GENERALIZATION OF SUPPORTING MOVEMENT IN TAG RUGBY FROM PRACTICE TO GAMES IN 7TH AND 8TH GRADE PHYSICAL EDUCATION

DISSERTATION

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By

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ABSTRACT

Dissatisfaction with the outcomes of traditional physical education has been a recurrent theme in the literature at least two decades. Central to the problems of traditional physical education has been ineffective game instruction. Recently, there have been a number of studies focusing on how to teach students the tactics of game play. Initial studies have failed to validate proposed instructional models. The purpose of this investigation was to examine the effects of tactic-focused instruction using technique-focused instruction as baseline on the 7th and 8th grade students' game performance, and to assess generalization effects from teaching scrimmages to scrimmages in tag rugby. Lessons were designed to provide good pedagogical examples of each instructional condition. The conditions were assessed using a multiple baseline design across two classes with a third class serving as a control. Four target students were selected from each class (n=12). The dependent variable was the percentage of correct "supporting movements" occurring during scrimmages. Results show that low skilled female and male students, and average skilled female students improved their percentage of supporting movements after the tactic-focused instruction was implemented. There were no intervention effects for average skilled male students, however, these students demonstrated practice effects during baseline. In addition, generalization from teaching scrimmages to scrimmages occurred for all student groups except average skilled males.

This study contributes to the literature in three ways. First, this study demonstrates that it was possible to explicitly teach and improve the tactical performance of students. Second, this study demonstrates generalization from practice to games in physical education providing a validation of the pedagogy assessed in this study. Third, data shows that low skilled students, and in particular female students, can acquire tactical skills within an instructional unit and participate as active and successful participants in game play.

Dedicated to Daryl Siedentop

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FIELD OF STUDY

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Physical Education

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CHAPTER 1

INTRODUCTION

Learning how to play sports is a major part of most secondary physical education programs. Accordingly, the National Association for Sport and Physical Education [NASPE] (1995) recognizes the development of competence and proficiency in games and sports as a primary goal of physical education programs. As a profession, we have assumed that individuals who are more competent and proficient at sports are more likely to be physically active in the future (Rink, 1996). The reality is that many students do not enjoy physical education (Carlson, 1995) and become disengaged during secondary school physical education (Cothran & Ennis, 1998). As a result, students tend to leave school without motivation, competence, and knowledge to participate successfully in sports as they enter adulthood (Bunker & Thorpe, 1982; Holt, Strean, & Bengoechea, 2002). Moreover, there is increasing evidence to show that non-participation in sports contributes to the inactivity of adults (Dale, Corbin, & Cuddihy, 1998; Dale & Corbin, 2000).

These outcomes of secondary physical education have been associated with what has been called "traditional" physical education (McMorris, 1998; Turner & Martinek, 1995). Traditional physical education is characterized by a multi-activity approach to physical education emphasizing multiple activities with varying amounts of time spent on

technique development, little or no emphasis on tactics and where playing in a tournament is the central outcome of the activity (Ward, 1999). Often this approach is structured as a 6-10 lesson instructional unit where 1-3 lessons are focused on basic skills, which is followed by tournament play for the remainder of the unit.

Dissatisfaction with the outcomes of traditional physical education has been reported by many researchers (Bunker & Thorpe, 1982; Griffin, Mitchell, & Oslin, 1997; Launder, 2001; McMorris, 1998; Rink, 1996; Turner & Matirtinek, 1995; Siedentop 1980, 1981, 2002). Central to the problems of traditional physical education has been ineffective game instruction (Bunker & Thorpe, 1982; McMorris, 1998). Too much emphasis has been placed on skill and technical practice as a means for improving performance in games. Less attention has been given to understanding the overall dynamics of game play (Bailey & Almond, 1983). For example, in many physical education lessons students spend time practicing techniques and skills without any chance to learn how to use these skills in games. It is commonly assumed that students automatically learn how to use skills during the game context. Often skill and technique practice tends to be often seen as an end in itself. As a result, students do not understand why they practice skills and techniques or how to use those skills and techniques in game situations (McMorris, 1998; Turner & Martinek, 1995). Rink, French and Tjeerdsma (1996) noted, "The traditional approach to teaching sports has done little beyond developing inert skills that have little reasonable chance of being used in a real setting. The real and authentic setting for sport activities in this context is the game" (p. 399).

A successful game performance requires more than skills. In order to be a good player, students have to be able to identify game conditions that increase their chances of

scoring points and identify game conditions that increase the chances of preventing their opponents from scoring points. Students should be able to play the game using tactics, which are specific choices students have made from their repertoire in response to the existing game condition. From an educational perspective such choices demonstrate that students know and understand when and how to use skills in a timely and effective manner.

For most of the 20th century, research has focused on skill development. Little attention has been given to investigating tactical skill development (McMorris, 1998; Rink et al., 1996; Siedentop, 2002; Turner & Martinek, 1995). In the late 1960s, the Teaching Games for Understanding (TGfU) approach was introduced at Loughborough University in England as one reaction against the traditional approach of teaching sports (Werner, Thorpe, & Bunker, 1996; Werner & Almond, 1990). Since the early 1990's, there has been a growing and active debate on how to teach games in the North American research and professional literatures. A number of pedagogical papers (Holt, Strean, & Bengoechen, 2002; Kirk & MacPhail; 2002; Mitchell & Oslin, 1999; Turner & Martinek, 1992, 1995, 1999), applied articles (Werner & Almond, 1990; Werner, Thorpe, & Bunker, 1996), and books (Butler, Griffin, Lombardo, & Nastasi, 2003; Griffin, Mitchell, & Oslin, 1997) have been published in support of TGfU.

There are two major assumptions in TGfU. One is that the primary goal of teaching games is not necessarily skillfulness, but game appreciation and tactical awareness (Werner & Almond, 1990; Werner, Thorpe, & Bunker, 1996). In the model, game appreciation is defined as players who understand what they are trying to do related to the rules of the game (Werner & Almond, 1990; Werner, Thorpe, & Bunker, 1996).

Tactical awareness occurs as players are introduced to the vocabulary, concepts and tactics in games, designated to promoting understanding (Bunker & Thorpe, 1982; 1986). Decision-making is considered critical to all games that require the performer to be adaptable and quick thinking. For example, decision-making occurs in the case of passing, shooting, or dribbling in invasion games. Bunker and Thorpe (1986) insist that the decision-making should precede the use of appropriate techniques. In TGfU instruction, emphasis is focused on developing tactical awareness, game appreciation, and decision-making, rather than skill execution alone.

A second assumption of TGfU (1982) is that "tactics" can be transferred from one game to another. For example, tactical problems of invasion games (i.e., soccer, field hockey, and basketball) such as how to penetrate an offense, or how to use person-to-person defense in games, are assumed to transfer from one game to another when taught using TGfU.

Most research conducted concerning TGfU has focused on comparing traditional physical education or a strictly technical based approach to TGfU (Turner & Martinek, 1992, 1999) or variations of TGfU. The focus of such instructional comparison studies has been to assess both cognitive and skill outcomes (French, Werner, Rink, Taylor, & Hussey, 1996; French, Werner, Taylor, Hussey, & Jones, 1996; Mitchell, Griffin & Oslin, 1995). The existing research however, is limited, equivocal, and fraught with non-significant findings (Holt, Strean, & Bengoechea, 2002; McMorris, 198; Rink, 1996; Turner & Martinek 1995; 1999; Werner & Almond, 1990). Initial studies have failed to prove that the TGfU approach is more effective than the technical approach or that the assumptions that underlie this approach are achievable. Instead, researchers have

concluded that both technical and TGfU approaches improved both cognitive and skill outcomes similarly (French, Werner, Rink, et als., 1996; French, Werner, Taylor, et als., 1996). There is some evidence that the TGfU approach has produced gains in student cognitive outcomes. However, these studies have not shown significant differences in games outcomes for either approach (Turner & Martinek, 1992; 1999). One study has examined the assumption of transfer of tactics from one game to another (Mitchell, Griffin, & Oslin, 1995).

One of the reasons of the non-significant findings could be a measurement problem due to the use of a broadly defined dependent variable. From a behavioral perspective an execution of tactical performance reflects the accumulation of a person's history of discrimination and generalization responses in similar conditions. Such discrimination and generalization are predicated on contextual stimuli. For example, the position of members of the offense during a corner kick in a game of soccer are stimuli for a defender's positioning. In addition, when the ball is kicked, the speed, direction and trajectory function as typographic stimuli for all of the players' resultant movements. Movements by players can also be affected by the rules they are following such as person to person or zone defense, or the instructions that if a particular situation occurs then "do this." Such rules can be provided by teammates or by the coach, or they might be formed from past experiences.

The other reasons for the non-significant findings could be a problem with the independent variable (i.e., curriculum problem). This is the issue either if the curriculum model itself is effective or the curriculum has been consistently examined. Few studies

have checked the independent variable as important to measure. It is impossible to know which issue is responsible to the non-significant findings.

Behavior analysis provides explicit instructional strategies for the teaching of generalization that include: (a) programming common stimuli (e.g., using almost identical game conditions such as using the same opponents, location of the game place, and same rules for practice), (b) loose training such as teaching defense skills in more demanding conditions (e.g., 2 vs. 3 or 3 vs. 4 players), (c) teaching enough examples (e.g., using various tactical scenarios to teach various game conditions and proper responses), (d) using indiscriminable contingencies (e.g., delivering intermittent reinforcement or delayed consequences), and (e) self-management (e.g., using a self-checklist to improve the success rate of proper response or using self-assessment) (Cooper, Heron, & Heward., 1987).

Statement of the Problem

Many of the issues relating to game performance of students in the physical education literature can be considered a failure of generalization from practices to games and from games to games. A number of researchers have demonstrated the effects of generalization from practice to games using public posting as a motivating variable in college football settings (Ward & Carnes, 2002; Ward, Smith & Sharpe, 1997) and in a high school intramural soccer setting (Brobst & Ward, 2002). However, little attention has been given to generalization from practice to games in physical education.

A behavioral approach does not assume learners' generalized behaviors occur by chance (i.e., teach and hope that students will understand) but instead uses explicit

teaching to carefully design and implement instruction designed to promote generalization. Generalization has worked well in team sports contexts (Brobst & Ward, 2002; Ward & Carnes, 2002), in special education (Craft, Alber, & Heward, 1998; Fantuzzo & Clement, 1981; Goetz & Baer, 1973; Hurlburt, Iwata, & Green, 1982; Sprague & Horner, 1984), and in general education contexts (de Rose, de Souza, & Hanna, 1996). To date, no study in secondary physical education has examined generalization effects as an instructional strategy in the context of teaching games.

The other issue from the literature can be considered a measurement of the dependent variable. It is important to establish accurate definitions of dependent variables including contexts of the behaviors and the unit of analysis based on the clarification of a system of tactics. In this study, tactics are defined as behaviors demonstrating when to use and how to use skills in a specific sport context. For this study "supporting movement" was chosen as a critical tactic in rag rugby. To clarify the scope of measurement a system of tactics in invasion games is used that was modified from Bauer (2001).

The purpose of this investigation was to examine the effects of tactic-focused instruction using technique-focused instruction as baseline on the 7th and 8th grade students' game performance, and to assess generalization effects from teaching scrimmages to scrimmages in tag rugby.

Research Questions

1. What is the level of supporting movement under technique-focused instruction for low and average skilled female and male participants?

2. What are the effects of tactic-focused instruction on supporting movement during the teaching scrimmage for low and average skilled female and male participants?
3. What is the level of supporting movement under technique-focused instruction for low and average skilled female and male participants?
4. What are the effects of teaching scrimmage under tactic-focused instruction on supporting movement during 4v4 free scrimmage for average and low skilled female and male participants?
5. How acceptable are the goals, procedures, and outcomes of the intervention to the teachers who taught the unit of the instruction?
6. How acceptable are the goals, procedures, and outcomes of the intervention to a panel of physical education professionals?

Significance of the Study

This study contributes to the literature in the following ways. First, this study provides a clear definition of tactics. In many studies, tactics have been described as decision-making, but the definition of tactics and the relationship with the measurement was often not clearly reported (Rink, 1996). To provide a precise definition of tactics, this study proposes a system of tactics in invasion games. According to Bauer (2002) there are various dimensions of tactics in a game system such as individual tactics, group tactics, team tactics, tactics with a ball, tactics without the ball, offensive tactics, and defensive tactics. The use of this framework allows tactics to be both typographically and functionally defined.

Second, in this study technique-focused instruction and tactic-focused instruction were compared. In similar studies there is often little effort to assure the quality of the "baseline" against which the "intervention" is compared. In this study, both instructional conditions were created to offer the best of each approach and the pedagogy used in this study was controlled to provide equal opportunity for quality performance. Thus, this study is based on a fair comparison under equal opportunity for quality performance between tactic-focused instruction and technique-focused instruction.

Third, this study assessed the generalization effects from practice to games in each instructional condition. The pedagogy used to achieve this included the use of the "freeze technique" (Allison & Allyon, 1980). In this technique the teacher calls a freeze to the play in a scrimmage or drill and players are questioned about their current physical placements relative to the play. This is followed by modeling and then a replay of the events. This pedagogy has not been assessed in physical education contexts previously. Moreover, this strategy of assessing generalization of tactics from practices to games provides a measure of validity the instructional approaches to teaching games that have been absent from past investigations.

Anthropological Assumptions

Behavior is the subject matter in this study. This assumption does not ignore the existence of decision-making, feelings, thinking, recall, problem-solving, ideas, and emotions (Skinner, 1974). They are covert, rather than overt behaviors, but they are nonetheless subject to the same principles and processes as overt behavior (O'Donohue, 2001; Skinner, 1974). Such behaviors are considered "verbal behavior" rather than

hypothetical mental entities (Skinner, 1974). Thus, in this study the variable of interest, tactics, is considered behavior.

Johnson and Pennypacker (1993) define behavior as, "that portion of an organism's interaction with its environment characterized by a detectable displacement in space through time of some part of the person and that results in a measurable change in at least one aspect of the environment." (p. 23). Based on this definition, several important anthropological assumptions follow:

1. The domain of behaviors is limited to a living organism (Johnston & Pennypacker, 1993). For example, 'pitching' by a ball machine is not a behavior.
2. Behaviors should be understood as a part of a relationship between an organism and its environment in which the biological result of an organism exists in a dynamic way (Johnston & Pennypacker, 1993). For example, when a rugby player successfully passes the ball to a teammate, this behavior is occasioned by some change in the environment such as a defender moving toward the player or a teammate who has in the past successfully scored a try moving to a desirable position to score a try. The probability of the player with the ball making this play again will depend on whether the play is successful in this instance. For example, both a try by the teammate or an interception by the defense are changes in the environment.
3. Behavior is not a property or possession of the organism, rather it is emitted when there is an interactive condition between the organism and

surroundings (Johnston & Pennypacker, 1993). An execution of tactical performance reflects the accumulation of a person's history of discrimination and generalization responses in similar conditions, rather than reflecting the individual's possession of the tactical skill to execute the skill.

4. There should be a functional relationship between conditions and changes to be considered a behavioral occurrence. Independent conditions and changes in the environment do not define behavioral occurrences due to the lack of causality (Johnston & Pennypacker, 1993). For example, there should be a functional relationship between technique-focused instructional condition and technique performance of students. But if the teacher taught all game rules and history of tag rugby, there is no functional relationship between student performance on techniques and teachers instructional condition.

5. Environment is defined as, "the complex of real circumstances in which the organism or referenced part of the organism exists. This includes any physical event or complex of events that is not part of a behavior and may include other aspects of the organism (Johnson & Pennypacker, 1993, p. 365)."

6. An individual's behavior is a result of their genetic predispositions, their specific history of reinforcement, and the contingencies operating at a current point in time (Skinner, 1974).

7. Tactical skills and decision-making are defined as behaviors.

Limitations of the study

1. There were student absences that caused missing data points.
2. Among three experimental classes (class A, B, & C), only class A and B received tactic-focused instruction. Class C did not receive the tactic-focused instruction, thus it remained as an untreated baseline.
3. There were only 4 sessions of the tactic-focused instruction for class B. Four sessions of the tactic-focused instruction limits the interpretation of the intervention effects.
4. There were practice effects under technique-focused instruction.
5. The low temperature outside influenced the data.

Delimitations of the study

1. This study is delimited to 19 sessions of a tag rugby unit.
2. The scope of this study is limited to teaching scrimmage and free scrimmage (4v4) in a tag rugby unit.
3. Tactics are defined as observable behaviors in the context of tag rugby.
4. Supporting movement was selected as a tactic in this study, which was measured in terms of each individual's performance when the team has the possession of the ball and the players excluding the ball carrier.
5. This study is delimited to middle school students (7^{th} and 8^{th} grades).
6. This study is delimitated to physical education.
7. This study is delimited to a unit of tag rugby taught by experienced and effective physical education teachers.

Definition of Terms

1. Discrimination: Tendency for behavior to occur in one situation but not others (Cooper et al., 1987).
2. Episode: Episode is defined as the duration from the time the ball carrier received the ball to the time when the same ball carrier released the ball. Thus, each episode ends with any incidence of pass, tag, scoring, or a ball carrier's error.
3. Free scrimmage: There were 8-minute 4v4 free scrimmage sessions everyday. During free scrimmage, students played games without teachers' instructional activities. Teachers took roles as referees.
4. Freeze and replay: Whenever students did not perform what they practiced during the practice session, teachers stopped and provided feedback in terms of how to perform better, and then the game restarted. When students followed the directions well and performed correctly, positive feedback was given. When students stopped the game due to the lack of game rules, teachers gave game instructions.
5. Game: broadly defined as any form of playful competition whose outcome is determined by physical skill, strategy and chance. However, game is usually meant as an authentic competition setting in which rule bound goal – driven activities take place (Siedentop, 2004).
6. Generalization: Stokes and Baer (1977) define generalization as the occurrence of relevant behavior under different, non-training conditions (i.e., across subjects, settings, people, behaviors, and/or time). In this study this definition will be used.

7. Potential ball carrier: The player right beside or behind the ball carrier is defined as a potential ball carrier in a diagonal formation or arrow formation.
8. Practice session: There were 8-minute practice sessions every lesson and either technique-focused drills or tactic-focused drills were practiced according to each instructional condition.
9. Sport: games that involve combinations of physical skill and strategy. Not all games are sport (e.g., chess, hop scotch), but sport is always a game (Siedentop, 2004).
10. Supporting movement: being beside or behind (except right behind position) the ball carrier or a potential ball carrier, and keeping a distance between 3-7 yards from the ball carrier or a potential ball carrier in each episode. If the episode is longer than 5 seconds, the observation stopped at the time of 5 seconds.
11. Tactics: defined as behaviors demonstrating when to use and how to use skills. More details of system of tactics are described in chapter 2 (See Figure 2.1) and descriptions.
12. Teaching scrimmage: There were 8-minute teaching scrimmage sessions every lesson and the "freeze and replay" strategy was used to teach either tactical skills or techniques. Teaching scrimmage sessions were held in the same 4v4 game context but the teachers were able to stop games and provided feedback (i.e., technique-focused feedback under technique-focused condition and tactic-focused feedback under tactic-focused condition).

13. Traditional approach – developing specific skills (i.e., dribbling, shooting, and passing), which emphasize developing physical ability rather than understanding the dynamics of game (Turner & Martinek, 1995).

CHAPTER 2

LITERATURE REVIEW

This chapter begins with a review of how tactics have been studied in physical education and sports settings. Next, the theoretical rationales that drive the research and teaching of tactics are discussed. Because tactics are sports-specific, this chapter concludes with a review of existing classification systems for tactics including a proposal for classifying tactics in invasion games.

How Have Tactics Been Studied?

The purpose of this section is to review the literature that focuses on research using tactics as a dependent or independent variable or as the primary focus of the study (e.g., descriptive or qualitative studies) in physical education and sport settings. Three inclusion criteria were used to select studies. First, studies were included if they measured tactics in the context of game performance. The primary purpose of tactics studies has been to improve game performance. Without considering the game performance dimension, it is hard to assess the validity of such an inquiry. Second, studies were included if they used participants in 5-12th grade physical education or participants in collegiate sports. The purpose of teaching games in the elementary school is different from upper elementary and secondary school because students lack mature

performances. Thus, the inclusion criteria excluded the early elementary school level. Third, studies were included if they were published in peer-reviewed journals. Dissertations, conference papers, non-data based articles, and textbook chapters were excluded for this review. The literature search began with a manual search in top ranked databased journals (i.e., Journal of Teaching in Physical Education [JTPE] and Research Quarterly in Exercise and Sports [RQES]) in physical education from 1981 to 2003. Two monographs of JTPE (Rink et al., 1996, Griffin et al., 2001) and several review studies (Holt, et al., 2002; McMorris, 1998; Turner & Martinek, 1995) were examined and the reference lists of these studies were used for the pool of articles. In addition, a search of three on-line databases (ERIC database, PsychInfo, and Sport Discus) was conducted using the key terms, “game(s)”, "tactic (al)", “teaching games for understanding” and "TGfU" combined with the term “physical education”.

Studies that met the inclusion criteria were then coded according to the following categories: (a) study focus, (b) authors and published date, (b) content (i.e., settings), (c) duration of study, (d) participants, and (e) definition and measurement of tactics. A total of 15 studies met the inclusion criteria. Four broad categories of studies were identified: (a) studies that compared the performance in the games of experts and novices (N=4), (b) studies that compared different approaches to the teaching of games (N=4), (c) studies that validated instruments designed to collect data on tactical performance (N=3), and (d) studies that specifically assessed generalization from one setting to another (N=4). These studies are summarized in Table 2.1 (See Table 2.1).

