mars, Associate Professor at Oregon State University (OSU) and Joel Schuldheisz, Doctoral Student at OSU have requested my participation in a research study at OSU. The purpose this study is to examine the effects of a reinforcement program on students' moderate to vigorous activity (MVPA) levels during physical education class. MVPA levels are typically 65 percent of an individual's maximal heart rate (130-140 for middle school students).

2. I will be trained to monitor students' activity levels in a systematic manner. The monitoring system the I will be using is similar to systems that have been used by classroom teachers and other physical educators. The primary researcher and I will randomly select a student using a coding system. The student will be referred to by the assigned code throughout the entire study.

Students will be rewarded with "choice minutes" for consistently reaching MVPA criteria. "Choice minutes" can be used to select activities from a "choice menu". All items on the "choice menu" will be approved by the teacher and awarded when the class meets the criteria. I will designate an appropriate time in the instructional unit for "choice minutes" to be used. All activities on the "choice menu" are typical of a middle school physical education curriculum.

In addition to the my observations, trained observers (OSU Exercise and Sport Science faculty and graduate students) will also systematically observe the classes. Observers will use the System for Observing Fitness Instruction Time (SOFIT) instrument. SOFIT is designed to assess student activity levels, lesson context, and teacher behaviors; SOFIT has been used extensively in school-based research. The SOFIT observation requires observers to rate student activity on a scale of 1 to 5 (levels 4 and 5 being MVPA), decide the context of the lesson (management, fitness, skill practice, game, etc.), and code teacher behaviors (promoting fitness, demonstrating fitness, instructing, observing, etc.). While observers will assist in data collection, only the researchers will have access to the data; identification codes will be established for the teachers and students. Neither the teachers nor the students will be referred to by name during the research or publication process.

3. There are no foreseeable risks associated with the reinforcement program. I do understand that I will be asked to learn a monitoring technique, wear a tune belt with microcassette recorder (the tune belt is made of a special neoprene rubber material that permits comfortable and safe movement while listening to microcassette recorder), and wireless microphone during lessons when data is collected. A cue tape in the microcassette recorder will systematically inform me when to observe students.

4. I understand that I will not receive tangible benefits (e.g., remuneration) for participation in this project. However, I may gain an understanding of students' physical activity levels during fitness instruction time. Furthermore, I realize that the resulting data will add to a knowledge base on teachers' accountability systems and its relationship to physical activity levels of middle school-aged students.

INFORMED CONSENT FORM
Page 2

5. I understand that the results of the research study may be published but that my name or identity will not be revealed. In order to maintain confidentiality, Dr. van der Mars and Mr. Schuldheisz will utilize a coding system that identifies me only by a code. Only Dr. van der Mars and Mr. Schuldheisz will have access to this confidential information which will be kept on file in a secure location in the Instructional Analysis Laboratory in the College of Health & Human Performance at Oregon State University.

6. I have informed Dr. van der Mars and/or Mr. Schuldheisz that I have no documented medical condition that might pose a risk for participation in this study.

7. I have been informed that I will not be compensated for participation in this study.

8. I have been advised that the research in which I will be participating does not involve more than the normal risk involved in teaching in a regular physical education setting.

9. I have been informed that any questions I have concerning this research project, before or after my consent, will be answered by Dr. van der Mars (phone 541/737-4649) or Mr. Joel Schuldheisz (phone 541/737-5932).

10. I understand if I have questions about my rights as a participant in this research project I can contact Mary Nunn (541/737-0670).

11. I have read the above informed consent. The nature, demands, possible risks, and benefit(s) of the project have been explained to me. I knowingly assume the risks involved, and understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to me. A copy of this consent form will be given to me.

Redacted for privacy

Teacher's Signature_____ Date 2/7/97

I, Hans van der Mars or Joel Schuldheisz certify that I have explained to the above individual the nature and purpose, the potential benefit(s) and possible risks associated with participation in this research project, have answered any questions that have been raised, and have witnessed the above signature and have provided the participant a copy of this signed consent document.