Study Focus	Author (s) & Published Year	Content (Setting)	Duration of study	Participants	Definition & Measure
Expert-Novice comparison	Blomqvist, Luhtanen & Laakso (2000)	Badminton	N/A	Age 13-14 (n=26)	Tactics as game understanding measured by game understanding test Correlation between skills and understanding was measured
	McPherson (1999)	Tennis	N/A	Age 10-11 Age 12-13 Collegiate adults	Tactics as decision-making measured by game performance measurement and verbal protocol procedure
	Nevett & French (1997)	Baseball	N/A	Age 8 (n=7), age 10 (n=8), and age 12 (n=9)	Tactics as cognitive function measured by knowledge test and verbal protocol procedure
	French, Spurgeon, & Nevett (1995)	Baseball	5 games during all season games	Age 7 (n=28) Age 8 (n=44) Age 9 (n=45) Age 10 (n=42)	Tactics as decision-making and knowledge measured by game performance instrument
Instructional Comparison	Turner & Martinek (1999)	Field Hockey (Technique and TGfU groups) Softball (control group)	15 lessons	6^{th} and 7^{th} grade students (n=71)	Tactics as decision-making during game measured by game performance instrument
	French, Werner, Rink, Taylor, & Hussey (1996)	Badminton	3 weeks	9^{th} grade (n=48)	Tactics as knowledge used in game play measure by "point-interview"
	French, Werner, Taylor, Hussey, & Jones (1996)	Badminton	6 weeks	9^{th} grade (n=52)	Tactics as knowledge measured by knowledge test, game performance instrument, and "point interview"
	Turner & Martinek (1995)	Field Hockey	15 classes	6^{th} & 7^{th} grades	Tactics as decision-making and knowledge measured by game performance assessment and knowledge test

Table 2.1: Experimental Studies in 5^{th} –12^{th} Grades and College settings (Continued)

Study Focus	Author (s) & Published Year	Content (Setting)	Duration of study	Participants	Definition & Measure
Validating an instrument	Richard, Godbout, Tousignant, & Grehaigne (1999)	Modified basketball activities	6 weeks	5th-8th grade (N/A)	Tactics are offensive and defensive capacities of the player measured by using the performance assessment instrument in team sports
	Oslin, Mitchell, & Griffin (1998)	Invasion Net/wall Field/run/score	N/A	6th grade	Tactics as understanding and problem solving skills measured by GPAI
	Grehaigne, Godbout, & Bouthier (1997)	Basketball European handball Soccer Volleyball	N/A	Age 12-13	Tactics are offensive and defensive capacities of the player measured by using the performance assessment instrument in team sports
Effects Generalization	Ward & Carnes (2002)	American Football	43 sessions (both practice & game)	Collegiate football players (n=5)	Football tactics defined as reads, drops, and tackles measured by the percentage of correct response
	Brobst & Ward (2002)	Soccer	37 sessions (both practice & game)	High school soccer players	Soccer tactics defined as kept and maintained possession of the ball/ moved to an open position during a game start/ moved to an open position after passing the ball measured by the percentage of correct response
	Ward, Smith & Sharpe (1997)	Football	38 sessions	Collegiates (n=5)	Football tactics as effects of accountability on task accomplishment measured by the percentage of correct response
	Mitchell, Griffin, & Oslin (1995)	Badminton & Pickle ball	15 lessons	9th grade (n=21)	Tactics as decision making measured by GPAI

Notes: N/A = Not available. GPAI = Game Performance Assessment Instrument

Table 2.1: Experimental Studies in 5th –12th Grades and College settings

Studies That Validated Instruments Designed To Collect Data On Tactical Performance

Until recently, game performance has rarely been assessed, instead skill tests assessing a student's technical performance have dominated the literature (Bauer, 2002; Biscombe, 1998; Verner, 1992). Since the early 1990's the need for an assessment of game performance has been emphasized (Griffin, et al., 1997; Siedentop, 2002). Griffin, et al. (1997) developed the Game Performance Assessment Instrument (GPAI) for assessing game performance that was introduced in their textbook, *"Teaching sport concepts and skills: A tactical games approach."* The GPAI is designed to assess game performance during the game, rather than during drills. Griffin et al. (1997) noted that improved game performance comes from increased tactical awareness, which is defined as "the ability to identify problems and their solutions in game situations" (p. 218). Griffin et al. described the link between game performance and tactical awareness as occurring as a result of 'off the ball movements', 'skill selection', and 'skill execution.' Seven components of game performance were identified and grouped into three classes: 'decisions made', 'skill execution' and 'support.' A coding of 'decisions made' occurs when a player chooses to pass to a teammate in the open or if a player chooses to shoot when appropriate. 'Skill execution' is divided into the three sub categories of reception, passing, and shooting. This category measures the technical component of the performance. 'Support' occurs when the player attempts to support the ball carrier by moving to an appropriate position to receive a pass. The instrument of Griffin et al.(1997) includes appropriate or inappropriate codes for both decision-making and support category, and efficient or inefficient codes for the skill execution category.

The GPAI was tested and validated by Oslin, Mitchell, and Griffin (1998) in soccer, basketball, and volleyball. The validity of the GPAI was established in terms of confirming face validity, content validity, construct validity, and ecological validity. Oslin et al. (1998) checked face validity, which was defined as "determining its acceptability and reasonableness to those who will be tested" (Messick, 1989, p.6). Content validity was determined through a panel of experts as Kerlinger (1986) suggested. Oslin et al. (1998) reported that construct validity of GPAI was measured by its success in distinguishing between individuals previously rated as high and low in game performance. Oslin et al. (1998) checked ecological validity using the consistency between instructional objectives and measures of student performance as Davis and Burton (1991) recommended. Instrument reliability of the GPAI was established using test/retest, and observer reliability by checking inter-observer agreement (IOA). Oslin et al. found that the GPAI provided a valid and reliable method for assessing game performance.

Grehaigne, Godbout, and Bouthier (1997) introduced a team sport performance assessment instrument based on the observation of player's actions during matches and converting codes to two performance indices. Tactics were defined as functional adaptations to new configurations of play and the circulation of the ball. Thus, tactics were considered as an adaptation to opposition positioning. Grehaigne et al. (1997) developed a coding instrument, which included measures of: (a) how the player gained possession of the ball, and (b) how the player disposed of the ball. These two categories included sub categories, such as: (a) conquered ball (CB), (b) received ball (RB), (c) neutral ball (NB), (d) lost ball (LB), (e) offensive ball (OB), and (f) successful shot (SS).

The data from these six categories provided both the number of attack balls (AB) and the volume of play (PB) information in addition. The number of attack balls (AB) was determined by summing up the totals for OB and SS. The volume of play (PB) was calculated by the conquered ball plus the received ball under the possession of the ball category.

This information allows researchers and teachers to determine the game performance score, which is calculated as follows (CB + AB)/(10 + LB) OR (CB + OB + SS) / (10 + LB). Both the volume of play and the efficiency indices are measures of the extent of player's involvement into the team's attack, which in turn is a measure of the team's tactics. When both indices have high values, the game performance score is considered higher.

Grehaigne, et al. (1997) team sport performance assessment instrument was reported as valid across various team sports by establishing content validity, concurrent validity, and ecological validity. Reliability was established using inter-observer agreement and the stability of performance over a short time period. This instrument was proposed as a tool for diagnostic, formative, and summative assessment.

Richard, Godbout, Tousignant, and Grehaigne (1999) used the team sport performance assessment instrument of Grehaigne, et al. (1997) in elementary and junior high school physical education. This instrument was used by peers to assess game performance in team sports. Two components of game performance (i.e., possession of the ball and disposal of the ball) were identified in team sports and included in this instrument. In the study by Richard et al. (1999), teachers (n=6) from grades 5 to 8 were asked to use this assessment procedure with their students for a 6-week period to test the

acceptability of using this instrument. Using interview data, they concluded that all teachers indicated the student's competency and objectivity in using this peer evaluation instrument in a team sport, but they indicated that it took considerable time to train students in how to use this instrument.

Discussion

GPAI was developed for teachers and researchers as a means of observing and coding game performance behaviors (Oslin, et al., 1998). Despite a strong rationale for hypothesizing cognitive entities such as tactical awareness or decision-making, the measures used to define GPAI variables are observable behaviors. Without evidence of a functional relationship between hypothetical entities such as "awareness" and "observed behavior", the assumptions underlying Oslin et al. (1998) remain unsubstantiated.

Another issue in using the GPAI is that the variables are broadly defined in each category. For example, "support" is defined as, "Off the-ball movement to a position to receive a pass when player's team has possession." This definition does not have any contextual information such as timing (e.g., when one should be in position), distance (i.e., how far the receiver should be from the ball carrier to receive a pass), or the player's location (i.e., where to receive the ball relative to the passer such as in front, in back, or on the side). Without such information coding can become inaccurate and lead to both issues of validity and reliability. While a useful tool for teachers, from a research perspective GPAI may not be contextual and precise enough to allow the precise measurement of tactical variables.

The team sport performance assessment instrument of Grehaigne, et al. (1997) provides summary data of player performance like the GPAI, but not in the context in which the behavior actually occurred. Both are products of measurements that do not provide information of ongoing changes in each player's performance, but provide a final picture of how each player played.

In conclusion, there are two instruments that have been used to assess game performance. While validity and reliability have been established for both, the definitions of tactics in each are broadly defined and neither reports the context in which the events are recorded. Both may serve teachers well, but they may not be precise enough to function as research tools.

Expert-Novice Comparison

There are several studies report expert-novice knowledge differences in sports settings. However, some studies were excluded because they did not meet the inclusion criteria of measuring game performance. Four representative studies were included in this category of expert-novice comparison studies. This line of inquiry was initiated from the motor learning literature that focuses on the knowledge structure of the expert and novice players and its relationship to skill execution in naturalistic setting.

French, Spurgeon, and Nevett (1995) examined expert-novice differences in cognitive and skill execution components of youth baseball performance. They examined how cognitive and skill execution components of performance combine and interact by examining 159 players in youth baseball. French et al. (1995) videotaped game performance by using a batting instrument, a defensive game play instrument, and field

notes. The batting instrument measured batting average and percentage of ball contact. The defensive game play instrument was divided into five major categories: setting information, positioning, controlling, decision, and execution for coding. Each coding category was defined and reliability was established before the actual coding.

Tactics were defined as decision-making, which involved game decisions (i.e., throwing and tagging). Game decisions included a simple one-choice decision (no runners on base) and a more complex choice decision (runners on base). The accuracy of simple and complex decisions was measured on throwing decisions only. French et al. (1995) found that skill execution components differentiated expertise level. However, cognitive components did not differentiate expertise.

Nevett and French (1997) investigated cognitive strategies in baseball in 8-year-olds, 10-year-olds, 12-year-olds, and high school youths. The focus of the study was age related changes in the cognitive processes such as preplanning, rehearsal, and updating of plans used during defensive game performance. Nevett and French (1997) considered tactics as sport knowledge and sport-specific strategies, which underlie complex decision making in sport. They measured participant's knowledge using a 40-item knowledge test and concurrent talk-aloud protocol. Since the focus of this study was to investigate knowledge differences between expert and novice, participants' verbal behaviors were observed and coded after the participants heard a selected situation from an audiotape of the player's actual game play. Nevett and French (1997) found correlation between cognitive strategies and age variables. Nevett & French (1997) concluded that in younger players, both the quality of sport-specific strategies and their use were related to each other.

McPherson (1999) investigated expert-novice differences in performance skills and problem solving skills of youth and adults during tennis competition. She defined tactics as "knowledge (i.e., condition, action, and goal concepts)" (p. 235). Tactics were measured in different ways in two separate experiments. In the first experiment, tactics were measured by coding game performance by measuring serve decision, serve executions, game control, game decisions, and game executions using direct observation. In the second experiment, interviews were used to explore the action plans of expert and novice players. Overall findings showed differences between experts and novices in game performance and knowledge. For example, experts made better decisions and more forceful executions during competition. Within expert groups, differences were found in age and experience.

Blomqvist, Luhtanen, and Laakso (2000) examined differences in skill, game performance and game understanding in expert (n=12), and novice (n=14) badminton players. They divided game performance into cognitive and skill components. Skill tests, a game performance test, and a game understanding test were used to measure performance. Game performance variables were identified as total amount of shots, side of shot, direction of shot, average length of shots, total distance traveled by the player, effective playing time, and type of shot. Among them, the forceful shots were used for the measurement of decision-making and the game understanding test was used for the measurement of game understanding. The differences between experts and novices were compared, and the correlations among measured variables were analyzed.

Blomqvist et al. (2000) found that there were differences between experts and novices in skills, game performance, and game understanding. Game performance was

measured by using a game observation instrument that they developed. Game understanding was measured by using a video clip understanding test (e.g., if – then questions and answers). They also found that the percentage of forceful shots was related to both skill (r = .89) and game understanding (r = .62). However, no significant relations or even negative relations were found between successful shots, skill, and game understanding. Blomqvist et al. (2000) concluded that more effective game play was related to both skill and game understanding, and the more skillful players had a better understanding of the game. Blomqvist et al. (2000) did not define tactics clearly in this study, but they measured game understanding by using procedural knowledge test. In terms of the relationship of game understanding with other variables, they found game understanding was correlated with skill tests (r = .52).

Discussion

The origin of expert-novice comparisons comes from cognitive psychology. In the motor learning field the focus in these studies is on the relationship between cognition (i.e., knowledge) and motor skill execution. Although early research examined the relationship between "knowing what to do" and "how to do it," the limitations of using simple skill execution in the laboratory settings have been criticized because findings of simple skills from the laboratory setting are not necessarily generalized to more complex skills or to more complex settings such as sports competition settings or group instructional settings. More studies are needed to validate findings with complex skills or more studies in naturalistic settings are needed. Initially, the field based expert-novice comparison studies began with simple skills as dependent variables, but gradually the

number of studies examining more complex skills and naturalistic game settings increased (McPherson & Thomas, 1989; Nevett & French, 1997).

The inquiry of field-based expert-novice comparisons has moved toward showing relationships between knowledge. (i.e., declarative knowledge, procedural knowledge, strategic knowledge) and skill execution in sports settings. Tactics in such studies are considered as procedural knowledge that can be measured in various ways such as a knowledge test, point interview, and situational interview by using video clips edited using different sports situations. To date, this line of study has been descriptive and correlational, rather than experimental. Studies have focused on validating methodological techniques as much as demonstrating difference between experts and novices.

Instructional Comparison Studies

Instructional comparison studies have been conducted to either validate a specific instructional model such as TGfU (Turner & Martinek, 1999) or to examine the differences between treatment groups such as tactics and a control group (French, Werner, Rink, Taylor, & Hussey, 1996; French, Werner, Taylor, Hussey, & Jones, 1996). This line of studies has become an active research area as more attention has been focused on teaching games in the past decade. A fundamental assumption of TGfU and other tactical instructions is that students can improve game performance with tactical instruction that emphasizes cognitive learning using indirect and direct instruction. Technique instruction is often labeled traditional game instruction, and it has been widely criticized as ineffective to improving game performance (McMorris, 1998; Turner &

Martinek, 1995). Thus, many studies compare technical instruction with tactics instruction in an attempt to show that tactics focused instruction is a more effective teaching method than technique instruction for the purpose of teaching students tactical dimensions of playing a game.

French, Werner, Rink, Taylor, & Hussey (1996) compared effects of tactical, skill, or combined tactical and skill instruction on badminton performance on 9th grade students. Two explicit and discrete types of tactical and technical skill (technique) instructions, a combination of tactical and skill instruction, and control group were examined. Student performance was measured in various ways such as badminton knowledge, skill, game play (videotaping), and the use of knowledge during performance.

Tactics were described as either knowledge or knowledge used during game performance (e.g., goals, conditions, actions, self-regulation). They used a knowledge test to measure knowledge. They used point interviews and a game play instrument to measure knowledge used during the game. In the game play instrument, decision-making and skill execution were separated for coding. Among the coding categories, the decision-making category was considered a tactics measurement. In the point interview, they collected various concepts that students reported during the game. Based on the interview data, the frequency was counted under each emerging category including goals, conditions, actions, self-regulation, and meta-cognition.

During game play, French, Werner, Rink et al. (1996) found that decision-making components of performance during game play in badminton were related to skill execution components of performance. For example, forceful shots were strongly related

to the percentage of appropriate game decisions. Tactical, skill, and combination groups were similar to each other but different from the control group on forceful shots, game decisions, contact decisions, service decision, serve execution, and cooperative shots. French, Werner, Rink et al. (1996) concluded that the treatment groups were similar and there were no significant differences on measures of skills execution and decision-making during the game. Differences were found in skill tests and knowledge tests. But the skill group and tactical group had better scores on skill tests than the combination groups.

From the interview data analysis, French, Werner, Rink et al. (1996) found eight major categories that were reported by students: execution goals, general strategy goals, winning goals, all actions, all affective comments, self-regulation of actions, and conditions related to opponent's prior shot and game status. French, Werner, Rink et al. (1996) found that the tactical group tended to report a higher frequency of action concepts than other treatment groups. All treatment groups reported higher frequencies of action concepts than did the control group. More importantly they concluded,

> The decision performance exhibited in games was not accompanied by much improvement in the knowledge content of structure used during game play…Use of knowledge and metacognitive strategies during game play may take a longer period of time to develop or require different types of tactical instruction" (French, Werner, Rink et al., 1996, p. 437).

This conclusion raises the question of whether or not a longer period of experimentation would have made a difference.

French, Werner, Taylor, Hussey, and Jones (1996) replicated the study of French et al. (1996) using different sample of students and different teachers. The purposes of this study were: (a) to examine the effects of tactical, skill, and combined tactical and skill instruction on student performance over a longer period time (6 weeks), and (b) to replicate the previous study using different teachers and a different sample of students. Student performance was measured twice at 3 weeks and at the end of 6 weeks of instruction to determine teacher effects. The authors added more measurement instruments (i.e., verbal descriptions and error detection tests), which were not used in the previous study.

French, Werner, Taylor et al. (1996) found that all instructional groups (i.e., skill, strategies, and combined groups) achieved higher levels of cognitive and skill performance than the control group. All instructional groups improved cognitive and skill components of performance from 3 to 6 weeks. However, this study replicated the same findings of the previous study and demonstrated non-significant statistical differences between the three types of instruction.

Turner & Martinek (1999) compared the teaching games for understanding model to both the technique approach to games instruction and to a control group who did not receive field hockey instruction. The purpose of this study was to validate the games for understanding model in field hockey. Seventy-one middle school students participated in this study and 15 lessons were observed and analyzed. Pre-and-posttests were conducted for hockey knowledge, skill and game performance, and students outcomes were analyzed for cognition and skill.

Since the purpose of this study was to validate the games for understanding model, tactics were defined as tactical awareness and decision-making. Tactics were measured in two ways: (a) field hockey knowledge test, which consists of declarative items and procedural items, and (b) decision-making (i.e., shoot, dribble, and tackle) measured by using a game play observation instrument. In the game play observation instrument, control, decision and execution were coded and the cognitive decision-making aspect of game performance was separated from the motor skill execution component. Decisions were coded as an appropriate decision (shooting, passing, or tackling) or as an inappropriate decision.

In the findings for cognitive outcomes, Turner and Martinek (1999) reported that students receiving game for understanding instruction made better passing decisions but there were no significant differences for either dribbling or shooting decisions. In the knowledge test, the games for understanding group scored significantly higher on declarative and procedural knowledge test than the control group. There was however, no significant statistical difference between the games for understanding group and the technique group on knowledge test.

For the skill outcomes during games, the game for understanding group was superior to both the technique and control groups on measures of controlling and passing execution during posttest game play. No statistically significant differences on dribbling and shooting were found. Skill test performance also showed that there were no significant differences between treatment groups on accuracy, but the technique group performed better on the speed test.

Discussion

This line of studies explores the effects of different instructions such as tactical, technical (i.e., skill), and combined tactical and technical instruction on both cognitive and skill components of game performance. The findings of each study have demonstrated non-significant differences in both cognitive and skill components among different instructional methods. To date, efforts to validate of TGfU have not been successful.

In these studies tactics are defined as procedural knowledge or decision-making. Measurement is quite complicated because of the definition of tactics, which requires data on knowledge, skills and decision-making during games. The relationship among various measurements is quite confusing and often not clearly reported (Rink, 1996). For example, although French, Werner, Rink et al. (1996) and French, Werner, Taylor et al. (1996) measured both knowledge and skill, the relationship between the two tests was not clearly reported.

French, Werner, Taylor et al. (1996) continued to report non-significant findings between different instructional approaches despite extending the duration of the study and controlling for teacher effects. Turner and Martinek (1999) compared two instructional groups with a control group and they also did not demonstrate significant differences. There are at least three explanations for the non-significant findings. First, it could be a measurement problem such as broad definitions of the dependent variables, as discussed previously in this chapter. Second, perhaps the wrong dependent measures were used to assess tactics. This suggests a problem of validity. Third, it could be that

these independent variables were all ineffective in producing the changes and modifications or re-conceptualizations of these methods are required.

Generalization Studies

Generalization studies can be categorized into two foci of inquiry. One is generalization of tactics from practice to game within a sport (e.g., Brobst & Ward, 2002; Ward & Carnes, 2002: Ward, Smith, & Sharpe, 1997) and the other is a generalization across sports within a same sport classification category (e.g., Michell, Griffin, & Oslin, 1995).

Ward, Smith, and Sharpe (1997) investigated the effects of accountability on task accomplishment in collegiate football. The study assessed the effects of public posting as an independent variable to determine the effects on blocking and predetermined routes run during practice and games for seven NCAA II wide receivers. The blocks were defined as whether or not the wide receiver blocked effectively and legally. Running routes were defined as whether or not the wide receiver ran a predetermined path during a specific offensive play. An A-B-A-B withdrawal design was used to evaluate the effectiveness of the public posting intervention. Ward et al. (1997) found that public posting improved the players' performances, which met or exceeded a criterion of 90% correct performance trials established during practice. Ward et al. (1997) also found that this criterion performance generalized to the game setting. Social validity data revealed that using a public posting intervention was well accepted by both coaches and players.

Ward & Carnes (2002) investigated effects of public posting on NCAA II collegiate football player's (n= 5) skill execution during practices and games. Posting

self-set goals was used as the independent variable for the intervention program in this study. Three dependent variables were assessed as (a) reads (i.e., reading the play correctly), (b) drops (moving into the correct position), and (c) tackles (i.e., stopping the forward momentum of the offense legally). The percentage of correct performance of each behavior was measured. A multiple baseline design was used to assess the effects of the intervention. The intervention was very effective in improving and maintaining the performance of the players in all three dependent variables. Like the earlier study (Ward et al. 1997), they found that the effects of intervention in the practice setting generalized to a game setting.

Brobst and Ward (2002) conducted another generalization study from practice to games in soccer. An intervention consisting of public posting, goal setting and oral feedback was used to assess the effects on three dependent variables: (a) keep and maintain possession of the ball, (b) move to an open position during a game restart (e.g., goal or corner kick), and (c) move to an open position after passing the ball. Female high school soccer players participated in this study. Brobst and Ward (2002) found that the intervention was effective in improving performances during practice scrimmages. They also found stimulus generalization from practice to game, but not to the same degree as in previous studies

Michell, et al. (1995) investigated tactical transfer (i.e., generalization) in the net games category. Ninth-grade students participated in this study and the content of sports was: (a) half court singles game, (b) singles game, and (c) pickleball. Using the GPAI, decision-making was measured as student game performance across two sports

performance. Mitchell et al. (1995) reported that tactical understanding improved during badminton instruction and this improvement was sustained during pickleball.

Discussion

The research approach of the first three studies (Brobst & Ward, 2002; Ward & Carnes, 2002; Ward, Smith, & Sharpe, 1997) is distinguished from that of Mitchell et als. (1995) in this review. The primary focus of the first three studies was on what the players did and when specific events occurred. There was no dichotomization between tactics as cognition and tactics as behaviors in these studies. What players specifically did during practice and games was reported. In these studies the goal was to increase the percentage of correct performance of the tactical behaviors. Thus, the research framework is quite simple, and it focuses on specific responses to specific types of stimuli.

Though the primary purpose of the first three of these studies (i.e., Brobst & Ward, 2002; Ward & Carnes, 2002; Ward, et al., 1997) was to assess the effects of public positing, the studies demonstrated generalization from practice to games. This strategy of assessing generalization not only provided a validation of the intervention from practice settings to game settings, but also demonstrated the intended learning outcome, "the improved game performance during a game" as a consequence of the intervention in the practice setting.

In contrast, Mitchell et al. (1995) defined tactics as procedural knowledge that was measured using the GPAI instrument. During game play, what they measured was in fact, actions rather than knowledge. These actions were observed and interpreted as either decision-making or skill executions. However, it is not easy to code whether the observed

action represents decision-making or skill-execution in badminton or pickle ball because of the nature of the sport. Griffin et al. (2003) defined decision-making net/wall games as, "students make appropriate choices when to place a long (deep) or short shot," and skill execution as, "students perform underhand ground strokes into opponent's court" (p. 162). According to this definition, a single action (i.e., a ground stroke over the net in depth of the opponent court) could be coded in both skill execution and decision-making categories. In terms of the accuracy coding on each category, the problem is that there is no access to the player's internal thought such as decision-making. A single event could be coded as an accurate incident without the player's correct decision (i.e., lucky shot), or as inaccurate incident although the player knew what to do but was not able to perform as she or he planned (i.e., error).

While the three programmatic studies of Brobst & Ward (2002), Ward, Smith, & Sharpe (1997), and Ward & Carnes (2002) have provided evidence of intervention effects and generalization from practices to games for high skilled players, there has not been an examination of whether there would be similar effects for low skilled players or in physical education settings.

General Discussion

As this review shows, for the past two decades, there has been increased inquiry focused on how to teach games. This inquiry has been based on evidence that teaching children and youth to play games has not been a successful outcome of physical education (Griffin et al., 1997; McMorris, 1998; Turner & Martinek, 1995). Although the initial focus of the inquiry was how to teach games, the answer has not been clarified as

yet. There are two reasons why this research has not been as productive as it might otherwise have been.

First, this result could be a measurement problem due to the use of broadly defined dependent variables. As the review of instrument validation studies show, broad definitions in the measurement instrument could hinder the sensitivity, objectivity and accuracy of the instrument. Data should represent actual events and behaviors of interest. But if the definitions of measurement are not precise enough to detect them, it becomes problematic to know which data represent which events, and to what extent changes have occurred over time. Thus, it is important to establish accurate definitions of dependent variables including contexts of the behaviors in advance.

Second, the non-significant findings may be a problem with the independent variable or what could be called a curriculum problem. When a curriculum model is examined in studies, there are two issues that should be considered. One is if the curriculum itself is effective in producing differences, and the other is if the same curriculum has been examined over time or across studies. The former is a question of internal validity and the latter a question of external validity. The reason of non-significant findings could be that the independent variables may not have been successful in producing effects. Since there has been little measurement of the integrity of independent variables in these studies, there is no way to know if the same curriculum has been examined when the studies are described as tactical studies. Without checking the integrity of the independent variables over time, it is hard to say that the technique group or tactical group in each study received the same intervention over time and across studies.

In contrast, behavioral studies have been successful in demonstrating the effects of their public posting interventions (e.g., Brobst & Ward, 2002; Ward & Carne, 2002; Ward, Smith, & Sharpe, 1997). These studies describe tightly defined dependent variables that demonstrate effects of independent variables over time. The studies show that even highly skilled players can improve game performance with intervention. The findings have been replicated in several studies thus demonstrating external validity. However, this line of studies has not contributed to curriculum issues thus far. Since the focus of this these studies is to improve the behaviors of interest, no attention has been paid to curriculum comparison or instructional comparison studies in K-12 settings as yet. One contribution of the behavioral studies is their use of generalization as both a methodological and pedagogical tool to validate the effects of changes in player performance across settings.

Theoretical Rationale for Tactics

In the previous review of literature on tactics, it was found that studies have been grounded in two different views of tactics. One is a cognitive view of tactics (e.g., Almond, 1986; Griffin et al., 1997; Bunker & Thorpe, 1986; Werner & Almond, 1990; Werner, Thorpe, & Bunker, 1996) and the other is a behavioral view of tactics (e.g., Brobst, & Ward, 2002; Siedentop, 1983). These two different views of tactics are described in this section.

A Cognitive View of Tactics

The cognitive view of tactics is grounded in learning theories from cognitive psychology. In particular, two theories have been referred to in the literature: Information Processing and Situated Learning.

Information Processing Theory

Information-processing theory hypothesize that humans represent the outside world through internal knowledge structures (Dodds et al., 2001). The knowledge structures include nodes, which represent concepts, facts, or theories in a hierarchical order. More currently, the domain specific knowledge, which can be categorized as declarative knowledge, procedural, conditional and strategic knowledge, are widely accepted constructs in the research community of instruction and learning (Dodds et al., 2001). Dodds et al. (2001), provides definitions of these knowledge concepts in the following:

> Declarative knowledge is often called prepositional knowledge, which indicates "knowing about something."… Procedural knowledge is defined as "knowing how to do something."… Conditional knowledge is defined as "understanding when and how to use particular declarative or procedural knowledge."…Strategic knowledge, a special type of procedural knowledge, involving goal directed procedures that may be used before, during or after a task performance (Alexander & Judy, 1988). Strategic knowledge is used across specific domains and assists in performing, regulating, and evaluating the execution of the task (p. 304).

As Dodds et al. (2001) noted, knowledge structures can be changed under various conditions over time.

Using information-processing theory, sport pedagogists have investigated how learners perform movement in relation to the environment and knowledge acquisition. Expert-novice studies that investigate differential knowledge structures and knowledge acquisition between expert and novice are one of a rigorous line of research grounded in information-processing theory. Tactical approaches to teaching games are also grounded in this theoretical view that centralizes learner's prior knowledge and domain-specific knowledge.

Grounded in this theoretical background, an important model for teaching games in physical education, which is well known, is the TGfU model. The original TGfU model was presented by Bunker and Thorpe (1982) in England as an alternative approach to the traditional technique-oriented approach to teaching games. The TGfU model includes six stages: (a) game, (b) game appreciation, (c) tactical awareness, (d) making appropriate decisions, (e) skill execution, (f) performance for developing decision-making, and (g) improved performance in game situations. Griffin et al. (2003) explained that TGfU is based on a student-centered learning approach where the teacher facilitates the learning process. Asking questions is the primary tool that can link the student performance and understanding, which is also considered to make tasks meaningful. Griffin et al. (2003) provided five types of questions under the TGfU model such as: (a) skill and movement execution (e.g., How do you…), (b) tactical awareness (e.g., What did you…), (c) time (e.g., What is the best time to…), (d) space (e.g., Where is/can…), and (e) risk (e.g., Which choice…).

Fundamental assumptions of the TGfU instructional model are summarized by Griffin, Butler, Lombardo, and Nastasi (2003) as the following. First, games are considered as an important part of the physical education curriculum that can provide enjoyable lifetime activities. Second, games can be modified to represent the advanced game form, and conditioned to emphasize tactical problems encountered within the game. Thus, teachers are encouraged to use small sized games because they help to slow down the pace and momentum, which may allow students a better chance to develop game appreciation, tactical awareness, and decision-making abilities. Third, games have common tactical elements, or problems, which form the basis of the games-classification system. Games with similar rules and played in similar ways are more alike than different (e.g., field hockey and soccer). Griffin et al. (2003) noted, "understanding these similar tactical problems can help students transfer performance from one game to another (p. 5)." For example, in soccer, off-the-ball movement and passing decisions are quite similar to those used in field hockey. Thus, teaching these similarities predict an improvement in understanding, tactical awareness, and game appreciation, which can ultimately improve student game performance.

Many pedagogists teach "tactical awareness" and "game appreciation" by exposing students to the tactical problem situations and allowing them to acquire meaningful understanding of how to make decisions and skill executions in the act of playing the game (Almond, 1986; Griffin et al., 1987; Bunker & Thorpe, 1986, Werner & Almond, 1990; Werner, Thorpe, & Bunker, 1996). Thus, understanding tactical awareness and game appreciation are more emphasized goals of teaching a game than that of performing tactics.

Currently, the TGfU model and its variations have been strongly promoted as a solution to what has been reported as poor games performance outcomes from the traditionally approached instruction in physical education (Griffin et al., 1997; Holt et al., 2002; Kirk & MacPhail, 2002).

Situated Learning Theory

The situated learning perspective on tactics has been introduced by Kirk and McPhail (2002) to the sport pedagogy community. Situated learning views tactics as a way of acquiring the knowledge, the tools (e.g., equipment), and artifacts (e.g., rules), which are distributed in the world among individuals, and also in the communities and practices in which they individuals participate (Greeno, 1997). Greeno (1997) noted, "The situated view of knowing, involving attunements to constraints and affordances of activity systems, suggests a fundamental change in the way that instructional tasks are analyzed" (p. 20).

Thinking is viewed as situated in a particular context of intentions, social partners, and tools (Resnick, Levine, & Teasley, 1991). Thus, when it comes to the design of learning environments, situated learning focuses on constructing environments of participation in social practices of inquiry and learning. Along with this rationale, it is necessary to consider relationships among the various physical, social, and cultural dimensions of the context of learning (Lave & Wenger, 1991). According to this view, the analyses of component subtasks are considered out-dated. Instead, the analyses of the regularities of successful activities are emphasized and highlighted more (Greeno, et al., 1998). At the same time, participation in practices of communities derived from cooperative activities is considered as important as the active engagement of the learner

is (Greeno et al., 1998; Kirk & McPhail, 2002). Thus, the central theme of the situated learning theory urges more concern for a learner's active engagement with the subject matter, which may be layered with physical, socio-cultural, and institutional contexts.

Kirk and McPhail (2002) suggested a revised TGfU model based on the situated learning perspective, which moved away from the view of the learner's information processing. More environmental concerns have been included in Kirk's and McPhail's revised TGfU model such as (a) the relationship between the game form and a learner (e.g., task and learner), (b) the relationship between game appreciation, tactical awareness, and emerging understanding, (c) the relationship between cue perception and decision-making, (d) the relationship between decision-making, movement execution, and technique selection, and (e) the relationship between skill development and situated performance.

By moving away from the information-processing perspective, which focuses on learner's cognition, Kirk and McPhail (2002) claim that the situated learning perspective broadens the view of tactics by including in the learner's environment, legitimate peripheral participation and explicit instruction (e.g., using perceptual cues).

A Behavioral View of Tactics

In a behavioral view, an execution of tactical performance reflects the accumulation of a person's history of discrimination and generalization responses in similar conditions. For example, the behavior of the offense during game is stimuli for a defender's response and the same is true when the roles are exchanged. When the ball flies to the player, the speed, direction and trajectory function as stimuli for the player's

intercepting response. When the teammate supports the ball carrier, the ball carrier's running direction, speed, and any kind of signs from the ball carrier (e.g., pointing and calling directions) may function as stimuli for the player following in support with the resultant movements being labeled support. In the game context, there are many stimuli and responses occurring simultaneously. The task for successful players can be described as both stimulus and response generalization. According to Sidman (1960), stimulus generalization is defined as "phenomena in which a response that has reinforced only in the presence of a given stimulus occurs with an increased frequency in the presence of different but similar stimuli (p. 206)." For example, a player's supporting behaviors were trained during practice by using tactical scenarios, which consist of standardized supporting formats as a group (e.g., scissor run, route run). When the player performs supporting tactics during a game, in similar situations to those occurring in the practice session, stimulus generalization is demonstrated.

Response generalization is defined as a situation in which a given stimulus, previously paired with reinforcement for a particular response, evokes similar but different responses (Cooper et al., 1987). When a player practices scissor runs and improves supporting behaviors, his other supporting behaviors such as snake run and looping skills are also improved. In this case, it is considered a response generalization. Overall, generalization is commonly used for indicating behavior changes that occur in non-training conditions as Cooper et al. (1987) noted. Thus, generalization is a central concept to explain the relationship between practice and game and how to improve game performance. Another central contribution of a behavioral view of tactics is its focus on

how to teach tactics. Teaching tactics may be considered as either a rule-governed behavior or a contingency shaped behavior (Siedentop, 1983). Siedentop (1983) noted:

> Clearly, not all situations can be identified and taught as rule governed sport behavior. But the fact that not all situations can be anticipated does not mean that frequently occurring and occasionally occurring important situations should not be identified and courses of action prescribed (p.14).

Rule-governed behavior is defined as "a behavior either verbal or nonverbal, under the control of verbal antecedents. Verbal antecedent can be a rule solely or with specifying contingencies…Rules do not necessarily qualify as discriminative stimuli even though they function as verbal antecedents" (Retrieved October, 10, 2003, http://www.coedu.usf.edu/abaglossary/glossarymain*).*

Another definition of rule-governed behavior is "the effects of instructions, advice, maxims, and laws on the listener's behavior" (Retrieved October, 10, 2003, from http://www.coedu.usf.edu/abaglossary/glossarymain). In this view, rules are seen as complex discriminative stimuli and the principles that govern stimulus control regulate the behavior of the listener. So students follow the direction of the instructors they come into contact with.

Contingency-shaped behavior is defined as a behavior which has been learned by directly experiencing success or failure. Contingency-shaped behavior may be contrasted with rule-governed behavior, which is under control of rules rather than having been shaped by contingencies. However, all rule-governed behavior ultimately comes under the control of contingencies.

Siedentop (1983) accepted both influences in shaping tactics. He accepts that students can directly learn tactics from experiencing success or failure in a sporting context (e.g., not supporting the ball carrier's movement then losing possession of the ball). But still he notes that rule-governed behaviors are needed to prevent too many failures or to save teaching time (e.g., teaching explicit rules of standard situations for promoting anticipated proper responses).

At first glance, the concept of contingency shaped behavior seems exactly the same as establishing tactical problems in the TGfU approach. But a behavioral view does not dismiss the importance of the principle that consequences drive the whole agenda of teaching tactics. Without creating pedagogical consequences (i.e., either using natural contingency or using contrived contingency), students may not learn automatically. Otherwise, a teacher might expect that students will be able to learn tactics by themselves from the natural contingency (e.g., playing games repeatedly, or learning from experience).

Based on a behavioral view of tactics Siedentop (1983) suggests how to teach tactics in practice. Siedentop noted "discrimination" under various conditions as the major component for competent sport performance. Certain conditions could be relevant stimuli for the player to discriminate how to respond by using any skill. However, it is also very important to respond to novel conditions that they haven't encountered before. Thus, Siedentop (1983) suggested the best way to teach the game is by building a repertoire of discriminated behavior in which the player is able to respond appropriately to complex situations that were not encountered previously.

This view is well reflected in Launder (2001)'s *Play Practice* instructional model. Play Practice is an alternative model for games teaching introduced by Launder (2001). The central idea of Play Practice is that it turns practice into play by using games and challenges in one form or another to create realistic and enjoyable learning situations. Also, if the alignment between a practice situation and the real game were closer, there would exist a greater possibility of transferring skills from one situation to another.

Summary

In summary, two different views of tactics were described to explain how tactics are defined differently at the philosophical level. In addition, implications of teaching in each approach were discussed. The cognitive view of tactics is taking a position that separates knowledge in mind and actions. In research, this hypothesis creates two different dimensions of tactics measurement such as knowledge test, and understanding test versus direct observation of behavior during game performance. The whole research agenda within this view struggles with describing and explaining what is the best way of accessing the learner's mind to know what happened during the learning process. The focus of research moved from a focus on instruction to a focus on learners, and the term 'instruction or teaching' replaced the term 'learning.'

The situated learning theory views tactics as shared knowledge that may exist in the environment such as equipment, peer cooperation, or teacher's instruction. Since the shared knowledge exists outside of the body, there are more opportunities to intervene in student learning by using perceptual cues, creating cooperating groups and community, and changing content or pedagogy. The focus is not on the knowledge as much as

creating a more effective learning environment. This view is similar to a behavioral view of tactics but the philosophical assumptions are significantly different.

A behavioral view is grounded in natural science and a pragmatic view, and the primary focus of the inquiry is toward the improvement of the behaviors of interest. There is no dichotomy between knowledge and behaviors.

A Classification System for Tactics

As the review of literature in the chapter shows, there has been neither agreement on the definition of tactics nor efforts to elucidate a clarification system of tactics. This section describes how sports are conceptualized and how tactics are understood within each conceptualization of sports. Using this analysis as a foundation, a system of tactics in invasion games is introduced as a fundamental framework for this study.

How Sports Have Been Classified?

The starting point of understanding tactics begins with a review of sport classification and the analysis of the rationales of the classifications. Several sports classifications have been proposed in the literature (Almond, 1986; Ellis, 1983; Griffin et al., 1997; Mauldon & Redfern, 1981; Siedentop, 1983).

Mauldon & Redfern (1981)

Mauldon & Redfern (1981) classified sports as (a) net games (e.g., badminton, tennis, and volleyball), (b) batting games (e.g., baseball, cricket, and rounders), and (c) running games (e.g., basketball, football, hockey, lacrosse, netball, rugby). The rationale of this classification system is based on the key technical elements of each activity

involved in the games. The fundamental focus of this classification system is the development and mastery of techniques in locomotor, non-locomotor, and manipulative skills, which are necessary for game play. Skill analysis on each of the actions is critical and this analysis results in a variety of ways to help students gain the technical aspects of game play (Werner & Almond, 1990). The concept of 'transfer' is considered to occur relative to movement patterns (e.g., throwing pattern). The variability of practice is suggested as important pedagogical principle using variety of distances, spin, or game situations to create variations in the throwing pattern. Thus, the goal of game play is not to improve game performance itself, but rather to refine the movement patterns by using various environmental contexts.

Ellis (1983)

Game categories of Ellis (1983) include (a) territory, (b) target, (c) court, and (d) field. Ellis (1983) provided sub categories in each game category, which added more specific rationale to each category. The territory games are divided into goal games (basketball, field hockey, soccer, team handball) and line games (flag football, football, rugby, speedball). In the target game category, there are opposed games (e.g., bocce, croquet, curling, horseshoes) and unopposed games (e.g., bowling, golf,). Court games include divided games (e.g., badminton, deck tennis, table tennis, volleyball) and shared games (e.g., handball, paddleball, racquetball, squash) category. In the field game category there are fan shaped games (e.g., baseball, rounders) and oval shaped games (e.g., cricket, stoolball) category.

In addition, Ellis (1983) introduced a conceptual game structure, which included components involving rules, skills/tactics, strategies and tactics. These factors are thought

to provide structure to a game its structure. For example, rules require preplay conditions such as equipment, number of players, and duration of play. Playing rules provide scoring, conditions for putting an object into play, formations, and restriction on skills. Skills and techniques provide how one controls the body (locomotor and non-locomotor skills) and handles equipment (e.g., throw, strike, dribble). Tactics and strategies were not clearly defined in Ellis, but they are subdivided into individual and team sports and offensive and defensive categories.

Ellis (1983) provided more detailed game categories than Maulden and Redfern (1981). In addition, Ellis (1983) described game structure components, which provides more information to understand the structure of games and the rationale for the game classification. In each game, the rules of preplaying and rules of playing are combined with skills, techniques, strategies, and tactics, which are used as the rationale for the game categories.

Almond (1986)

Almond (1986) classified sports using the following categories: (a) invasion games (e.g., handball, basketball, netball, team handball, ultimate frisbee, waterpolo, hockey, soccer, football, rugby), (b) net/wall games (e.g., badminton, tennis, table tennis, paddle tennis, squash, handball, paddleball, racquetball), (c) Fielding/Run scoring games (e.g., baseball, softball, rounders, cricket, kickball), and (d) Target games (e.g., golf, croquet, bowls, curling, ten, pub skittles, billiards, snooker, pool).

The emphasis of Almond (1986) in this classification system is different from Maulden and Redfern (1981), and from Ellis (1983). The focus has been shifted from skill or technique to a strategic or tactical base (Werner & Almond, 1990). It is

hypothesized that there are unique tactical problems to be solved in each game. The similarity of these tactical problems was considered as the rationale for the game classification when teaching the game.

Siedentop (2004)

Siedentop (2004) suggests four classifications of games as: (a) Territory or invasion games (e.g., basketball, ice hockey, soccer, team handball, lacrosse, water polo, American football, Australian rugby, speedball, basketball, soccer, hockey), (b) Target games (e.g., croquet, horseshoes, curling, golf, bowling), (c) Court games (e.g., badminton, squash, jai alai, handball, tennis, table tennis), and (d) Field games (Cricket, baseball, softball, rounders). As suggested, primary rules and secondary rules are similar with preplaying conditions and playing rules in Ellis (1983). Siedentop (1990) considered primary rule and secondary rule as foundations of institutionalized sports system. The primary rule is defined as "how a game is played and how winning is achieved" (p. 95). For example, the primary rule in Rugby determines how to score, how to preventing scoring, and how to restart a game. The primary rules of the game are what make Rugby very different from Tennis, or Golf, but similar to Soccer or Field Hockey. A secondary rule is defined by Siedentop (2004) as, "rules that can be modified without changing the essence of the game that typically define the institutionalized form of the game, or what we call the parent game" (p. 95). For example, the number of members of the team in Tag rugby can be changed (i.e., 13 to 4) or the size of the rugby field can be altered for the purpose of delivering developmentally appropriate activities. Siedentop (2004) explained the rationale for the four classifications of sports as the similarity of the primary rule.

Discussion

The Table 2.2 shows the summary of these various sports classification systems. The first row shows the overall rationale of each classification and from the second row onwards shows the details.

Based on the analysis of various sports classifications, several conclusions can be derived. Similarities among different terminology were found from this review. Most importantly, there are similarities among tactical problems and tactical awareness concepts in Almond (1986), preplaying rules and playing rules in Ellis (1983), and primary rules and secondary rules concepts in Siedentop (2004). Only Maulden and Redfern (1981) used technical components as the rationale for the game classification. But in Ellis (1983), the techniques and skills are considered the same as parts of components that consist of game structure. In fact, primary rules, playing rules, and tactical problems and tactical awareness can be considered identical concepts, which are used as the rationale for the game classification in each system.

The other finding indicates a chronological change of the way of understanding games and the shift of the emphasis on the components of game structure. As Ellis (1983) noted, "all skills/ techniques, and strategies/ tactics consist of a game structure (p. 15)." While this point remains true today, there has been a change in the emphasis from techniques to tactics. At the same time, there has been a change of understanding game classifications and the rationale for the game classifications. All these changes focus on directing attention toward the teaching of tactics and the necessary components of learning how to play games.