Signature of On-site Investigator Redacted for privacy Date 2/7/97
(Hans van der Mars or Joel Schuldheisz)

APPENDIX E

Cheldelin Middle School
8th Grade Physical Education

Choose your top 3 choices
1 = 1st, 2 = 2nd, 3 = 3rd
for Indoor and Outdoor Options

Indoor Choices

____ Beachball Volleyball
____ Blob Tag
____ Crab Soccer
____ Fitness Scramble
____ Medic Dodgeball
____ Obstacle Course
____ Poisonous Yogurt Marsh
____ Ping Pong
____ Ropes to Islands (portapits)
____ Snake Pits
____ Springboards
____ Snake Pits
____ Tag
____ Whiffleball Baseball
____ Other :_____

Outdoor Choices

____ Basketball
____ Football
____ Foursquare
____ Handball
____ Red Rover
____ Rollerblade
____ Skateboard
____ Soccer
____ Softball
____ Tag
____ Track
____ Other :_____

APPENDIX F

Training of the Teacher

The teacher participating in this investigation will participate in a four step training process. First, the teacher will watch a selected video tapes that involves the same fitness activities that they will be implementing in the study. On the basis of the initial observations the researcher and teachers will develop coding log and table of activities coded to at respective SOFIT levels. Second, the teacher will study the activity codes and be able to give several examples of activities at each SOFIT level. Third, the teacher will practice using the momentary time sampling (MTS) technique, with the modified SOFIT, with one student from a selected video tape. Fourth, the teacher will practice coding one student live using the MTS technique (from a class that is not involved in the intervention). The teacher will continue to practice until she feels comfortable using the system while teaching.

APPENDIX G

Training of Observers

Observers participating in this investigation will participate in a seven step training process. First, observers will watch selected video tapes that involve the same fitness activities that teachers in the study will use. On the basis of the initial observations the observers and researcher will develop coding log and table of activities coded to at respective SOFIT levels. Second, observers study the activity codes, teacher behavior codes, and lesson context codes and pass a proficiency exam (100% criterion). Third, observers will practice coding one student from a selected video tape using the SOFIT system. Fourth, observers will practice coding two students (alternating between student one and two) from a selected video tape using the SOFIT observation system. An intra-observer agreement criterion of 90% or greater must be demonstrated before observers can progress to the next stage of training. Fifth, observers will practice coding two students live using the SOFIT observation system. Sixth, observers will demonstrate 90% or greater inter-observer agreement in a live setting (pilot study). Seven, observers will periodically (once every two weeks) code a tape and

demonstrate 90% or greater inter-observer agreement to prevent observer drift.

APPENDIX H

Activity Log & Coding Agreements

MVPA Actvities

skip
hop
jump rope
running
galloping
sliding
sit-ups
push-ups
treadmill
squat thrust
holding bridge
line jump
jumping jacks/jills
ski jumps
leaping
bear walk
crab walk

Non-MVPA Actvities (less than brisk walk)

stretching
laying on back in between situps
laying on stomach in between pushups
sit-ups where the shoulder blades don't come off the floor
rocking sit-ups (grabbing the back of the thighs and rocking back & forth)
strolling, meandering, milling, sauntering, moseying

Rules MVPA Actvities

1. Moving the arms or legs vigorously (inverted bicycle) is a Y
2. Transitions....if caught in the "act" between a N and a Y code as a Y
3. Transition...from sitting down to getting up and walking/jogging etc is coded as a Y

Rules Non-MVPA Actvities

1. Milling (standing basically in one place and shuffling feet) is coded as a N
2. Transition...from standing to sitting down code as N

Teacher Behaviors (partial interval recording - hierarchical)

1st - **Promotes Fitness**

Examples: "Great hustle!", "Good job!", "Way to go on the exercise bikes!", etc.
Non-verbal examples: High five, thumbs up

2nd - **Demonstrates Fitness**

Examples: doing jumping jacks with the students, running in place, demonstrating a skill, playing a game (badminton, horse, etc) with a student

3rd - **Instructs**

Examples: "Raise your hand if your heart rate was 13 or more? 14? 15?", "How many got more bumps during this 30 seconds?", "The rules for crab soccer are ....", "When I say go get a carpet square, scooter, jump rope, and ...." (transition directions)

4th - **Other**

Examples: keeping score during a game, silently observing, filling out attendance forms, moving or putting equipment away, umpiring a game..."you're OUT!", etc.