	Almond (1986)	Ellis (1983)	Mauldon & Redfern (1981)	Siedentop (2004)
Rationale of Classification	Tactical problems & Tactical awareness	Similarities of preplaying rules & playing rules	Similarities of technical elements	Similarities of the primary rules & secondary rules
Invasion/ Territory	√	√	X	√
Net/Wall	√	X	√	X
Court	X	√	X	√
Field (run-scoring)	√	√	√	√
Target	√	√	√	√
Batting	X	X	√	X

Table. 2.2: Rationale of Sports Classifications and various categories

In each game classification system, tactics are mentioned in different ways and to different extents. In Mauldon and Redfern (1981), tactics are referenced to 'gaining possession' and in Ellis (1983) tactics are mentioned as offensive-defensive or individual-team tactics. Almond (1986) describes tactics as tactical problems (e.g., scoring, preventing scoring, restart) and tactical awareness while Siedentop (2004) considers tactics primary rules to be taught. Regardless of these different definitions of tactics in each system, the analysis of game classification shows there are similarities. In other words, tactics and tactical problems of Rugby are very similar with soccer or football but very different from that of tennis or badminton in the net game category. While tactics in invasion games are scoring, preventing scoring, and restarting, tactics in tennis and badminton are considered as creating space, scoring, and preventing scoring.

In this section, various game classifications were reviewed and the rationale of game categorization was discussed. These various classification systems are valuable in understanding tactics in the context of the game-to-game comparisons. However, they do not assist one in determining the specific tactics to use in a game.

A Proposed System of Tactics for Invasion Games

In the previous section, various sports classifications and different views of understanding games were reviewed relative to their relationship to tactics. In addition to the idea of general tactics (i.e., scoring, preventing scoring, and restarting), it is necessary to map out various dimensions of tactics such as offensive/defensive, individual/team, on the ball/off the ball offensive, and on the ball/of the ball defensive tactics. Such a level of specification of tactics provides a useful framework for research of tactics and for the

teaching of tactics. In this section, a system of tactics in invasion games is introduced. This system of tactics was originally developed by a German Soccer coach, Bauer (2002), and modified by this investigator for this study (See Figure 2.1.).

Figure 2.1 shows a game system consisting of several dimensions of tactics. From the bottom of the figure in the center, there are three big boxes, and each box shows general tactics and specific tactics consisting of each individual tactics, group tactics, and team tactics in the invasion games. The right side of the figure shows the defensive dimension of tactics and the left side of the figure shows the offensive dimension of tactics. Both offensive and defensive dimensions are divided into several situations depending on where the ball is and who possess the ball.

From the top of the figure 2.1, there are team tactics defined as, "the purposeful, planned offensive and defensive actions of all players on a team (Bauer, 2002, p. 91), which include general team tactics (e.g., offensive and defensive tactics). An individual and a group carry out actions together in this category. Examples of team tactics include covering the opponent, space, mixed coverage, manipulating space, alternating tempo, rhythm of action, and counterattack as a team.

Group tactics addresses, "two or more players with the same objective working together" (Bauer, 2002, p.86). This dimension of tactics consists of 'general group tactics' and 'specific tactics for standard situations.' Examples of general group tactics include cooperative actions for managing game situations such as offensive tactics and defensive tactics. Specific tactics for standard situations include specific set play such as restart (e.g., free throw). The individual tactics dimension is defined as, "purposeful, planned, coordinated offensive and defensive actions a player performs to manage typical game

situations, independent of any specific responsibilities related to his position" (Bauer, 2002, p.109).

Offensive team tactics occur when offensive the team has the ball. In offensive tactics, there are offensive 'group tactics' and offensive 'individual tactics', which include actions either with the ball or without the ball.

Overall, a system of tactics was introduced in this section. This system of tactics also provides a clear conceptualization of some hidden dimension of tactics. When we focus on one dimension of tactics the other dimensions of tactics is in fact covert. While it is easy to focus on tactics as "possession of the ball" and "off the ball decisions," data may not uncover other dimensions such as the rest of the teammates' tactics or the opponent team tactics. Considering the fact that invasion games are team sports, such hidden dimensions are in fact huge. The low incidence of coding problem is not at all a surprise. Although not all of those events can be detected, critical and tactical events can be concurrently occurring for all players regardless of offending or defending conditions. This clarification provides a holistic view of tactics in the game system and some dimension of tactics that can be hidden during data collection.

In addition to the above descriptions, 'tactics specific position' and the 'tactics for standard situations' elements raise an important pedagogical issue. Tactics specific for positions means that each player has other tasks to perform and special tactics he can put to use depending on the player's position (e.g., tactics of the ball carrier or tactics of the linebacker in rugby). Tactics for standard situations refers to standard situations (e.g., restarts, set play), which deserve intense practice during training (Bauer, 2002). These two concepts provide an important dimension in which dimension interventions

can be occurring to improve game performance. Specific tactics for standard situations which belong to group tactics, and specific tactics for positioning, which belongs to individual tactics might be a good start to teach tactics, which promise game performance improvement.

The focus of in this study is on individual tactics dimension and group tactics dimension when the team is attacking. In figure 2.1 the white boxes indicate the focus of this study (e.g., supporting individually or in a group) and the shaded boxes indicate the delimitated focus of this study (See Figure 2.1.).

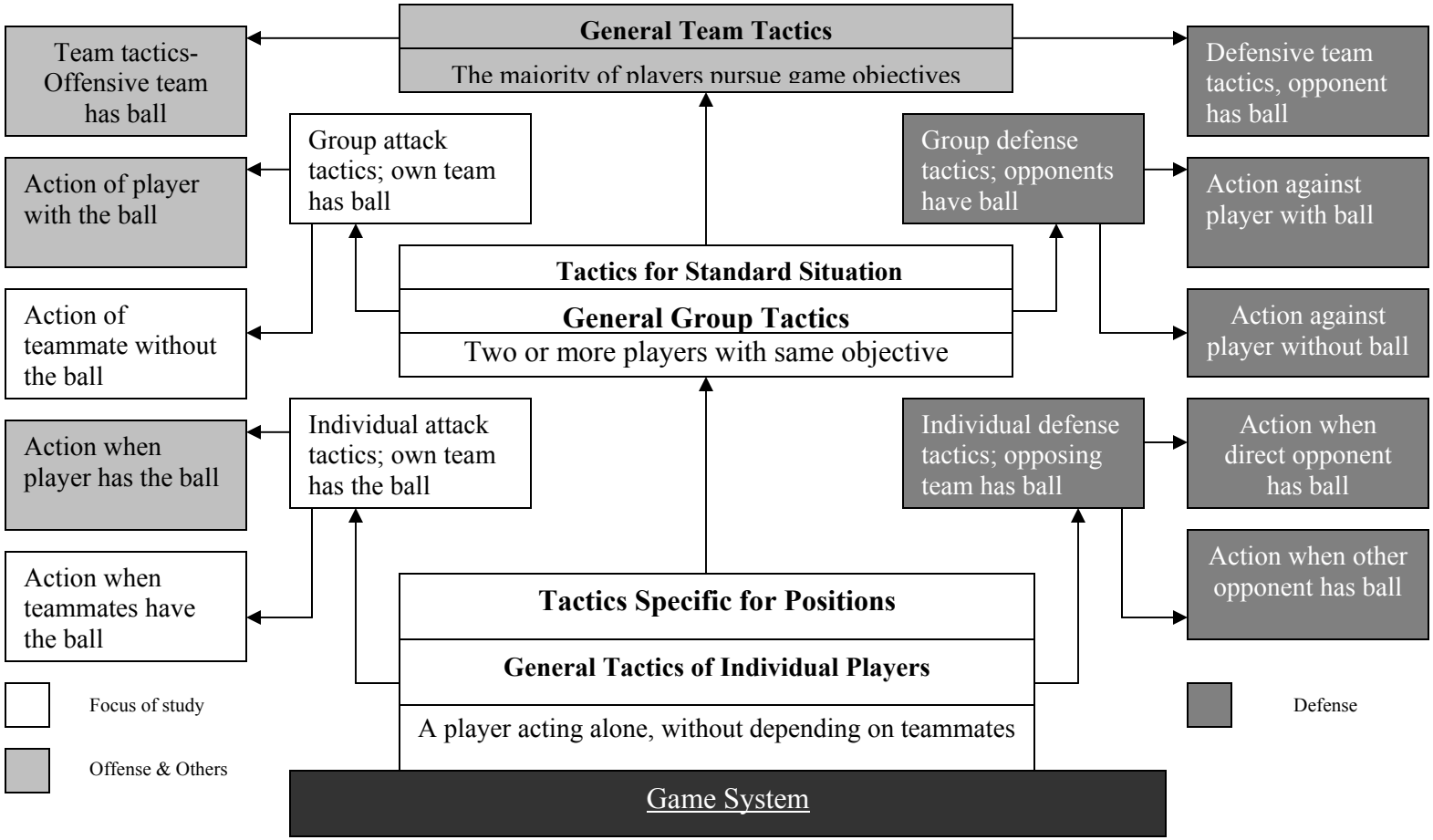

Figure 2.1: Different Types of Tactics System in Invasion Games (modified from Bauer, 2002)

CHAPTER 3

METHODS

This section describes the research methods, procedures, data collection, and research design employed by this study. Initially, a description of the research setting, teacher, participants, and dependent variables is provided. The following sections describe in detail research procedures and intervention. The final section describes the research design.

Setting

This study was conducted at Mirror Lake Middle School (pseudonym). Mirror Lake Middle School is an urban public middle school with a population of 647 students. Student ethnicity consists of 94% African American, 4% Caucasian, and 1% Asian. Fifty-seven percent of students receive free or reduced-price lunch. Mirror Lake Middle School is located within 1.5 miles from the downtown Columbus area. The school has a basketball-sized gym and football-sized field. Physical education is offered three days per week for 32 minutes per lesson, including changing clothes and transition time. The study began in the middle of the fall semester and continued for eight weeks, every Monday, Wednesday, and Friday, excluding inclement weather days. Tuesday and Thursday classes were excluded, because the class size was doubled due to additional students who

did not attend Monday, Wednesday, and Friday classes. Those students were taught a different curriculum. All classes were conducted either on the field or in the gymnasium.

The instructional unit consisted of a 19-day Tag Rugby program. Tag Rugby is a speedy and vigorous invasion game, which requires highly competent tactical movement (Leonard, 2001). Like other invasion sports such as soccer, field hockey, and handball, the acquisition of tactical skills is critical if the game is to progress (Launder, 2001). A key reason for the selection of Tag Rugby is that it was a novel sport for most American students. Because of this novelty, it was possible to minimize the effects of student experience and knowledge during this investigation. For example, there is a unique rule that does not allow passing the ball forward. This rule requires a behavior that is very distinguishable from other invasion games.

The Teachers

The physical education department consisted of two teachers. Both teachers participated in this study. The teachers were selected from a pool of cooperating teachers used by The Ohio State University School of Physical Activity and Educational Services. The selection criteria included the teacher's reputation based on recommendations of university faculty members and university supervisors. The female teacher had 10 years teaching experience and the male teacher had 5 years teaching experience. Both teachers had actively participated in various professional development programs. Recently they had participated in a year-long professional-development program, which was part of Columbus Public School (CPS) Physical Education for Progress (PEP) grant. They

reported that their knowledge of invasion games was good and they had taught various invasion games such as soccer, football, gate ball, and team handball.

Participants

This study was conducted in three physical education classes-two seventh-grade classes and one eighth-grade class. Participants include 17 students (F=13, M=4) from class A (7^{th} grade), 32 students (F=16, M=16) from class B (8^{th} grade), and 34 students (F= 17, M=17) from class C (7^{th} grade). All of them were taught by two teachers using a team teaching method in this study.

Four target students from each class were purposively selected according to gender and skill levels (i.e., low- and average-skilled students). In general, low skilled students are not served well in physical education. In addition, low and average skilled students were selected to show a range of intervention effects. The selection of target students was made by the teachers using their own evaluation records. Descriptions of the target students can be found in Table 3.1.

The Investigator

The investigator was a doctoral candidate in the School of Physical Activity and Educational Services at the Ohio State University. The investigator has previously established a collegial relationship with the school and the teacher during an earlier tactical approach workshop as a part of the Physical Education for Progress (PEP) workshop series. The investigator had informally observed the school setting and the teacher's teaching performance prior to the study as a university supervisor.

Class	Grade	Gender	Name (Pseudonym)	Skill Level	Observable ethnicity
Class A	7th	Female	Suzy	Low	African American
		Female	Jane	Average	Caucasian
		Male	Jack	Low	African American
		Male	Ron	Average	African American
Class B	8th	Female	Terry	Low	African American
		Female	Kerry	Average	African American
		Male	Andy	Low	African American
		Male	Don	Average	African American
Class C	7th	Female	Pam	Low	African American
		Female	Cherry	Average	African American
		Male	David	Low	African American
		Male	Dennis	Average	African American

Table 3.1: Characteristics of Target Students

Gaining Entry

Initial permission was obtained from the school principal after confirming the teacher's agreement in participating in the study. The permission to conduct the investigation was then formally obtained from the Columbus Public Schools through The Ohio State University's Office of Student Outreach Engagement (See Appendix A). Finally, permission from The Ohio State University Behavioral and Social Sciences Institutional Review Board was obtained (See Appendix B) and parent permission (See

Appendix C) was obtained prior to the beginning of data collection. The purpose of the investigation and the procedure was also explained to the students (See Appendix D).

The teachers were informed of the investigator's intention to conduct systematic observations of their classes and to intervene on the "instructional" conditions, and their permission was obtained (See Appendix E). The teachers were informed of the experimental conditions to be used and controlled, but not of the dependent variables to be observed. Teachers were informed who the target students were since they needed to be allocated to the same team.

Definition and Measurement of the Dependent Variable

In tag rugby, movement supporting the ball carrier is an essential requirement for the game. Since the ball carrier cannot pass the ball forward, only pass sideward or backward, players without the ball must support the ball carrier all the time by maintaining a position that would allow them to receive the ball, and then either to pass it onward to another player or score a try. Thus, supporting movement was defined as a critical tactic in tag rugby that needs to be taught for successful game performance.

The dependent variable selected in this study was the percentage of correct "supporting movements" of each target student. Supporting movements are defined as: (a) being beside or behind the ball carrier or a potential ball carrier, and (b) keeping a distance within 3-7 yards from the ball carrier or a potential ball carrier. The potential ball carrier is defined as the player right beside or behind the ball carrier in the diagonal formation or arrow formation.

Data were coded whenever a member of the team has possession of the ball in each episode and for the rest of team members' supporting movement except the ball carrier. An episode for coding is defined as the time during which the ball carrier maintains possession until the player is tagged, passes, or scores a try. However, if the episode was longer than 5 seconds, the observation stopped. The duration of each episode varied from episode to episode. Thus it was thought that it is not relevant to make a same coding decision on short episodes and very long episodes (e.g., 20 –30 second).

Observation and Coding Procedure

Classes were videotaped using a digital camcorder. The camcorder recorded both date and time on the digital tape. The camcorder was located in the corner position as close as possible to the target students, but not on the field of play. Videotaping started at the beginning of each class and finished when the teacher gave closure comments.

In this investigation, the primary investigator videotaped and collected data. A graduate student participated in both data collection and interobserver agreement. One faculty member in the computer science area participated in interobserver agreement as well. The training of observers began with learning the definition of target behavior: "supporting movement." The definition of "supporting movement" was explained, and several examples of "supporting movement," with a key of correct coding were given by using video clips with 15 episodes. In the following session, a selected video clip was shown and the observers then coded the tape. The criterion for training was 90% accuracy.

Data were collected using continuous measurement and event recording. The following figure illustrates the coding sheet used to record the variables under investigation in this study (See Figure 3.1.). Coding occurred whenever the team had possession of the ball. Coding occured once for each episode for all target students. However the coding for the correct supporting movement occurred for the rest of team players except the ball carrier since the ball carrier was not able to support himself or herself. Each episode ended with any incidence of a pass, tag, scoring, or a ball carrier's error. Whenever the team lost the ball possession, one line was left as empty which indicated the change of the offensive team. The following description explains the coding. An example of a completed coding sheet is given in Figure 3.1

Time column: In the beginning of each episode, time is recorded.

Episode column: Shows the number of the episode that indicates the change of the ball carrier. While the team has the possession of the ball the number of episodes is recorded. If the offensive play ended the line was left blank. Later the team starts attacking again, beginning with the following number of the next episode.

Events columns: Explains the reasons of changing the ball carrier such as pass, tag, score, or error. A pass occurs when the students threw the rugby ball to their other teammates. A tag occurs when the opposing player pulls off one of the tag belts that the ball carrier wore. Errors include missed passes, missed catches, or other rule related mistakes that stop game play. When any of these incidences occurred, a "Y" was coded under the error columns.

Date:_____ Session Number_____ Class_____

Observer Name: _____ (Primary / Secondary)

* Whenever the supporting occurrence is observed and it is correct, code **Y**. Otherwise, code **N**. Code **B** on ball carrier
* Time is recorded at the beginning of each episode.

I. Teaching Scrimmage

Time	**Episode**	**PASS**	**TAG**	**SCORE**	**ERROR**	Support				Received the Pass				note
						S1	**S2**	**S3**	**S4**	**S1**	**S2**	**S3**	**S4**	
8:33:00	1	Y				Y	Y	B	N			Y		
	2		Y			N	N	B	N					Line out
8:36:01	3	Y				Y	Y	B	N	Y				
	4	Y				B	Y	Y	N		Y			
	5	Y				Y	B	Y	Y					
	6		Y			N	B	N	N					Line out

II. Free Scrimmage (4V4)

Time	**Episode**	**PASS**	**TAG**	**SCORE**	**ERROR**	Support				**Received the pass**				**note**
						S1	**S2**	**S3**	**S4**	**S1**	**S2**	**S3**	**S4**	
8:38:00	1	Y				Y	Y	B	Y	Y				
	2	Y				B	Y	N	N		Y			
	3	Y				N	B	Y	Y			Y		
	4			Y		Y	Y	B	Y					Score
	5	Y				Y	Y	B	Y		Y			
	6		Y			N	B	N	N					Line out
	7													

Figure 3.1: Example of a Completed Coding Sheet

Support columns: Shows the incidence of the supporting movement (i.e., dependent variable) of players without the ball, and who is the ball carrier. A "Y" was coded whenever the correct occurrence was observed. Otherwise a "N" was coded. The ball carrier was coded as "B."

Catch column: Indicates who received the ball when the ball would have been passed. This coding shows the next ball carrier or the change of the offensive team.

Comments column: Any important field notes are recorded under this column (e.g., line out, scoring, freeze).

Participant Reactivity

To minimize obtrusiveness, this investigator used following strategies:

1. For a week before the investigation, the investigator with a video camera were present in the class to try and minimize the reaction against the novel presence of the investigator and video taping instrument.
2. The investigators tried not to have any conversation with students and the teacher during the lesson.
3. The investigators were introduced to all students in both classes, and the students were informed that they were being videotaped during the rugby unit. The purpose of the videotaping and observation was explained as well.
4. Participants who did not agree to be videotaped were not allocated to the same group with target students to avoid being videotaped by chance.

Interobserver Agreement

Interobserver agreement (IOA) was conducted among the primary investigator, a graduate student in the same department, and a faculty member in the computer science area. IOA was conducted on 33.3 % of all dependent measures collected during baseline and intervention across three settings. The percentage of agreement was calculated by using the following formula (Cooper, et al. 1987): Agreements divided by agreement and disagreement, then multiplied by 100 to produce a percentage of agreement.

Teaching Procedure

Each class session consisted of: (a) practice (8 min.), (b) teaching scrimmage (8 min.), and (c) free scrimmage (8 min.) as a regular routine. On the first day of the unit, the class routine was set up and a lecture about rules and basic concepts was given. The teachers broke down the class into groups of four. Teachers identified student skill levels based on their evaluation record and observation in other sports unit. They distributed students to the group with the best efforts to make skill levels and gender ratio evenly distributed among each group. The target students were placed in the same team. Students were assigned their team in the first class session and remained in the same team until the end of the unit with some exceptions (i.e., absences, drop out).

Practice

The purpose of this section of the lesson was to introduce the primary focus of the day. Students practiced either a technical drill if they were under a technique-focused condition or tactical drills if they were under a tactic-focused condition. Practice sessions

began with the teachers' introduction with an opening comment (e.g., Line- up, Let's get started!). The introduction of the drill began with teachers' explanation and demonstration. Teachers identified critical elements of the drills and provided correct and incorrect examples of each drill for the day. Students began to engage in the practice drill that was taught for the day. During practice, students were asked to practice either as a whole group or small groups depending on the task.

Teaching Scrimmage

The purpose of the teaching scrimmage was to have students' apply what they practiced during practice session to the game context. The teaching scrimmage was almost like a game context with the main difference being that there were instructional activities using a "Freeze-replay" strategy. Whenever teachers identified the need for instruction, they freezed the class and taught students how to perform the drill correctly. Teachers' verbal explanations with good examples were given and students restarted the games after they received the instruction. Except for the teachers' instructions and feedback, the teaching scrimmage was almost identical with the 4v4 games. Defenders tried to defend and offense tried to score. Teachers tried their best to provide an equal opportunity for each team and helped each team accomplish successful experiences. When the teachers observed incorrect performances, they stopped the activities with "Freeze" and gave corrective feedback specifically related to the technique if students were in the technique-focused instruction or tactic if students were in the tactic-focused instruction. The freeze and replay strategy was frequently used during this teaching scrimmage whenever students' incorrect performance was observed.

After students received instruction feedback, teachers provided concurrent feedback. In technique-focused instruction, the examples of concurrent feedback included "Excellent", "Good pass," or "Catch was great" in terms of the emphasis on the technique element. In tactic-focused instruction, the example of concurrent feedback included "Quick pass," "move forward," "follow the ball carrier," or "support" in terms of emphasis of timing and positioning elements.

Free Scrimmage

For the last eight-minutes of each day students were engaged in a "free scrimmage." The purpose of this session was to provide an opportunity for students to apply what they learned during the practice such as the practice session and the teaching scrimmage session to the real 4v4 game setting. During free scrimmage students played a 4v4 tag rugby game, and teachers took a role as referee. Unlike the teaching scrimmage teachers did not stop the game unless there was a managerial issue, rule related errors (e.g., line out, errors) or safety issues.

Experimental Conditions

According to Bailey and Burch (2002), there are two categories of independent variables that can be examined for their effects on human behavior. One is an antecedent environmental event, such as cues, prompts, or instruction. The other is a consequent event, such as reinforcement, extinction procedures, and punishment. Although the primary focus in behavior analysis has been the consequential events, more recently behavioral researchers have paid more attention to the study of antecedent stimuli. The

study of antecedent stimuli is considered a contemporary focus of applied behavior analysis (Bailey & Burch, 2002).