Suggestions: As soon as you code the student activity level, move your pencil to the teacher behavior column...if at any point the teacher promotes (nice job, good hustle, etc.) mark the "P" and prepare to code the student activity level. If no promotional behavior was observed you must decide, if at any point during the interval, that the teacher was demonstrating or instructing. If neither of these teacher behaviors were observed then code as "O" for other.

If the teacher says something to the class it will be coded as either "P" or "I". Unless you can hear small group conversations they will be coded as instructions ("I").

APPENDIX I

SOFIT

System for Observing Fitness Instruction Time

(August 21, 1991)

Thomas L McKenzie, Ph. D.
San Diego State University
Department of Physical Education
San Diego, CA 92182
(619-594-6413)

SOFIT

System for Observing Fitness Instruction Time
(T. L. McKenzie, August, 1991)

Introduction

SOFIT enables researchers and supervisors to directly observe physical education classes and record both the physical activity levels of students and selected environmental factors that are associated with opportunities for fitness. SOFIT permits the coding of student activity, the class context, and teacher behavior. It borrows from the work of other pedagogical researchers, but is designed to examine specifically for physical fitness factors. The system may also be used to assess physical fitness opportunities from videotapes of classes.

SOFIT is conceptualized as a three phase decision system. The first phase requires a decision to be made on the activity levels of individual learners. The learner involvement decision is made by observing a preselected student and determining his/her level of physical activity (active engagement level). The engagement level provides an estimate of the intensity of the child's physical activity and uses the activity codes from BEACHES (McKenzie et al., 1990). Codes 1 to 4 (lying down, sitting, standing, walking) describe the body position of the child and code 5 (very active) identifies when the child is expending more energy than he/she would during ordinary walking.

The second phase of the decision sequence involves coding for the curricular lesson context of the class being observed. For each observation sample (10-second interval) a decision is made as to whether class time is currently being allocated for general content (M) (such as management) or for actual subject matter (physical education) content. If substantive physical education content is occurring an additional decision is necessary to determine whether the class focus is on knowledge content (coded as either general knowledge (K) or physical fitness knowledge (P) or motor (physical activity) content. If motor content is occurring, a further decision is necessary to code whether the context is one of fitness (F), skill practice (S), game play (G) or other (O).

The third phase of the decision sequence involves coding the teacher's involvement during class. Teacher behavior is classified into one of six categories. The first behavior category, promotes fitness (P), is directly related to student involvement in fitness activities and is coded when the teacher prompts or consequates learners for physical fitness engagement. The second category, demonstrates fitness (D), identifies when the teacher models fitness engagement. The remaining four categories, instructs generally (I), manages (M), observes (O), and off-task (T), are only indirectly related to student fitness opportunities but provide important information on how a teacher spends his/her time.

At the end of each 10-second observation interval the observer circles one code each for student behavior, lesson context, and teacher behavior. The three-phase decision system is summarized below.

SOFIT 3

Phase 1. **Student activity** decision.

What is the physical nature of an individual learner's engagement? What is his/her activity level?

Choices:
(1). lying down
(2). sitting
(3). standing
(4). walking
(5). very active

Phase 2. **Lesson context level** decision.

What is the context of the lesson? How is time allocated for the class as a whole (at least 51% of the students)?

Choices:

General content (M)	Knowledge content	Motor content
transition	physical fitness(P)	fitness (F)
management	general knowledge(K)	skill practice(S)
break	rules, strategy	game play (G)
	social behavior	other (O)
	technique	

Phase 3. **Teacher involvement** decision. What is the teacher doing?