Bailey and Burch (2002) explained two types of antecedent stimulus control: (a) cueing or prompting and (b) training or instruction. Cueing or prompting can be used as an independent variable when the response is not complex, and may be partly or wholly in the subject's repertoire. Training or instruction can be used as an independent variable when the behavior to be changed is complex. In this study both types of instructional strategies were applied. The category of the independent variable used in this study belongs to the antecedent stimulus variable, especially cueing or prompting category for the concurrent feedback, and training and instruction category for freeze-replay strategy. Since the behavior of interest is complex and the needs of changes are urgent, antecedent stimulus control took both forms of cueing and prompting as well as training or instruction as Bailey and Burch (2002) suggested. These strategies were applied to the whole experimental sessions however there were some conditional differences as explained following.

This study compared tactic-focused instruction to a baseline called technique-focused instruction. Each condition was designed to ensure that it represented a high standard of instruction and content selected from three textbooks of tag rugby and the full game of rugby. "*Tag rugby"* was originally developed by Leonard (2001). The second source was *"Step to Success,"* written by Biscombe (1998) and widely used as a textbook for the teaching of rugby. The third book was *"Rugby tactics, skills, and rules,"* written by Williams and Hunter (2000). These resources were provided to the teachers one month prior to this study to allow the teacher enough time to be familiar with content.

Condition A: Technique-Focused Instruction

This condition was called a technique-focused instruction, where emphasis was given to the mastery of techniques such as pass, catch, and running. The technique-focused instruction has been considered traditional game instruction (Griffin et al., 1997; Launder, 2001; McMorris, 1998; Turner & Martinek, 1995). Those content tasks were selected from the textbooks of Biscombe (1998) and Leonard (2001) by an investigator and a university faculty member who are familiar with the game of rugby. Experts in rugby provided feedback on the technique-focused content list. Based on the content list, the investigator and teachers developed lesson plans that included specific descriptions of practice drills, teaching scrimmage session, free scrimmage, and critical directions for the experimental condition. A sample of a technique-focused lesson plan was presented in the Appendix (See Appendix F). The block plan in Table 3.2 shows an idea to which content task was taught and when each experimental condition was implemented in each class (See Table 3.2.). The light cells represent the technique-focused instructional condition and the darker gray cells represent the tactic-focused instructional condition.

As described previously, instructional activities during teaching scrimmage included freeze-replay strategy and concurrent feedback. The focus of freeze-replay and the concurrent feedback was technique. When students performed very well or poorly freeze-replay occurred and prompts were occurred (e.g., “use your fingers,” “good pass,” “correct catch”). During free scrimmage, there were 4v4 games without teachers’ any instructional activities.

	Class A	Class B	Class C
Session 1	Pass in 2&3	Pass in 2&3	Pass in 2&3
Session 2	Catch in 2&3	Catch in 2&3	Catch in 2&3
Session 3	Running skills	Running skills	Running skills
Session 4	Pass in 4	Pass in 4	Pass in 4
Session 5	Catch in 4	Catch in 4	Catch in 4
Session 6	Review	Review	Review
Session 7	Loop pass with defenders	Pass in 2&3	Pass in 2&3
Session 8	Running diagonal	Running skills	Running skills
Session 9	Running in arrow	Catch in 2&3	Catch in 2&3
Session 10	Review of tactics tasks	Review	Review
Session 11	Switch pass I	Pass in 4	Pass in 4
Session 12	Switch pass II	Review	Review
Session 13	Delayed support	Pass in 2&3	Pass in 2&3
Session 14	Scissor cut in 4v4	Catch in 2&3	Catch in 2&3
Session 15	Scissor cut II in 4v 4	Running skills	Running skills
Session 16	Scissor cut III in 4v4	Loop pass with defenders	Pass in 2&3
Session 17	Support the ball carrier	Running diagonal	Catch in 2&3
Session 18	Support the ball carrier II	Running in arrow	Running skills
Session 19	Support the ball carrier II	Review of tactics	Pass in 4

Tactic-focused condition Technique-focused condition

Table 3.2: Block plan for each class

Condition B: Tactic-Focused Instruction

This condition was called a tactic-focused instructional condition, where emphasis was given to the mastery of supporting movement. The mastery of timing and positioning on how to support the ball carrier is a major goal of tactic-focused drills. Thus, the drill context included defenders all the time to provide the similar context as in a game. Explicit tactical scenario and set play drills provide enough examples of supporting movement. The content task list was selected from the textbooks of Leonard (2001) and Biscombe (1998) by the investigator and a university faculty member who was familiar with rugby. Experts in rugby provided feedback on the tactic-focused content list.

Based on the content list the investigator and teachers developed lesson plans that included specific descriptions of each tactic-focused drills, teaching scrimmage, free scrimmage, and critical directions for the experimental condition. A sample of the tactic lesson plan is presented in the Appendix (See Appendix G). The block plan in Table 3.2 provides an idea which content task was taught and when each tactic-focused teaching condition was implemented in each class (See Table 3.2.). The dark gray cells represent the technique-focused instructional condition.

As described previously, instructional activities during the teaching scrimmage included freeze-replay strategy and concurrent feedback. The focus of freeze-replay and the concurrent feedback was tactics elements such as supporting movement using correct timing and spacing (i.e., positioning). When students performed very well or poorly freeze-replay occurred and instructions were given. Concurrent feedback followed (e.g., "follow the ball carrier," "support," "quick pass"). During free scrimmage, there were 4v4 games without teachers' instructional input. Figure 3.2 presents a comparison of the

two conditions in order to illustrate the similarities and differences in each condition. As the table shows the constants are time and lesson organization (e.g., practice, teaching scrimmage, and free scrimmage). What differs is the nature of the content and the verbal feedback (i.e., concurrent feedback) provided.

<table>
<tr><th colspan="3">Class Organization</th><th rowspan="2">Condition A</th><th rowspan="2">Condition B</th></tr>
<tr><th>Time</th><th>Phase</th><th>Major Events</th></tr>
<tr><td rowspan="2">8min.</td><td rowspan="2">Practice</td><td>Skill practice</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Content tasks</td><td rowspan="5">Technique-focused</td><td rowspan="5">Tactic-focused</td></tr>
<tr><td rowspan="3">8min.</td><td rowspan="3">Teaching Scrimmage</td><td>Freeze & Replay</td></tr>
<tr><td>FB*</td></tr>
<tr><td>Concurrent FB*</td></tr>
<tr><td>8min.</td><td>Free Scrimmage</td><td>FB* Focus</td></tr>
<tr><td>8min.</td><td>Free Scrimmage</td><td>Game (4 vs. 4)</td><td>Yes</td><td>Yes</td></tr>
</table>

* FB means feedback

Figure 3.2: Class Organizations and Teaching Conditions

Experimental Design

The multiple baseline design across settings was selected as the design of choice to assess effects of the intervention on the dependent variable. This design was selected because the treatment effects on target behavior are nonreversible.

The type of the treatment arrangement in this study is categorized as a cumulative treatment arrangement, rather than a single treatment arrangement. This is because the participants received the treatment everyday of the intervention, and the contingency was applied cumulatively across three baselines (Bailey & Burch, 2002).

One of distinguishable features of behavioral research design is the repeated measurement of the target behavior (Cooper et al. 1987). This is called baseline logic, which establishes the internal validity of the study and consists of prediction, verification, and replication (Cooper et al., 1987). Johnston and Pennypacker (1980) describe prediction as the anticipated outcome of a presently unknown future measurement. It is the most elegant use of quantification upon which validation of all scientific and technological activity rests" (p. 120). A stable pattern of responding in points of the variable provides a baseline on which a prediction can be occur.

The experiment must have its effects verified to demonstrate the functional relationship between the independent variable and the dependent variables. Verification in the multiple baseline design is accomplished by demonstrating that untreated baselines do not change when the independent variable is applied to other baselines. The accuracy of the prediction of the baseline is verified in the second graph and the third graph since data points remain stable while the intervention is introduced to the second and third graphs respectively.

Replication is defined as repeating the previously observed changes with further manipulations of the independent variable (Cooper et al., 1987). Replication within an experiment decreases the probability of chance that the changes occurred accidentally. This functional relationship (i.e., intervention effects) needs to be replicated as the second and third graphs demonstrate the same intervention effects.

Treatment effects are demonstrated by using visual analysis of graphic data in terms of three fundamental properties of data: (a) the extent and type of variability in the data, (b) the level (i.e., improved or decreased) of the data, and (c) trends in the data (Cooper et al., 1987). The quantity of change reported in each condition should demonstrate the effects of treatment. In the graphic data, the viewers should be able to determine the quantity of data reported during each condition. As a common rule, when variability in performance is clear during a given condition, it is necessary to add additional data points for the evidence of the stability of the data. Also, the number of data points needed for the reliable record of behavior depends on how many times the same phase or condition has been repeated during the study.

The level, which shows the value of vertical axis, shows the value on the dependent variable. In the graphic data, the level is examined within a condition in terms of its value on the Y-axis scale, the degree of stability of variability, and the extent of change from on level to another. A horizontal line is drawn across a condition at the point on the vertical axis equaling the average value of the response measure during the condition. This is called the “mean level line.” The change in level within a condition is determined by calculating the difference in absolute value between the first and last data

points within the phase of condition, and noting whether the change is in the desired direction.

The trend of the data demonstrates the overall direction of data path (i.e., increasing, decreasing, or zero trend), degree of trend, and extent of variability of data points around the trend. A straight line drawn through the data can show the direction and degree of trend in a series of graphic data points, called trend line of progress. The comparison of trend lines drawn through data on the graph can provide critical information of rate of behavioral change.

Treatment Integrity

Procedural integrity data was collected for each class to ensure that treatment is implemented as planned. To determine the extent to which teachers correctly implemented components of the lesson plan, five strategies were used. First, two days before the beginning of the study, each lesson plan was delivered to the teachers. Based on the discussion with teachers on the lesson plan, the investigator modified and refined each lesson plan to better 'fit' the plans to the school setting. The final draft of each lesson plan was delivered to teachers one day prior to the experiment day (See Appendix H and I for the sample lesson plans).

Second, teachers had a *rehearsal session* where they tried each lesson plan in 1-2 non-experimental classes (i.e., other 6^{th} grade classes) a day before each treatment day. The purpose of this *rehearsal session* was to maximize the teachers' competence level for conducting novel lessons and to minimize any confusion due to the complicated

experimental conditions and schedule implementation. Teachers reported they conducted rehearsal sessions for every lesson plan.

Third, the first class of each day was a non-experimental class. This class was used as a training session to convince whether the plan was implemented correctly. The investigator observed each *training session* and provided feedback whenever any misapplications were observed (e.g., tactic-focused feedback were given during technique-focused instruction or vice versa) with the presence of the investigator on every experiment day. There were four consecutive classes on each experiment day and the first non-experimental class was used for the *training session*. A total of 19 *training sessions* occurred (i.e., 6 sessions for every technique-focused lessons and 13 sessions for every tactic-focused lessons) for the purpose. Fourth, for each experimental lesson taught, the lesson plan was used as a checklist by the investigator to determine if the lesson was taught as planned. Teachers taught each lesson plan as planned (i.e., 100%).

In the final strategy, durations of practice time (8 minutes), teaching scrimmage (8 minutes) and free scrimmage (8 minutes) were checked to keep time consistent. It was found that teachers were not able to keep the duration of each phase consistently, especially when classes were held out of the gym. Thus from the second session, the investigator began to provide a signal to move from one phase of the lesson to the next.

Social Validity

Social validity means the measure of the acceptability of the intervention for the direct or indirect consumers. As indirect consumers, the teachers who participated in this experiment and a panel of physical educators were asked their satisfaction and

acceptability of the tactic-focused instruction. The instructional approach of interest in this study was tactic-focused instruction. Thus, only the acceptability of tactic-focused instruction was checked. In this study, the goals, procedures, and effects of the study were assessed in two ways. To assess the goal of the target behavior, acceptability and satisfaction of the intervention process, and the effects on the target behavior, two questionnaires were developed for the teachers who implemented the interventions and for a panel of teachers (n=6) who were asked to judge the three components of social validity. The first survey questionnaire (See Appendix H.) was given to the teachers to assess their satisfaction with the goals, procedures, and effects of tactic-focused instruction in the study.

The second survey was given to a panel of teachers consisting of two university faculty members, two doctoral students in the same department, and two leading physical education teachers in the same district. They were asked to rate their acceptability of the goals, procedures, and effects of tactic-focused instruction (See Appendix I.). The sample classes of each intervention were randomly selected and edited as two videotapes that included technique-focused and tactic-focused instructions respectively. The edited tape was 7-8 minutes long per tape, showing performances in each of the teaching conditions with practice, teaching scrimmage, and free scrimmage. The panel of physical educators completed the survey after they watched these two instructional videotapes.

The direct consumers of the intervention of this study were students. However IRB board did not give permission for the social validity survey for students.

CHAPTER 4

RESULTS

This chapter presents the results of this investigation. Two instructional approaches were implemented across two classes while a third class served as a control. The results are presented in the following sections: (a) interobserver agreement (IOA), (b) treatment integrity, (c) correct supporting movement in the teaching scrimmage, (d) generalization in free scrimmage, and (e) social validity.

Interobserver Agreement

Interobserver agreement was conducted on 33.3 % (19 of 57 classes) on all dependent measures collected. Table 4.1 summarizes the interobserver agreement for the three classes. Total IOA for supporting movement was 91.1% (range, 80-100%). The IOA for support movement in technique-focused instruction was 89.2% (range, 81-97%). The IOA for support movement in tactic-focused instruction was 94.6% (range, 80-100%).

Treatment Integrity

Treatment integrity was checked during all experimental sessions using treatment integrity checklist. Since several preventive strategies were used as described in chapter

Instructional condition	Class A Mean (range)	Class B Mean (range)	Class C Mean (range)	Total Mean (range)
Technical focused condition	88% (82-97)	90% (N/A)	89.6% (80-98%)	89.2% (81-97%)
Tactical focused condition	98.7% (N/A)	90.6% (81-100%)	N/A	94.6 % (80-100%)
Total Mean	93.5% (82-98.7%)	90.3% (81-100%)	89.6% (80-96%)	**91.1% (80-100%)**

Table 4.1: Interobserver agreement measures for the dependent variable.

3, there was no misimplementation of the lessons observed. The teachers conducted all lesson plans as planned. As preventive strategies the process of lesson plan development, rehearsal session, and training sessions were also checked if they were conducted as planned. Any absence of each process was not observed (See Appendix J).

Teaching Scrimmage

In this section, the percentage of correct support movement during teaching scrimmage before and after the tactic-focused instruction is reported. The data tables are presented in Appendix (See Appendix K.). The results of target students from Classes A, B, and C are reported in terms of low skilled female students (n=3), low skilled male students (n=3), average skilled female students (n=3), and average skilled male students (n=3).

Low Skilled Female Students

The percentage of correct support movement of low skilled female students during teaching scrimmage is presented in Figure 4.1. Suzy was absent on sessions 4, 10, and 12. Terry was absent on session 1. On session 12, weather hindered the class B's session. Thus, Terry does not have a data point on session 12. Pam was absent on session 2, sessions 12-15, and sessions 17-19.

Suzy

During baseline, Suzy performed 0% of correct supporting movement. After the tactic-focused instruction was taught, Suzy did not improve immediately but began to improve from the second intervention session (i.e., session 8). On session 9 Suzy's data reached above 50% of correct supporting movement (range, 0-92%). For the remained intervention sessions, data were invariable but sustained at the improved level.

Terry

During baseline, Terry showed 0% of correct supporting movement for 6 sessions. On session 7, Terry's data were 43% then ranged between 10% and 22% for the remainder of baseline.

Pam

Pam showed 0% of correct supporting movement by session 6. From session 7 Pam's data show a gradually increasing pattern of correct supporting movement. Pam's data show an ascending trend over time (range, 0-40%). However, the level of her data did not exceed 40%.

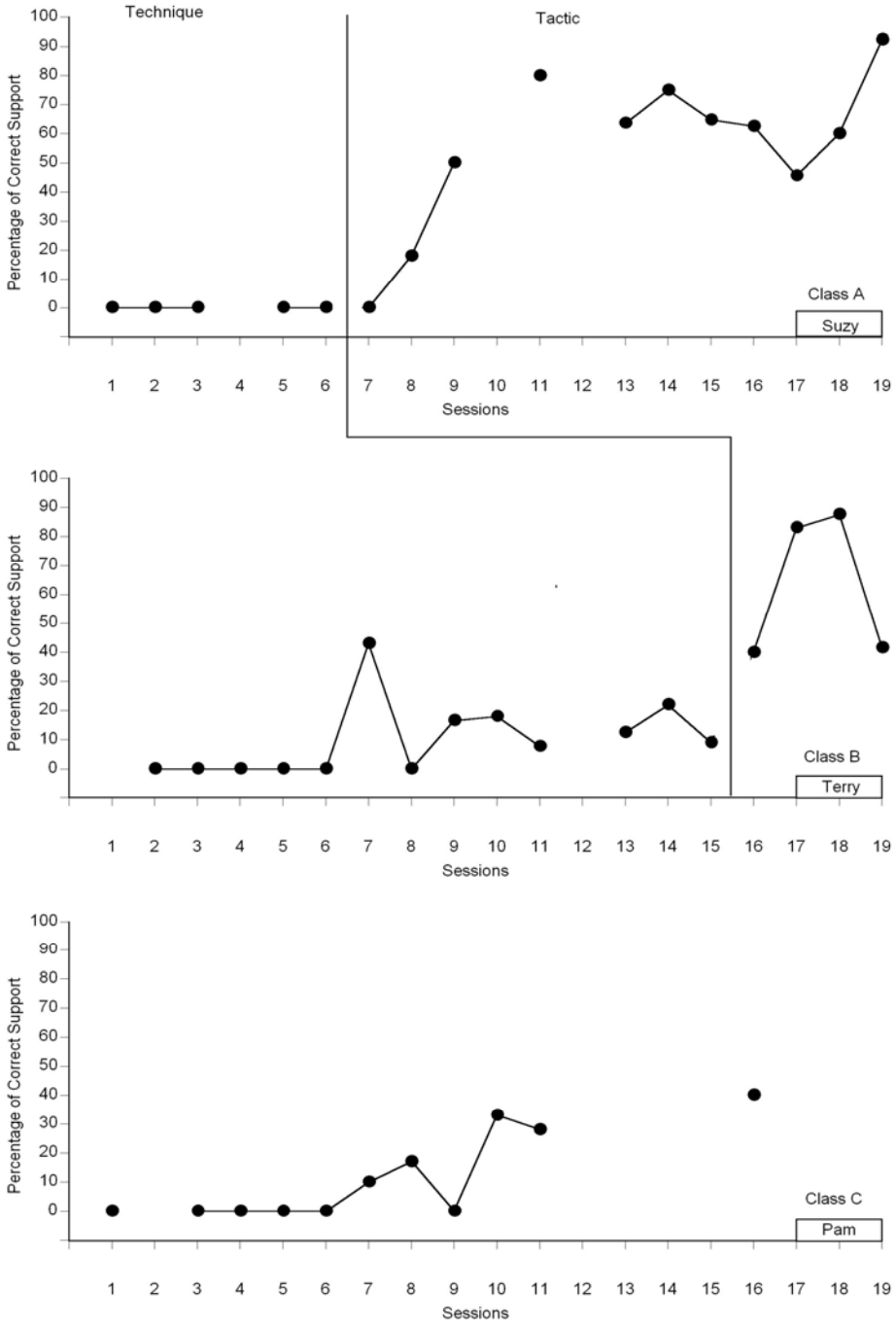

Figure 4.1: Percentage of correct support movement of low skilled female students during teaching scrimmage.

Low Skilled Male Students

The percentage of correct supporting movement of low skilled male students during teaching scrimmage is presented in Figure 4.2. Jack from the class A dropped out from this experiment at session 11 because he had to attend to English as Second Language (ESL) class instead of physical education class. On session 12, weather hindered the class B's session thus Andy does not have a data point.

Jack

During baseline, Jack showed 0% of correct supporting movement. After the tactic-focused instruction was taught, Jack immediately improved his correct supporting movement from 25%. Jack continuously improved his supporting movement (range, 25-72%).

Andy

During baseline, Andy gradually improved his correct supporting movement over time (range, 0-33%). However the highest data point did not exceed 33%. Following intervention, Andy immediately improved his correct supporting movement from 0 to 75%. His data were variable ranging from 14-75%. The intervention data overlapped once with the baseline data.

David

David showed a variable pattern with a wide range of the supporting movement (range, 0-75%). On session 10, David performed an exceptionally high correct supporting movement (75%).

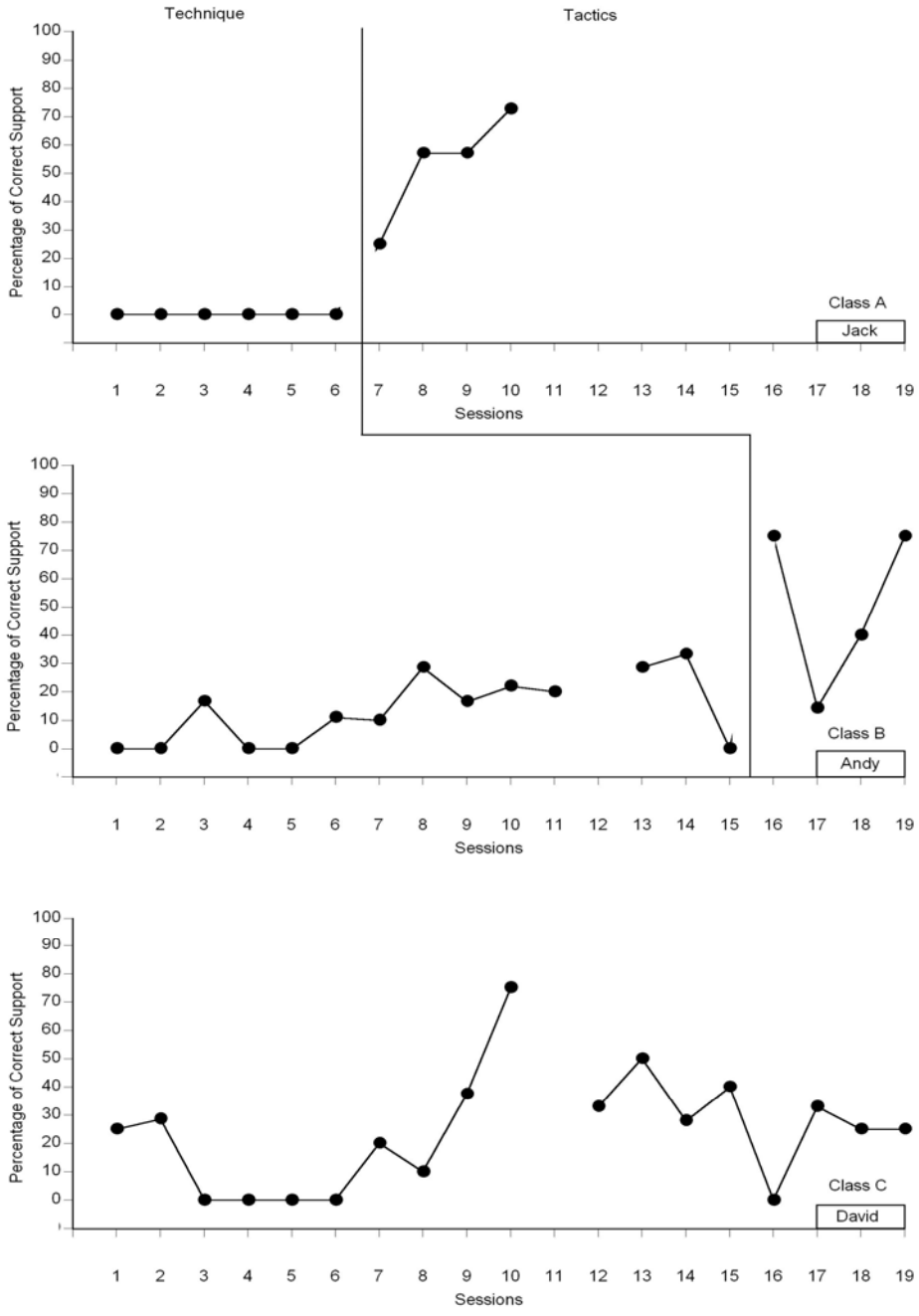

Figure 4.2: Percentage of correct support movement of low skilled male students during teaching scrimmage.

Average Skilled Female Students

The percentage of correct supporting movement of average skilled female students during teaching scrimmage is presented in Figure 4.3. Jane in class A was absent session 1. Kerry in class B was absent on sessions 1, 4, and 7. On session 12, the class was cancelled due to the weather. Cherry in class C was absent on days 10 and 11.

Jane

During baseline, Jane showed a low percentage of supporting movement (range, 0-16.7%). After the tactic-focused instruction was taught, Jane's data showed a wide variability showing an ascending trend (range, 11-100 %).

Kerry

During baseline, Kerry's data stayed relatively low with the exception of sessions 9 and 14. After the tactic-focused instruction was taught, Kerry immediately improved her supporting movement and there was an ascending pattern (range, 28-66.6%).

Cherry

Cherry showed a variable range from 0-58% throughout the study.

Average Skilled Male Students

The percentage of correct supporting movement of average skilled male students during the teaching scrimmage is presented in Figure 4.4. Don from class B was absent from session 11 to 14 because of his hand injury.

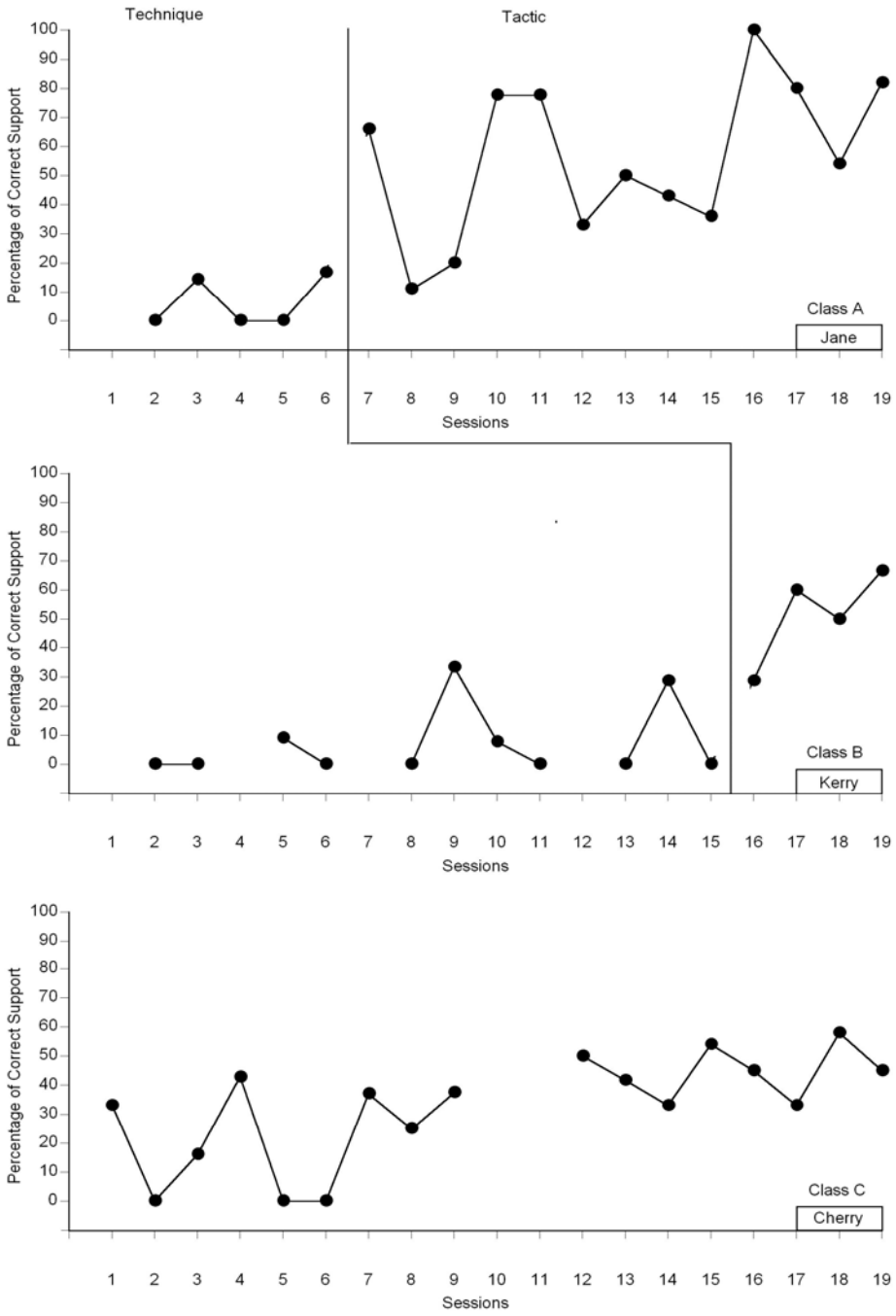

Figure 4.3: Percentage of correct support movement of average skilled female students during teaching scrimmage.

Ron

During baseline, Ron showed 0% of supporting movement. When tactic-focused instruction was taught Ron's data showed an immediate change to a variable but high level (range, 25-83%).

Don

During baseline, Don showed a variable but a gradually ascending data path (range, 0-50%). After tactic-focused instruction was taught, there was no indication of change from baseline (range, 14-45%).

Dennis

Dennis showed a variable but overall ascending data pattern (range, 0-70%).

Free Scrimmage

In this section, the percentage of correct supporting movement during the 4v4 free scrimmage is reported. The free scrimmage data show the generalization of tactics from teaching scrimmage to free scrimmage under each experimental condition. On session 1, the generalization data for all target students during free scrimmage (4 vs.4) across three classes were not reported because teachers spent all the instructional time explaining how to play game. The sessions 6 and 10 were devoted to 8 v 8 games. On session 12, the weather prevented data collection.

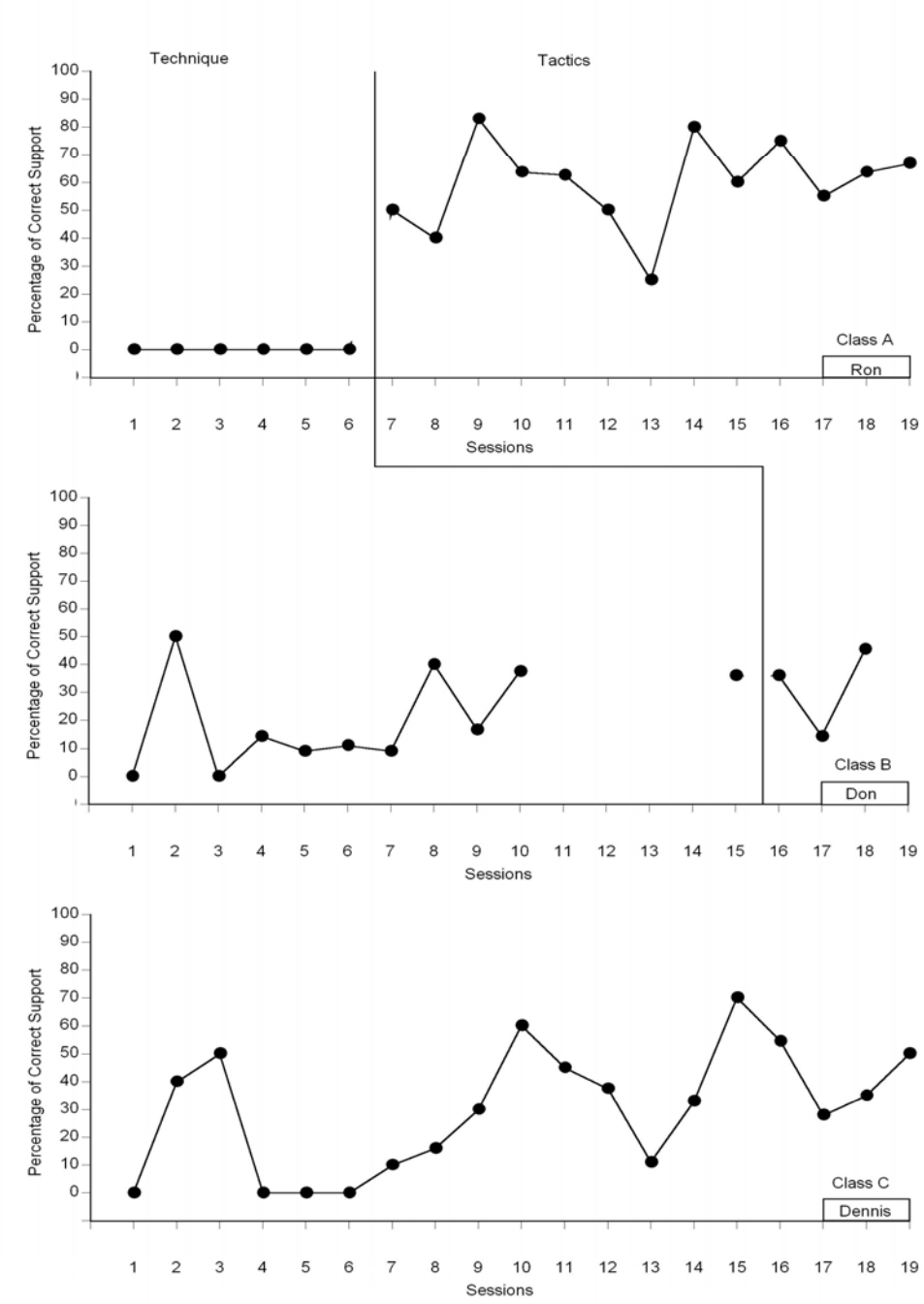

Figure 4.4: Percentage of correct support movement of average skilled male students during teaching scrimmage.

Low Skilled Female Students

The percentage of correct supporting movement of low skilled female students during 4v4 free scrimmage is presented in Figure 4.5. Suzy from class A was absent on sessions 4, 12, 15, and 16.

Suzy

During baseline, Suzy showed 0% of supporting movement. After tactic-focused instruction was taught, Suzy showed an immediate improvement and showed an increasing pattern of correct support movement during intervention.

Terry

During baseline, Terry showed a low level of correct supporting movement (range, 0-16.7). After the tactic-focused instruction was taught, Terry immediately improved her supporting movement and kept a high level of the dependent variable (range, 64.7-83%).

Pam

Pam improved her correct supporting movement over time but her data did not exceed 33% (range, 0-33%).

Low Skilled Male Students

The percentage of correct supporting movement of low skilled male students during 4v4 free scrimmage is presented in Figure 4.6. Jack from the class A dropped out from this experiment from session 11 because he had to attend to ESL class instead of physical education class. Andy's data point of session 12 is not available because the weather hindered the class B's session.

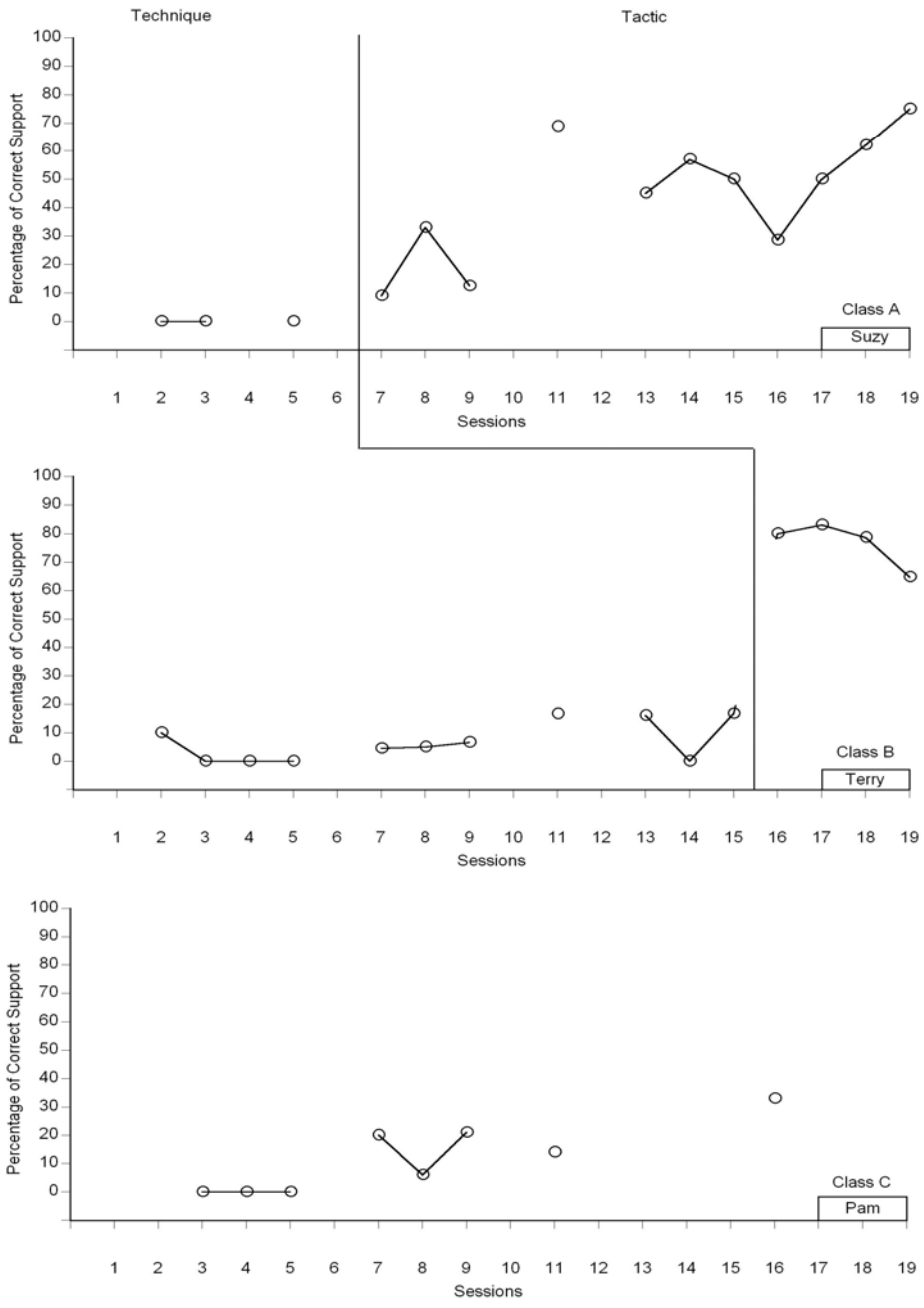

Figure 4.5: Percentage of correct support movement of low skilled female students during 4v4 free scrimmage

Jack

During baseline Jack showed a low level of supporting movement (range, 0-7.7%). After tactic-focused instruction was taught, Jack's data showed variable data (range, 14%- 60%).

Andy

During baseline, Andy's data show a variable data pattern (range, 0-33%). After the tactic-focused instruction was taught, Andy's data show an ascending data pattern from 33-90%. During intervention one data point overlapped with baseline.

David

David's data show variability with a gradually ascending trend (range, 0-44%). However, the highest data point did not exceed 44%. Overall the level of the data remained low below 50%.

Average Skilled Female Students

The percentage of correct supporting movement of average skilled female students during 4v4 free scrimmage is presented in Figure 4.7. Jane was absent session 1 and Kerry was absent on day 1, 4, and 7.The data point of Kerry on day 12 was not available because of the weather hindered the session. Cherry was absent on sessions 10 and 11.

Jane

During baseline, Jane showed 0% supporting movement. After the tactic-focused instruction was taught Jane showed improvement on her correct supporting movement

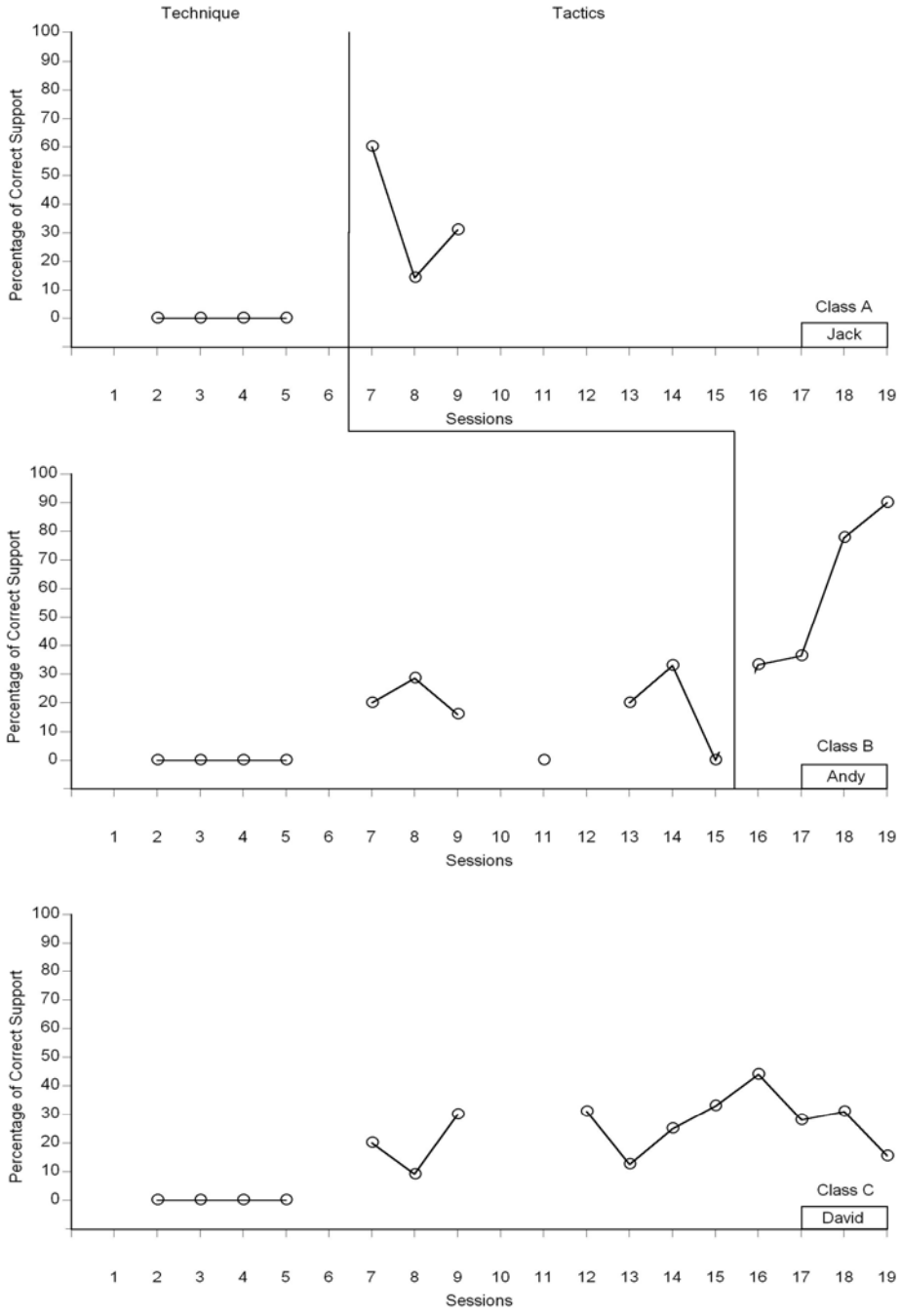

Figure 4.6: Percentage of correct support movement of low skilled male students during 4v4 free scrimmage.

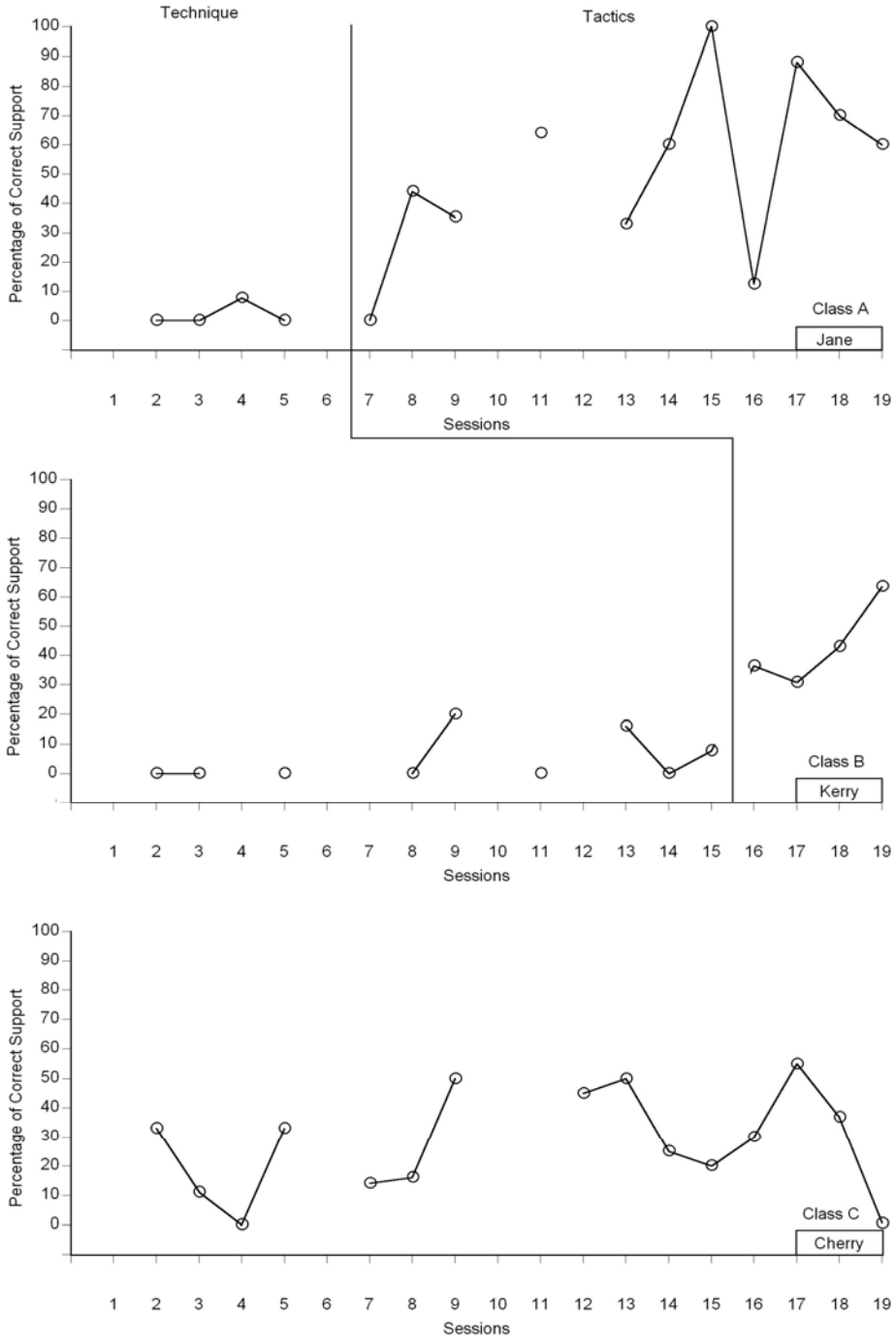

Figure 4.7: Percentage of correct support movement of average skilled female students during 4v4 free scrimmage

data with a wide variability from 0 % to 100%. The data show a gradually ascending pattern.