Choices:
(P). promotes fitness (prompts, encourages, praises,etc.)
(D). demonstrates fitness (models)
(I). instructs generally
(M). manages
(O). observes
(T). off-task

Sample Coding Sheet

Interval	Student Activity	Lesson Context	Teacher Behavior
1	1 2 3 4 5	M K P F S G O	P D I M O T
2	1 2 3 4 5	M K P F S G O	P D I M O T

SOFIT DEFINITIONS AND CODING CONVENTIONS (8/21/91)

STUDENT ACTIVITY

Code the activity level/ body position of an individual target child into one of the five following categories using momentary time sampling (i.e., code a number to indicate what the student was doing at the "record" signal from the audio tape):

1. lying
2. sitting
3. standing
4. walking
5. very active

Code levels 1-4, (lying, sitting, standing, walking), unless the student is expending more energy than that required for an ordinary walk.

Code level 5 (very active), for any activity in which the student is expending more energy than he/she would during ordinary walking; do not consider body position only. For example, code 5 (very active--e.g., running, jogging, skipping, hopping) if the student is wrestling with a peer (even though he is lying on his back) or pedaling a moving tricycle or stationary bike (even though sitting).

When the student is in transition from one category to another, enter the code for the higher category. For example, code '2' if at the record signal the student is partially lying down and partially sitting up; code '3' (standing) if the student is getting up from either sitting or lying down.

LESSON CONTEXT (Modified from Siedentop et al, 1982) SOFIT 5

Code the lesson context allocated for the majority of class members (51%) by using momentary time sampling (i.e., circle M, K, P, F, S, G or O to indicate what the class was doing at the "record" signal).

General Content. (M) Refers to class time when students are not intended to be involved in physical education content (either knowledge or movement). General content includes transition, management, and break times. Transition refers to time allocated to managerial and organizational activities related to instruction such as team selection, changing equipment, moving from one space to another, changing stations, teacher explanation of organizational arrangement, and changing activities within a lesson. Management refers to time devoted to class business that is unrelated to instructional activity such as taking attendance, discussing a field trip, or collecting money for class pictures. Break refers to time devoted to rest and/or discussion of non-subject matter related issues such as getting a drink of water, talking about last night's ball game, telling jokes, celebrating the birthday of a class member, or discussing the results of a class election.

P.E. Knowledge Content. Refers to class time when the primary focus is on knowledge related to any aspect of physical education rather than on activity itself. Either Physical Fitness knowledge (P) or General Knowledge (K) may be coded.

Physical fitness (P) is coded when the knowledge content includes information related to physical fitness concepts, including endurance, strength, and flexibility.

General Knowledge (K) is coded when the information transmitted relates to areas of physical education other than physical fitness, such as history, technique, strategy, rules, and social behavior.

P E Motor Content. Refers to class time when the primary focus is on motor involvement in physical education activities. Coded categories include fitness (F), skill practice(S), game play (G), and other (O).

Fitness (F). Activity time devoted to activities whose major purpose is to alter the physical state of the individual in terms of cardiovascular endurance, strength, or flexibility. This includes aerobic dance, calisthenics, distance running, weight training, agility training, fitness testing, and warm-up and cool down activities. Relays conducted with more than three per team are coded as games (G), not fitness.

Skill Practice (S). Activity time devoted to practice of skills with the primary goal of skill development (e g., passing drills in volleyball, exploring movement forms, and practicing dribbling a basketball, dance steps, or a skill on a balance beam). Included also is time devoted to the refinement and extension of skills in an applied setting (like the one in which the skill is actually used) and during which there is frequent instruction and feedback.

Game play (G). Activity time devoted to the application of skills in a game or competitive setting when participants generally perform without major intervention from the instructor, such as during volleyball and tag games, balance beam routines, and folk dance performances.

Other (O). Refers to free play time during which physical education instruction is not intended. This time resembles recess during which students may select to participate or not.

NOTE: Transition time naturally occurring within an activity is coded as part of that activity rather than as management (M). For example, time spent moving from one fitness station to another is coded (F), and changing sides of the court during a volleyball game is coded (G).

TEACHER BEHAVIOR SOFIT 6

Circle the appropriate letter (P D I M O T) to indicate what the teacher did during the observation interval. Use partial interval recording according to the following hierarchy:

Promotes fitness (P). Promotes fitness by prompting, or encouraging fitness activity. For example, (a) attempts to initiate or increase student engagement in a fitness activity or enhance students' perception of their ability to do a fitness task); and (b) praises or reinforces fitness activity (e.g., makes a statement or gesture during or following a student fitness activity engagement clearly designed to increase or maintain such responses in the future).

Demonstrates fitness (D). Models fitness engagement (e.g., demonstrates how to do a fitness task or participates with students in a fitness activity).

Instructs generally (I). Lectures, describes, prompts, or provides feedback to students related to all physical education content (e.g., topography, skill development, technique, strategy, rules) except physical fitness engagement. Both positive and corrective feedback for skill attempts are coded as instructs generally. This category is coded when the teacher model physical skills or lectures about physiological responses without promoting fitness engagement.

Manages (M). Manages students or the environment by engaging in non-subject matter tasks (e.g., sets up equipment, takes roll, collects papers, directs students to do management tasks).

Observes (O). Monitors entire class, group, or an individual. To be recorded, the teacher must observe throughout the entire interval and not be engaged in any other coding category.

Off-task (T) Attends to events not related to his/her responsibilities to the class at hand; for example, reads the newspaper, turns back on class, leaves the instructional area. To be recorded, the teacher must be off-task for entire interval.

NOTES:

Teacher behavior categories are listed in hierarchical order. Code only one category for each 10-second observation interval. For example, category one (promotes fitness) is scored if it occurs at any time during the interval; category two is scored if it occurs during an interval, unless a category one behavior also occurs.

Researchers interested in obtaining a measure of negative reinforcement or punishment are directed to score prompts that are sarcastic or punitive in nature by drawing a line through the P, rather than circling it.

SOFIT Observation Form
Cheldelin Middle School Physical Activity Study

Date: _____ Teacher: _____ Grade: ____ Period: _____ Observer: _____

Girl: _____ Boy: _____ Fitness Activity: _____

Lesson Focus: _____ Location: _____

Comments: _____

Interval (Minutes)		Girl Activity Level	Boy Activity Level	Teacher Behavior	Lesson Context
0:00	1	Y - N		P D I O	M - management
0:10	2		Y - N	P D I O	T - transition
0:20	3	Y - N		P D I O	K - knowledge
0:30	4		Y - N	P D I O	F - fitness
0:40	5	Y - N		P D I O	S - skills practice
0:50	6		Y - N	P D I O	G - game
1:00	7	Y - N		P D I O	
1:10	8		Y - N	P D I O	X - out of view
1:20	9	Y - N		P D I O	L - lost
1:30	10		Y - N	P D I O	? - interpretation
1:40	11	Y - N		P D I O	
1:50	12		Y - N	P D I O	
2:00	13	Y - N		P D I O	
2:10	14		Y - N	P D I O	
2:20	15	Y - N		P D I O	
2:30	16		Y - N	P D I O	
2:40	17	Y - N		P D I O	
2:50	18		Y - N	P D I O	
3:00	19	Y - N		P D I O	
3:10	20		Y - N	P D I O	
3:20	21	Y - N		P D I O	
3:30	22		Y - N	P D I O	
3:40	23	Y - N		P D I O	
3:50	24		Y - N	P D I O	
4:00	25	Y - N		P D I O	
4:10	26		Y - N	P D I O	
4:20	27	Y - N		P D I O	
4:30	28		Y - N	P D I O	
4:40	29	Y - N		P D I O	
4:50	30		Y - N	P D I O	
5:00	31	Y - N		P D I O	
5:10	32		Y - N	P D I O	
5:20	33	Y - N		P D I O	
5:30	34		Y - N	P D I O	
5:40	35	Y - N		P D I O	
5:50	36		Y - N	P D I O	
Reliability		_____	_____	_____	