Kerry

During baseline, Kerry showed a low level supporting movement (range, 0-20%). After the tactic-focused instruction was taught Kerry showed an ascending trend of supporting movement (range, 30-63.6%).

Cherry

Cherry demonstrated a variable pattern of correct supporting movement (range 0.5-50%).

Average Skilled Male Students

The percentage of correct supporting movement of average skilled male students during 4v4 free scrimmage is presented in Figure 4.8. Don from class B was absent from Day 11 to 14 and 19 because of an injury to his hand.

Ron

During baseline, Ron performed a low level of supporting movement (0-12.5%). Following the tactic-focused instruction was taught Ron's supporting movement improved immediately but was variable (range, 10-78).

Don

During baseline, Don showed an ascending pattern of supporting movement (range, 0-60 %). During intervention 75% of his data overlapped with baseline.

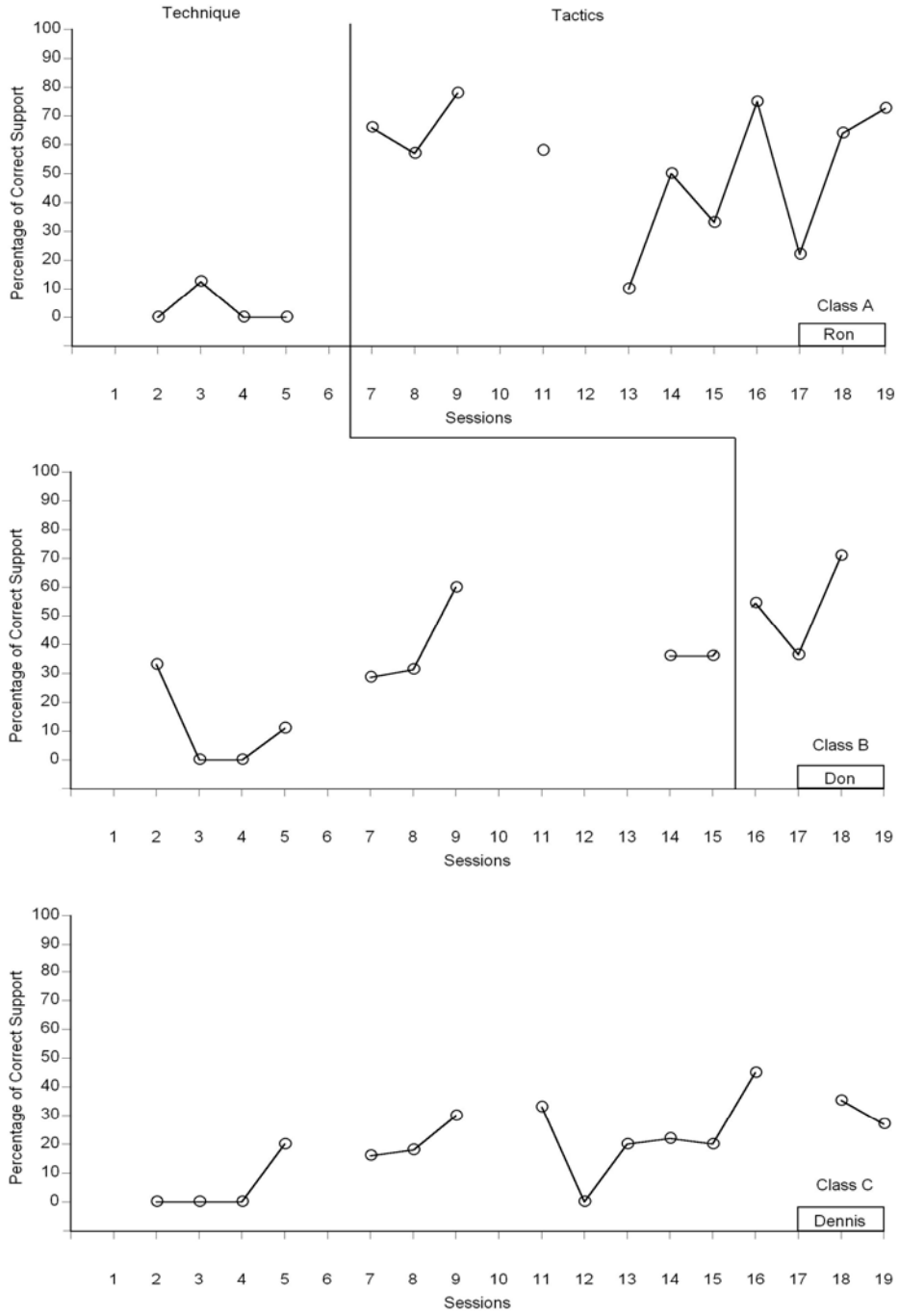

Figure 4. 8: Percentage of correct support movement of average skilled male students during 4v4 free scrimmage.

Dennis

Dennis's data show a gradual ascending trend (range, 0-44%).

Social Validity

To determine whether the tactic-focused instruction was socially valid, a survey was conducted for the study. The survey questionnaire was completed by the two teachers who participated in the experiment, and a panel of teacher educators (i.e., two faculty members, two doctoral students in physical education teacher education, and two experienced physical education teachers). The questionnaire includes two questions focusing on the acceptability of the goal, two questions about the procedure, and four questions about the effects of tactic-focused instruction. After the two teachers and a panel of physical educators watched two
edited videotapes of each instruction, they responded to the questionnaire. The results are presented in the following sections.

The Teachers' Acceptability

The result of the social validity survey shows that tactic-focused instruction is highly acceptable for the teachers who participated in the study (See Figure 4. 9.). Teachers' responses on each question of goals, procedures, and effects are presented below.

Goals

Question 1. Tactics should be taught in physical education. Teachers rated *Strongly agree* on the question 1 (Mean=5). Teachers judged that tactic should be taught in physical education.

Question 2. Tactical approach is more beneficial for students than technique approach. Teachers rated *Strongly agree* on the question 2 (Mean=5). Teachers judged that tactic-focused instruction was beneficial than the technique approach.

Procedures

Question 3. The tactical approach is more difficult to implement than the technique approach. Teachers rated *Strongly disagree* on the question 3 (Mean= 1.5). In fact, question 3 was asking if tactic-focused instruction was difficult to implement comparing to the technique-focused instruction. Thus, teachers judged that tactic-focused instruction is not difficult comparing to the technique-focused instruction.

Question 4. Overall, the tactical approach is a good pedagogy. Teachers rated *Strongly agree* on question 4 (Mean=5). Teachers judged that tactic-focused instruction was a good pedagogy.

Effects

Question 5. Students can play better in a tactical approach than in a technical approach. Teachers rated S*trongly agree* on question 5 (Mean=5). Teachers judged that students were able to play better in tactic-focused instruction than in technique-focused instruction.

Question 6. Students can understand better how to play the game in a tactical approach than in technical approach. Teachers rated *Strongly agree* on question 6

(Mean=5). Teachers judged that students were able to understand better how to play the game in tactical approach than in technical approach.

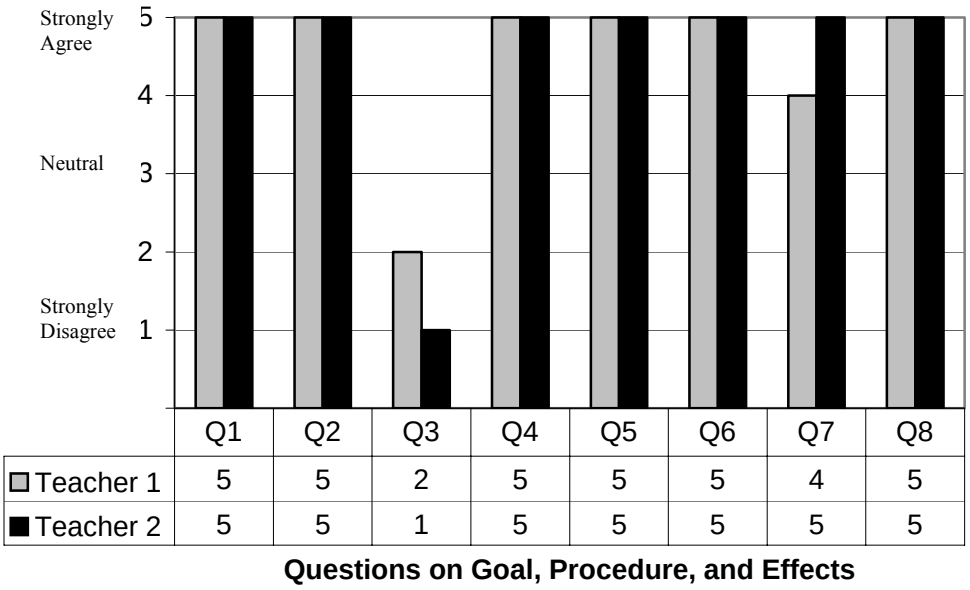

Figure 4.9: The teachers' acceptability of goal, procedure, and effects of tactic-focused instruction.

Question 7. Students can perform technique better in a tactical approach than in technical approach. Teachers rated *Strongly agree* (Mean=4.5) on question 7. Teachers judged that students were able to perform technique better in tactic-focused instruction than in technique-focused instruction.

Question 8. Overall, students learn more in the tactical approach than in the technical approach. Teachers rated Strongly agree on the question 8 (Mean=5). Teachers

judged that students were able to learn more in the tactical approach than in the technical approach.

Overall, the teachers were very positive to the goals and procedure, and effects of the tactic-focused instruction.

The Panel of Physical Educators

The result of the social validity survey shows that tactic-focused instruction is also highly acceptable for a panel of physical educators (See Figure 4.10.). However, there were some varied responses on some questions.

Goal

Question 1. Tactics should be taught in physical education. A panel of physical educators rated *Strongly agree* on the question 1 (Mean=5). They judged that tactic should be taught in physical education.

Question 2. Tactical approach is more beneficial for students than technique approach. A panel of physical educators rated *Strongly agree* to *Neutral* (range, 3-5). The mean score was 4.3. The range and mean score of the responses indicate that the panel of physical educators' acceptability of the goal of the tactic-focused instruction with some variability.

Procedure

Question 3. The tactical approach is more difficult to implement than the technique approach. A panel of physical educators showed a wide range of the responses on the question 3 (range, 1-4). The mean score indicates a measure between neutral and disagree (Mean= 2.6). In fact, question 3 was asking if tactic-focused instruction is

difficult to implement comparing to the technique-focused instruction. The panel of physical educators reported their position as neutral to question 3.

Question 4. Overall, a tactical approach is a good pedagogy. A panel of physical educators rated *Strongly agree* to *Neutral* (range, 3-5). The mean score was 4.2. The range and mean score of the responses indicate that the panel of physical educators' acceptability of the procedure of tactic-focused instruction with some variability.

Effects

Question 5. Students can play better in a tactical approach than in a technical approach. A panel of physical educators rated *Strongly agree* to *Neutral* (range, 3-5) on question 5. The mean score was 4.2. The range and the mean score of the responses indicated that the panel of physical educators' acceptability on the effects of tactic-focused instruction with some variability.

Question 6. Students can understand better how to play game in a tactical approach than in a technical approach. A panel of physical educators rated *Strongly agree* to *agree* on question 6 (Mean=4.8). Overall, they judged that students were able to understand how to play a game better in tactical approach than in a technical approach.

Question 7. Students can perform technique better in a tactical approach than in a technical approach. A panel of physical educators rated *Strongly agree* to *Disagree* (range, 2-5). The mean score was 3.7. The range and the mean score indicated that the panel of physical educators indicated variable responses on the question 7.

Question 8. Overall, students learn more in the tactical approach than in the technical approach. A panel of physical educators rated *Strongly agree* to *Neutral* on the question 8 (range 3-5). The mean score was 4.2. Teachers judged that students were able

to learn more in the tactical approach than in the technical approach with some variability.

Overall, the teachers were very positive to goals and procedure, and effects of the tactic-focused instruction.

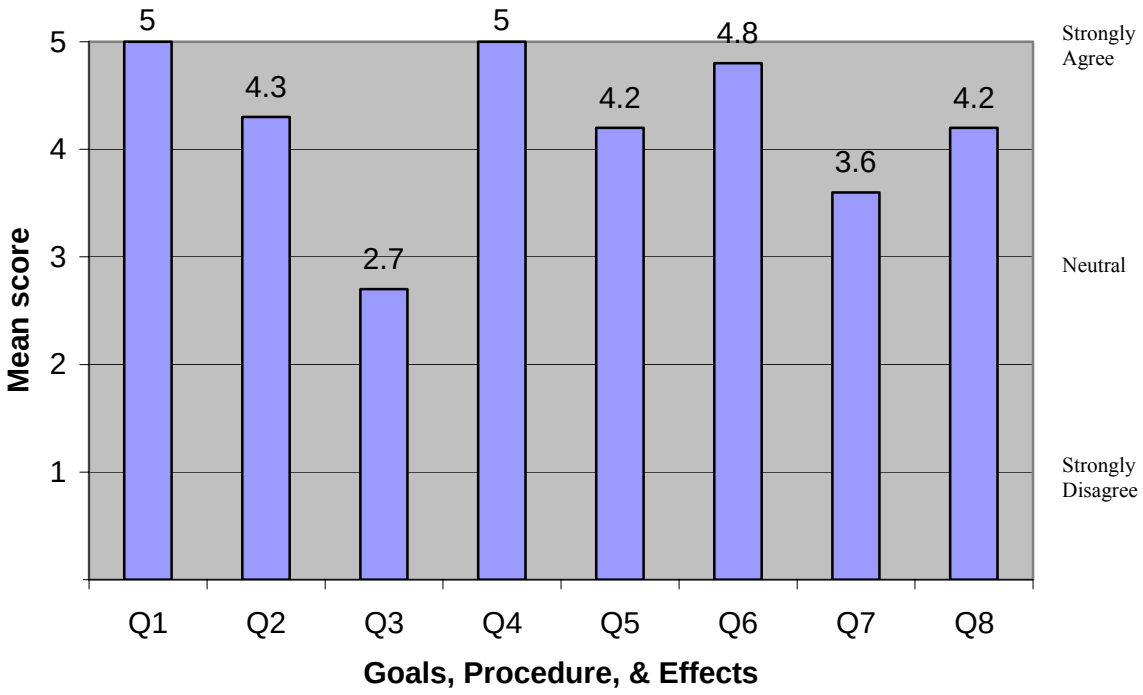

Figure 4.10: The panel of physical educators' acceptability of goal, procedure, and effects of tactic-focused instruction.

CHAPTER 5

DISCUSSION

This chapter discusses the results of the study investigating the effects of tactic-focused instruction in secondary physical education. Results relative to the research questions, general discussion, limitations to the study, implications for practice, and directions for future research are discussed.

Research Questions and Discussion

This section addresses summary of findings and discussion in terms of each research question.

Research Question 1. What is the level of supporting movement under technique-focused instruction for low and average skilled female and male participants during teaching scrimmage?

This section is organized for low skilled females, low skilled males, average skilled females, average skilled males, and discussion.

Low skilled females. Low skilled female students did not show any correct supporting movement for 6 sessions under the technique-focused instruction. In the session 7, Suzy began to receive tactic-focused instruction. In the same session Terry and

Pam began to improve supporting movement without any tactic-focused instruction. The reason could be induction effects. Although the treatment integrity was carefully checked and many strategies were used to prevent the teachers' inaccurate implementation, still there might be a possibility of induction that the investigator was not able to observe due to the distance and hinders to observe teachers' behaviors. Otherwise, the improvement from session 7 could be practice effects due to the 8v8 game that was conducted on session 6 instead of 4v4 free scrimmage. Fortunately, the unusual high data point on session 7 for Terry dropped on the next session and the slope of the improving pattern for Pam was not very radical. Also, the same data trend did not occur in other students on session 7. Rather, the initial improving data points in other students' data varied and their extent of the improvement was not low unlike that of intervention. Thus, it is unclear if the improved data point on session 7 for Terry and Pam were induction effects. It could be a practice effect or an outlier due to confounded variable.

Low skilled males. Low skilled male students performed low level of supporting movement in technique-focused instruction in general. Jack performed 0% of supporting movement during baseline but Andy was able to show some improvement on session 3. David was able to perform supporting movement even on the first session.

Under the technique-focused instruction during teaching scrimmage there were practice effects over time because the slope of improvement was not rapid unlike tactic-focused instruction.

Average skilled females. Average skilled female students performed low to average level of supporting movement in technique-focused instruction. Jane was able to perform supporting movement during baseline although the level was low. Kerry was

also perform supporting movement that ranged from 0-33.3%. Cherry performed variable supporting movement that ranged from 0-55%. Thus, average skilled female students were able to perform supporting movement in technique-focused instruction and they were able to improve supporting movement earlier than low skilled female students.

Average skilled males. Average skilled male students performed low to high level of supporting movement in technique-focused instruction. Ron performed 0% of supporting movement during technique-focused instruction as a baseline. Don began to improve supporting movement on session 2 and showed practice effects over time. The extent of the improvement for Don was not low under the technique-focused instruction relative to his tactic-focused instruction data. Dennis began to improve his supporting movement on session 2 and showed variable data that ranged 0-70%. The level of data for Dennis after session 10 was almost identical with other student data in the intervention.

Discussion. During technique-focused instruction, low skilled students were not able to perform supporting movement very well. Average skilled students demonstrated practice effects over time. In other words, technique-focused instruction for average skilled students was effective enough to improve the level of supporting movement. However, low skilled students clearly need more time to learn tactics. The critical questions are: (a) not that average skilled students might acquire tactics over time but whether they would obtain it to the same degree and as quickly as in tactic-focused instruction, and (b) whether instructor can continue to teach technique if low skilled students are not acquiring tactics.

The baseline findings of the current study support previous studies that have shown that technique-focused instruction does improve over time tactical performance at a low level over time (French, Werner, Rink et al., 1996; French, Werner, Taylor, et al., 1996). In studies by French et al. (1996), the technique condition, like the condition of this study was designed to be very effective technique instruction. However most secondary physical education classes are not characterized by effective technique-instruction. Thus, the findings in this study and the findings from French, et al. (1996) may be overstating the level of performance that typical physical education teachers might be able to achieve during their physical education lessons.

Research Question 2. What are the effects of tactic-focused instruction on supporting movement during the teaching scrimmage for low and average skilled female and male participants?

This section is organized for low skilled females, low skilled males, average skilled females, and average skilled males.

Low skilled females. Three participants were classed as low skilled (Suzy, Terry, and Pam). For Suzy and Terry, tactic-focused instruction was effective in improving their supporting performance. Pam gradually improved over the course of the 19 sessions. Data for Terry and Pam both showed increases in performance during baseline at the same time as the intervention occurred with Suzy. It is possible that some induction occurred here, however, there is minimal overlap between baseline and intervention and the intervention data are at substantively higher level than the baseline data. The treatment integrity check showed that the teachers taught lessons as planned. In addition

this induction effect was not observed in other participants. Thus, it is hard to conclude if the increase from the session 7 is due to induction, practice effects or due to unknown variables.

Low skilled males. Three participants were classed as low skilled (Jack, Andy, and David). For Jack and Andy tactic-focused instruction was effective in improving their supporting movement. David's data was variable throughout the study. Both Andy's data and David's data show evidence of practice effects.

Average skilled females. Three participants were classed as average skilled (Jane, Kerry, and Cherry). For Jane and Kerry, the tactic-focused instruction was effective in improving their supporting movement. Jane's intervention data showed a wide variability with two data points overlapping baseline data. However, her data showed an ascending pattern over time. That demonstrates the effects of tactic-focused instruction. Cherry's data shows variability over the course of the 19 sessions.

Average skilled males. Three participants were classed as average skilled (Ron, Don, & Dennis). For Ron tactic-focused instruction was effective in improving his supporting movement. Don's data do not show any improvement from baseline to intervention. Dennis showed practice effects over time with some variability. Thus, it is reasonable to conclude that the experimental effect of tactic-focused instruction was not replicated for average skilled males.

Discussion. Tactic-focused instruction was effective in improving supporting movement during the teaching scrimmage for low skilled female and male, and average skilled female. The interpretation for average skilled students was problematic because Don's data did not replicate the effects obtained for Ron. One reason for no effect in

Don's data could be due to a hand injury he sustained on day 10. It is unclear whether or not that hand injury was an effect of Don's performance. However, the investigator's observation suggests that it was a factor. The baseline data for Dennis showed practice effects. The data for Don and Dennis support a hypothesis that average skilled and perhaps high skilled students are able to improve tactical performance during technique-focused instruction.

Compared to previous studies (French, Werner, Rink et al., 1996; French, Werner, Taylor, et al., 1996; Turner & Martinek, 1995, 1999), this study has demonstrated that pedagogy and tactical content used in this study were effective in teaching tactics to low skilled females and males and average skilled female students. This represents an important step forward in the teaching of tactics.

It was an interesting finding that low skilled students were also able to improve correct supporting movement in tactic-focused instruction. Low skilled students are typically not served very well by group intervention in physical education (Johnson & Ward, 2001). However, recently a number of behavioral focused interventions have shown positive effects for low skilled students such as class wide peer tutoring (Johnson & Ward, 2001), peer tutoring (Wilson, Dunn, van der Mars, & McCubbin, 1997; Goldberger & Gerney, 1986; Goldberger, 1982; Murata, 1995; Webster, 1987), peer-mediated group accountability (Crouch, Ward & Patrick, 1997; Ward Smith Makasci & Crouch, 1998), and cooperative learning strategies (Barrett, 2000). This current study adds another intervention that can assist low skilled students learning.