Interval (Minutes)		Girl Activity Level	Boy Activity Level	Teacher Behavior
6:00	37	Y - N		P D I O
6:10	38		Y - N	P D I O
6:20	39	Y - N		P D I O
6:30	40		Y - N	P D I O
6:40	41	Y - N		P D I O
6:50	42		Y - N	P D I O
7:00	43	Y - N		P D I O
7:10	44		Y - N	P D I O
7:20	45	Y - N		P D I O
7:30	46		Y - N	P D I O
7:40	47	Y - N		P D I O
7:50	48		Y - N	P D I O
8:00	49	Y - N		P D I O
8:10	50		Y - N	P D I O
8:20	51	Y - N		P D I O
8:30	52		Y - N	P D I O
8:40	53	Y - N		P D I O
8:50	54		Y - N	P D I O
9:00	55	Y - N		P D I O
9:10	56		Y - N	P D I O
9:20	57	Y - N		P D I O
9:30	58		Y - N	P D I O
9:40	59	Y - N		P D I O
9:50	60		Y - N	P D I O
10:00	61	Y - N		P D I O
10:10	62		Y - N	P D I O
10:20	63	Y - N		P D I O
10:30	64		Y - N	P D I O
10:40	65	Y - N		P D I O
10:50	66		Y - N	P D I O
11:00	67	Y - N		P D I O
11:10	68		Y - N	P D I O
11:20	69	Y - N		P D I O
11:30	70		Y - N	P D I O
11:40	71	Y - N		P D I O
11:50	72		Y - N	P D I O
12:00	73	Y - N		P D I O
12:10	74		Y - N	P D I O
12:20	75	Y - N		P D I O
12:30	76		Y - N	P D I O
12:40	77	Y - N		P D I O
12:50	78		Y - N	P D I O
13:00	79	Y - N		P D I O
13:10	80		Y - N	P D I O
13:20	81	Y - N		P D I O
13:30	82		Y - N	P D I O
13:40	83	Y - N		P D I O
13:50	84		Y - N	P D I O
Reliability		_____	_____	_____

Lesson Context

M - management
T - transition
K - knowledge
F - fitness
S - skills practice
G - game

X - out of view
L - lost
? - interpretation

Interval (Minutes)	Girl Activity Level	Boy Activity Level	Teacher Behavior	Lesson Context
14:00 85	Y - N		P D I O	M - management
14:10 86		Y - N	P D I O	T - transition
14:20 87	Y - N		P D I O	K - knowledge
14:30 88		Y - N	P D I O	F- fitness
14:40 89	Y - N		P D I O	S - skills practice
14:50 90		Y - N	P D I O	G - game
15:00 91	Y - N		P D I O	X - out of view
15:10 92		Y - N	P D I O	L - lost
15:20 93	Y - N		P D I O	? - interpretation
15:30 94		Y - N	P D I O	
15:40 95	Y - N		P D I O	
15:50 96		Y - N	P D I O	
16:00 97	Y - N		P D I O	
16:10 98		Y - N	P D I O	
16:20 99	Y - N		P D I O	
16:30 100		Y - N	P D I O	
16:40 101	Y - N		P D I O	
16:50 102		Y - N	P D I O	
17:00 103	Y - N		P D I O	
17:10 104		Y - N	P D I O	
17:20 105	Y - N		P D I O	
17:30 106		Y - N	P D I O	
17:40 107	Y - N		P D I O	
17:50 108		Y - N	P D I O	
18:00 109	Y - N		P D I O	
18:10 110		Y - N	P D I O	
18:20 111	Y - N		P D I O	
18:30 112		Y - N	P D I O	
18:40 113	Y - N		P D I O	
18:50 114		Y - N	P D I O	
19:00 115	Y - N		P D I O	
19:10 116		Y - N	P D I O	
19:20 117	Y - N		P D I O	
19:30 118		Y - N	P D I O	
19:40 119	Y - N		P D I O	
19:50 120		Y - N	P D I O	
20:00 121	Y - N		P D I O	
20:10 122		Y - N	P D I O	
20:20 123	Y - N		P D I O	
20:30 124		Y - N	P D I O	
20:40 125	Y - N		P D I O	
20:50 126		Y - N	P D I O	
21:00 127	Y - N		P D I O	
21:10 128		Y - N	P D I O	
21:20 129	Y - N		P D I O	
21:30 130		Y - N	P D I O	
21:40 131	Y - N		P D I O	
21:50 132		Y - N	P D I O	
Reliability	_____	_____	_____	

Interval (Minutes)		Girl Activity Level	Boy Activity Level	Teacher Behavior	Lesson Context
22:00	133	Y - N		P D I O	M - management
22:10	134		Y - N	P D I O	T - transition
22:20	135	Y - N		P D I O	K - knowledge
22:30	136		Y - N	P D I O	F - fitness
22:40	137	Y - N		P D I O	S - skills practice
22:50	138		Y - N	P D I O	G - game
23:00	139	Y - N		P D I O	X - out of view
23:10	140		Y - N	P D I O	L - lost
23:20	141	Y - N		P D I O	? - interpretation
23:30	142		Y - N	P D I O	
23:40	143	Y - N		P D I O	
23:50	144		Y - N	P D I O	
24:00	145	Y - N		P D I O	
24:10	146		Y - N	P D I O	
24:20	147	Y - N		P D I O	
24:30	148		Y - N	P D I O	
24:40	149	Y - N		P D I O	
24:50	150		Y - N	P D I O	
25:00	151	Y - N		P D I O	
25:10	152		Y - N	P D I O	
25:20	153	Y - N		P D I O	
25:30	154		Y - N	P D I O	
25:40	155	Y - N		P D I O	
25:50	156		Y - N	P D I O	
26:00	157	Y - N		P D I O	
26:10	158		Y - N	P D I O	
26:20	159	Y - N		P D I O	
26:30	160		Y - N	P D I O	
26:40	161	Y - N		P D I O	
26:50	162		Y - N	P D I O	
27:00	163	Y - N		P D I O	
27:10	164		Y - N	P D I O	
27:20	165	Y - N		P D I O	
27:30	166		Y - N	P D I O	
27:40	167	Y - N		P D I O	
27:50	168		Y - N	P D I O	
28:00	169	Y - N		P D I O	
28:10	170		Y - N	P D I O	
28:20	171	Y - N		P D I O	
28:30	172		Y - N	P D I O	
28:40	173	Y - N		P D I O	
28:50	174		Y - N	P D I O	
29:00	175	Y - N		P D I O	
29:10	176		Y - N	P D I O	
29:20	177	Y - N		P D I O	
29:30	178		Y - N	P D I O	
29:40	179	Y - N		P D I O	
29:50	180		Y - N	P D I O	
Reliability		_____	_____	_____	

Interval (Minutes)	Girl Activity Level	Boy Activity Level	Teacher Behavior	Lesson Context
30:00 181	Y - N		P D I O	M - managment
30:10 182		Y - N	P D I O	T - transition
30:20 183	Y - N		P D I O	K - knowledge
30:30 184		Y - N	P D I O	F - fitness
30:40 185	Y - N		P D I O	S - skills practice
30:50 186		Y - N	P D I O	G - game
31:00 187	Y - N		P D I O	X - out of view
31:10 188		Y - N	P D I O	L - lost
31:20 189	Y - N		P D I O	? - interpretation
31:30 190		Y - N	P D I O	
31:40 191	Y - N		P D I O	
31:50 192		Y - N	P D I O	
32:00 193	Y - N		P D I O	
32:10 194		Y - N	P D I O	
32:20 195	Y - N		P D I O	
32:30 196		Y - N	P D I O	
32:40 197	Y - N		P D I O	
32:50 198		Y - N	P D I O	
33:00 199	Y - N		P D I O	
33:10 200		Y - N	P D I O	
33:20 201	Y - N		P D I O	
33:30 202		Y - N	P D I O	
33:40 203	Y - N		P D I O	
33:50 204		Y - N	P D I O	
34:00 205	Y - N		P D I O	
34:10 206		Y - N	P D I O	
34:20 207	Y - N		P D I O	
34:30 208		Y - N	P D I O	
34:40 209	Y - N		P D I O	
34:50 210		Y - N	P D I O	
35:00 211	Y - N		P D I O	
35:10 212		Y - N	P D I O	
35:20 213	Y - N		P D I O	
35:30 214		Y - N	P D I O	
35:40 215	Y - N		P D I O	
35:50 216		Y - N	P D I O	
36:00 217	Y - N		P D I O	
36:10 218		Y - N	P D I O	
36:20 219	Y - N		P D I O	
36:30 220		Y - N	P D I O	
36:40 221	Y - N		P D I O	
36:50 222		Y - N	P D I O	
37:00 223	Y - N		P D I O	
37:10 224		Y - N	P D I O	
37:20 225	Y - N		P D I O	
37:30 226		Y - N	P D I O	
37:40 227	Y - N		P D I O	
37:50 228		Y - N	P D I O	
Reliability	_____	_____	_____	

Interval (Minutes)	Girl Activity Level	Boy Activity Level	Teacher Behavior	Lesson Context
38:00 229	Y - N		P D I O	M - management
38:10 230		Y - N	P D I O	T - transition
38:20 231	Y - N		P D I O	K - knowledge
38:30 232		Y - N	P D I O	F - fitness
38:40 233	Y - N		P D I O	S - skills practice
38:50 234		Y - N	P D I O	G - game
39:00 235	Y - N		P D I O	X - out of view
39:10 236		Y - N	P D I O	L - lost
39:20 237	Y - N		P D I O	? - interpretation
39:30 238		Y - N	P D I O	
39:40 239	Y - N		P D I O	
39:50 240		Y - N	P D I O	
Reliability	_____	_____	_____	

MVPA Summary

Allocated Time Summary

	Girl	Boy		
Fitness	____/____	____/____	Fitness	_____
Percentage	_____	_____		
Average	_____			
Skills Practice/Game	____/____	____/____	Practice/Game	_____
Percentage	_____	_____		
Average	_____			
Combined (Fitness, Skills practice & Games)	____/____	____/____	Combined	_____
Percentage	_____	_____		
Average	_____			
Other (management, transition, knowledge)	____/____	____/____	Other	_____
Percentage	_____	_____		
Average	_____			
TOTAL	____/____	____/____	TOTAL	_____
Percentage	_____	_____		
Average	_____			

APPENDIX J

Cheldelin Middle School
SOFIT Observation Form

Date: _____ Gr: _____ Period _____
Teacher: _____

Student (Minutes)		Girl MVPA	Boy MVPA
0:00	1	Y - N	Y - N
1:00	2	Y - N	Y - N
2:00	3	Y - N	Y - N
3:00	4	Y - N	Y - N
4:00	5	Y - N	Y - N
5:00	6	Y - N	Y - N
6:00	7	Y - N	Y - N
7:00	8	Y - N	Y - N
8:00	9	Y - N	Y - N
9:00	10	Y - N	Y - N
10:00	11	Y - N	Y - N
11:00	12	Y - N	Y - N
12:00	13	Y - N	Y - N
13:00	14	Y - N	Y - N
14:00	15	Y - N	Y - N
15:00	16	Y - N	Y - N
16:00	17	Y - N	Y - N
17:00	18	Y - N	Y - N
18:00	19	Y - N	Y - N
19:00	20	Y - N	Y - N
20:00	21	Y - N	Y - N
21:00	22	Y - N	Y - N
22:00	23	Y - N	Y - N
23:00	24	Y - N	Y - N
24:00	25	Y - N	Y - N
25:00	26	Y - N	Y - N