Research Question 3. What is the level of supporting movement under technique-focused instruction for low and average skilled female participants during 4v4 free scrimmage?

Low skilled females. During 4v4 free scrimmage low skilled females performed low supporting movement under technique-focused instruction as baseline. Suzy performed 0% of supporting movement. Terry and Pam showed practice effects over time but the level of supporting movement was low.

Low skilled males. During free scrimmage low skilled males also showed a low level of supporting movement when they are under the technique-focused instruction. All three students showed 0% of supporting movement by session 5. In session 7 Andy and David began to improve supporting movement. It could be either induction effects or practice effects with time that makes it difficult for any interpretation.

Average skilled females. During free scrimmage average skilled female students showed some supporting movement in technique-focused instruction. Jane and Kerry showed a spontaneous and low level of supporting movement. In contrast, Cherry was able to perform supporting movement even on session 2. Although Cherry showed variable data, she was able to perform better supporting movement than that of Jane and during their first and second intervention session.

Average skilled males. During free scrimmage average skilled male students began to perform supporting movement earlier sessions relative to other students. The level of the supporting movement of Don and Dennis was not low during baseline unlike other low skilled students.

Discussion. During free scrimmage all students showed a similar trend of supporting movement as they performed during teaching scrimmage under technique-

focused instruction. When students performed supporting movement with a certain degree during teaching scrimmage, there was a similar trend and pattern of generalization data during free scrimmage. If students performed a low level of supporting movement during teaching scrimmage they performed the similar level of data during free scrimmage.

Today, there have been no studies in physical education that used similar strategies in the assessment in game performance. There are however coaching studies that used the strategies (Brobst & Ward, 2002; Ward & Carnes, 2002; Ward, Smith, & Sharpe, 1997). These studies basically indicated that the players played games as they practiced the games. Thus, if their performance in the practice was low in the game was low. Relatively the baseline data obtained in the free scrimmage of technique-focused instruction in this study, students were considerably lower skilled than those in the football study.

Research Question 4. What are the effects of teaching scrimmage under tactic-focused instructional condition on supporting movement during 4v4 free scrimmage for average and low skilled female and male participants?

This question asks if the skills learned in the teaching scrimmage generalized to the free scrimmage.

Low skilled females. During free scrimmage students showed a similar pattern and level of improved supporting movement as they performed during teaching scrimmage under the tactic-focused instruction. The tactic-focused instruction was effective and the

intervention effects were generalized to the free scrimmage for the low skilled female students.

Low skilled male students. Two students showed generalization effects. Though interpretation is made problematic because Jack left the study after 3 sessions of intervention, this data suggests that the intervention was effective for low skilled male students. Low skilled male students were able to generalize to the free scrimmage when they improved during teaching scrimmage.

Average skilled females. During free scrimmage average skilled female students showed generalization effects. The improved level and trend of teaching scrimmage data was generalized to the free scrimmage under tactic-focused instruction.

Average skilled males. Generalization conclusions cannot be formed for average skilled male students since there was considerable overlap in Don's data, which presents a threat to internal validity.

Discussion. There were generalization effects of tactic-focused instruction. When students were taught with an explicit tactic-focused instruction they were able to improve tactical performance and further, they were able to generalize what they learned to the free scrimmage. None of previous studies were able to conclude that tactic-focused instruction was more effective than technique-focused instruction. In addition, the generalization effects in this investigation provides a solid validation that tactic-focused instruction was effective. One of the conclusions of previous instructional comparison studies of French, Werner, Rink et al. (1996), and French, Werner, Taylor, et al. (1996) was that tactic-focused instruction and technique-focused instruction were similarly effective in teaching tactics. That level of effects was not particularly high. In the present

study, the level of generalization from practice to game was quite high. While the data for average skilled male students remain unclear the data for rest of students are a strong indication of the effectiveness of tactic-focused instruction.

Research Question 5. How acceptable are the goals, procedures, and outcomes of the intervention to the teachers who taught the unit of the instruction?

The teachers who participated in the investigation were asked to rate the acceptability of goals, procedures and outcomes of the study. The likerd scale from 5 to 1 (strongly agree to strongly disagree) was used to assess the degree of their agreement on each question.

In terms of goals, there was a strong agreement for tactic-focused instruction by the teachers who participated in this study. They strongly agreed that tactics should be taught in physical education class and tactical approach is more beneficial for students relative to technique approach.

The teachers also strongly agreed on the questions on procedure of the tactic-focused instruction. They also strongly agreed that tactical approach was not difficult to implement than technique focused instruction thus it is a good pedagogy.

In terms of effects, the teachers strongly agreed to the questions on effects of the tactic-focused instruction. They strongly agreed that students were able to play better during tactic-focused instruction than during technique-focused instruction. They also strongly agreed that students were able to understand better how to play during tactic-focused instruction than during technique-focused instruction thus. Surprisingly, the teachers even thought that students are able to perform techniques of the game better

during tactic-focused instruction than during technique-focused instruction. Thus they agreed that overall students learn more in tactical approach than in the technical approach.

In conclusion, teachers were very positive relative to the goals, procedure, and effects of the study. The degree of their acceptability and satisfaction of tactic-focused instruction was very high. However, it is important to note a caveat here: This finding may have been also influenced by their previous involvement in the Ohio State University workshops on tactics.

Research Question 6. How acceptable are the goals, procedures, and outcomes of the intervention to a panel of physical education professionals?

A panel of physical educators was asked to rate their agreement of the goals, procedures, and outcomes of tactic-focused instruction in order to determined social validity of the intervention. They agreed that tactics should be taught in physical education. They also agreed that the tactical approach is more beneficial for students than technique-focused instruction. Compared to the teachers who participated in the study the panel of physical educators showed less agreement to the goal related questions. But the degree of the agreement is still high enough to show their acceptability for the goal of teaching tactic-focused instruction.

In terms of the questions on the procedure of teaching tactic-focused instruction, the panel of physical educators was neutral on the question 3 which asked if the tactical approach is not more difficult to implement than technique approach. The panel of physical educators strongly agreed for the question 4 which asked if overall, tactical

approach is a good pedagogy (See Figure 4.10.). Unlike the teachers who participated in the study, the degree of the acceptability of the tactic-focused instruction procedure was not very strong. This result may show that the panel of physical educators showed a more conservative view on both technique-focused instruction and tactic-focused instruction. Alternatively the panel of physical educators may have thought that the tactic-focused instruction used in this study could be improved.

In terms of questions on effects of tactic-focused instruction for students, the panel of physical educators rated agree. They agreed that students can play better in tactic-focused instruction thus students can understand better how to play game in tactic-focused instruction. The panel of physical educators rated on agreed on the question that students are able to perform technique better in tactic-focused instruction. The panel of physical educators agreed that overall students learn more in the tactical approach than in the technical approach. Again, the panel of physical educators tends to show less agreement on the effects relative to the teachers. This result may imply the panel of physical educators' of fair view on both technique-focused instruction and tactic-focused instruction.

Although there was some variability, overall the panel of physical educators indicated their strong acceptability of the goals, procedures, and effects of tactic-focused instruction with some degree of fair value on both tactic-focused and technique-focused instructions.

General Discussion

This study contributes to the literature in three ways: by defining tactical performance, by providing evidence of learning and generalization of tactics in physical education, and by demonstrating that low skilled students, and in particular female students, can acquire tactical skills within an instructional unit and participate as active and successful participants in game play. This section will discuss each of these contributions.

Defining Tactical Performance

A unique feature of this study is that the two instructional conditions were designed to represent a high quality of instruction for each instructional model. Previous studies using a similar approach (French, Hussey, & Jones et al. 1996; French, Werner, Rink et al. 1996) had concluded that there was no difference among three instructional conditions (i.e., tactical approach, technical approach or combined with tactical and technical approach) designed to teach tactics. The finding of this study contradicts these previous studies. The most likely explanation for the difference may be the definition of the dependent variable. In previous studies tactics have been defined very loosely and measured using instruments that were not behavior specific. In game performance assessment instrument (GPAI), the definition of support in soccer, which is also an invasion game was "the player appeared to support the ball carrier by being in or moving to an appropriate position to receive a pass." This definition does not provide any contextual information such as timing (e.g., when one should be in the position), distance (i.e., how far the receiver should be from the ball carrier to receive a pass), or the player's

location (i.e., where to received the ball relative to the passer such as in front, in back, or on the side). Without such information coding can become inaccurate and lead to both issues of reliability and validity.

In the present study tactics was defined as a specific observable behaviors. In the definition of supporting movement of tag rugby was defined as "being beside or behind (except right behind) the ball carrier or a potential ball carrier, and keeping a distance between 3-7 yards from the ball carrier or a potential ball carrier in each episode." While not all individuals may agree with this definition of dependent measurement, the important point is that by defining the behavior explicit teaching and measurement can occur.

A second unique feature of this study that may explain the findings from previous studies may be the measurement system. The team sport performance assessment instrument of Grehaigne, et al. (1997) provides summary data of player performance like the GPAI, but not in the context in which the behavior actually occurred. Both the team sport performance assessment (Grehaigne, et al., 1997) and the GPAI (Griffin et al., 1997) report products of measurements that do not provide information of ongoing changes in each player's performance, but provide a final picture of how each player played. Such data is very much like a normative fitness test. It tells you a final score but provides no guidelines on how to improve the performance. In contrast, the measurement system in this study used the individual as the unit of analysis and tightly defined the context during which the dependent variable could be recorded. This information allows teachers and researchers to plan for specific instructional assistance for students.

Learning and Generalizing of tactics in physical education

A common criticism in the literature is that students do not learn to play games in physical education when the approach is focused on the technique of skill performance. Techniques are not tactics. Bunker and Thorpe (1986) proposed a curriculum model (TGfU) that was designed to teach tactics to generalize to games and across games (i.e., from tennis or badminton). However this model has yet to be validated. One of the few studies to assess generalization with any effects in physical education was an investigation of tactical transfer in net games (Mitchell, et al., 1995). The study examined the half court badminton games, single badminton games, and pickball games. The GPAI was used to measure the game performance and the perfect score for the decision-making was 1. The Mitchell et al. (1995) study showed a decision-making score as .28 for the badminton and .33 for the pickleball. Although they concluded that there was a significant difference between the half court badminton to the singles badminton, and there was a transfer from badminton to the game of pickleball. The generalization measure of correct decision-making rate was only 28-33%. Though this is better than the reported lack of generalization in physical education it is quite insufficient if the goal is to provide more skillful game play.

However, studies have reported generalization from practice to games in collegiate football settings. (Ward, Smith et al., 1997; Ward & Carnes, 2002). In these studies the game performance consistently mirrored the practice performance. When practice performance was low, game performance was low, and when practice performance was high, game performance was high. Brobst and Ward (2001) showed that female high school soccer players generalized performance from practice to games. The

generalization data in Brobst and Ward (2001) were not as strong as those obtained in the football studies. One reason proposed for the difference between the football and soccer studies was that the participants in high school soccer intramurals were less skilled than collegiate football players (Brobst & Ward, 2001). If generalization effects are related to skill level, students in physical education classes might have less generalization effects relative to high school athletes or collegiate football players because they are less skillful. Although there are some unanswered questions in the current investigation, generalization effects in physical education classes were found on low skilled and average skilled students. These students are not high skilled at all thus they are not supposed to demonstrate a high level of generalization if the hypothesis is correct.

The findings of this study provide strong evidence against to the hypothesis that generalization effects are related to the student skill level. Students in physical education classes do not deserve to have lack of generalization due to their skill level.

Based on the previous studies of tactics in sport and this current study in physical education, one hypothesis might be that generalization effects may vary according to a players' history of game experience and amount of practice time. This hypothesis can be represented as a continuum in following diagram (see Figure 4.11.).

As the diagram shows, there was the strongest generalization from practice to games by collegiate football players (Ward & Carmes. 2002; Ward, Smith, & Sharpe, 1997). For the high school athlete, there were generalization effects but the extent of generalization was not as strong as the collegiate athletes (Brobst & Ward, 2001). In high school physical education setting, some generalization was found but the extent was low at the best in the study of Michell et al. (1995). At the end of continuum there might be

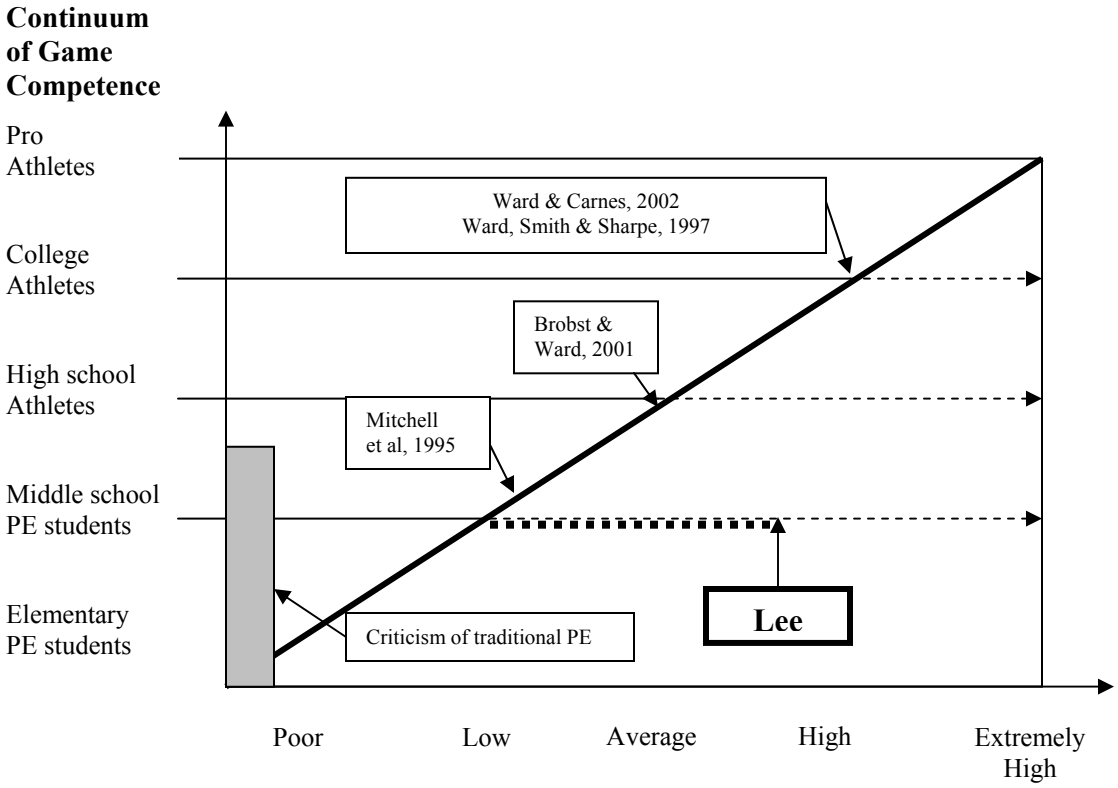

Figure 4.11: The extent of generalization in the continuum of game competence

poor generalization or no generalization-which represents the criticism of outcomes in traditional physical education. The solid line in the middle is a conceptual tool only. The dotted arrow is the degree toward the maximum generalization.

This study demonstrated a generalization from teaching scrimmages, which represent practice to scrimmages, which represent games. The solid dotted line demonstrates the degree of improved generalization in middles school students; performances. The efficacy of instruction and pedagogy has been demonstrated in this

study using effective behavioral principles to maximize generalization effects such as discrimination training (e.g., freeze-replay), providing enough examples (e.g., tactical scenario, set play drills), and programming common stimuli using a close alignment between practice to games (Cooper et al., 1987).

In conclusion, this study demonstrates that it is possible to improve tactical performance of students in physical education. It was possible to demonstrate generalization from practice to games as a validation of tactic-focused instruction.

Educational Equity

Low skilled students, and in particular female students, often do not acquire skills or do not participate actively in traditional physical education that has produced low skilled students in games (Griffin et al. 1997; Johnson & Ward, 1999). Such students are underserved by traditional physical education. Despite the quality of the technique-focused instruction in this study, low skilled students did not perform the dependent measure well during baseline. The tactic-focused intervention, however, not only increased the success of the students in performing the supporting movements it allowed these students to increase the quality of their participation in the game. Thus, the tactic-focused instruction, at least relative to low skilled students did not reproduce an outcome that has been common in physical education-that of low skilled students disengagement and low success rates. This study shows that low skilled students can acquire tactical skills within an instructional unit and participate as active and successful participants in game play.

Limitations of the study

There were several unanticipated problems that caused limitations of the study. The biggest limitation of this study is student absences and the drop out that might have a huge impact on data. Don's absence due to the hand injury might have produced many unanticipated problems such as a threat of internal validity. The research questions for the average skilled males were remained as unanswered. It was the biggest limitation of this study. Jack's dropped out also left a huge blank area for the low skilled male students. In fact, the shortage of intervention data points in free scrimmage weakened the strength of the findings. There were several absences of other students that left missing data points in the graphs. The absence of one student in a group influenced to the group dynamic that might have influenced on the variability of data.

The absence of an intervention on the third class is another limitation of this study. Replication of the intervention effects is an essential criterion for single subject designs. However, the variability of data after the first intervention delayed the second intervention and the existing limitation of the scheduled lessons resulted in too little time to intervene on the second class. As a result, there was no time to intervene on the third class. Without a stable baseline, there is no ability to predict the data trend. Thus, nine sessions were spent waiting for a stable baseline. This had two effects (a) only four sessions were provided for the second intervention group, and (b) the third class was treated as untreated control.

Another limitation of this study was that there seem to be indications of induction for some participants. Terry and Pam in classes B and C began to improve their supporting movement on session 7, which is the first day of the intervention for class A.

This is unlikely to be practice effects since their data were 0% prior to this point. The most likely explanation is that some induction occurred for Terry and Pam. However the same trend was not found as in other participants. One explanation for the induction may have been an 8v8 game that was played between session six and session seven that was removed from the data display because the analysis was stopped at that point for 8v8 games. It is possible but probably unlikely because induction effects were not shown for other participants.

Practice effects under technique-focused instruction are also a limitation of this study. Under technique-focused instruction, some improvement was observed in the second intervention group and the control group that could be practice effects. For example the performances of Terry, Andy, Pam, and Dennis improved prior to intervention. The practice effects in the control group (i.e., class C) were more dominant especially for the average skilled male students. Even though this improvement demonstrates that technique-focused instruction helped them improve the dependent variable, the improving pattern of data weakens the verification component of the baseline logic of the multiple baseline design. This result could suggest that average skilled students and perhaps high skilled students are able to improve tactical performance regardless of instructional approaches because they are able to generalize tactics from other invasion game experience. Since the technique-focused instruction was designed to reflect good pedagogy this hypothesis bears further investigation.

Initially, it was planned to examine 8v8 games for the generalization in other settings, however coding the data became problematic. The camera did not allow all eight players to be captured on the screen because one or more players were frequently

blocking one or more of their teammates. Because of this reasons, the investigation of 8v8 game generalization was not conducted. Between the session 6 and 7, 8v8 game was conducted and it was suspected that 8v8 game might have caused the improvement of supporting movement, which was discussed as a possibility of induction effects.

Another limitation of the study that appears to affect the interpretation of this study was variability of the data. There are two possible reasons for this. First, with the low temperatures outside students often did not participate in activities very well. For example, in the session 12, it was not possible to continue the class B's session because of the wind chill and resultant managerial problems (i.e., students' complaints). There was no option for dealing with this kind of problem. Thus, there was a missing data point on the day.

Implications for Practice

There are several implications for practice can be suggested from the current investigation.

1. Tactics should be defined in terms of the sport specific context before it is taught. In this study the dependent variable, which was one individual tactic in the game was clearly defined as supporting movement.
2. Tactics should be taught in explicit ways. In this study, tactical scenarios and set plays were explicitly used to teach tactics. Focusing on explicit offense and defense tactics in response to specific defense and offense scenarios is much more effective than merely relying on practice alone to teach students when and how to apply the tactic.

3. The use of Freeze-replay strategy is a powerful pedagogical vehicle in the teaching of tactics. The freeze replay strategy is a discrimination training strategy. Without any type of discrimination training, students may not know what they did wrong or how to do right in the game context. Although they may notice some errors, they need to know what should be changed to make a correct performance. The teachers' freeze-replay strategy can help students to discriminate what responses they should perform and when to perform them. The practical use of this strategy for teaching game skills is invaluable.
4. Once tactics are taught in explicit ways, it is necessary to assess student performance in game settings as well as practice settings. It is essential to evaluate student performance in the game context because this validates the instruction and allows students opportunities to respond to variations of the scenarios that were taught in practice. The purpose of using teaching scrimmage and free scrimmage is to program common stimuli such as defenders' position and movement when to use what they learned. Those situational contexts are very different comparing to only practice drill with the absence of defenders or game like context. Under the teaching scrimmage, more game like common stimuli can be programmed while freeze-replay strategy is delivered. Thus it is easier for students to generalize what they learned from practice to games in the given pedagogy.

Directions of Future Studies

The first direction for future studies should be a replication of the intervention effects and generalization. Due to the limitation of the data, it is unclear whether the tactic-focused instruction is beneficial for average skilled students in this study including examining the effects of the intervention for high skilled students in future studies.

Findings of this study are limited to only tag rugby unit. It will be important to examine other invasion games that are not novel such as basketball, soccer, or team handball. In addition, other forms of sports should be examined such as racquet sports (e.g., tennis, badminton) and court sports (e.g., basketball and team handball).

This study used one dependent variable. It is recommended that other tactic variables be assessed. For example, supporting movement was selected as an individual level of tactics in this study. In future studies, group tactics or team tactics could should be examined. At the same time, the game related outcomes such as scoring and turnover rates can be analyzed in relation to tactical performance.

A pedagogy for teaching tactics and its generalization was introduced in this study. This pedagogy called "freeze-replay" although not the primary focus of this study is clearly an important teaching tool. Further investigation should occur to examine the effectiveness of "freeze-replay".

One important issue that needs more investigation is the role of teacher's content knowledge. When teachers do not have good content knowledge, it is difficult to provide accurate feedback. Helping teachers to understand tactics and to be able to teach them is a critical area for future investigation. One resource that promises to be very useful for improving teachers understanding is Launder (2001)'s *Play Practice*. This book provides

rationale of transfer of training with game progression to maximize the generalization effects. Though the book is based on the experience of the author, it remains unverified empirically. Assessing the validity of assumptions of this book should be a major outcome of future research.

Conclusions

It is a challenge to conduct research on how to help students learn game skills in physical education. The existing body of literature of the field has not produced validated teaching procedures for the teaching of tactics. It has instead been dominated by anecdotal suggestions and more recently ideology. This investigation pinpointed the research problem as the lack of generalization from practice to games, and then compared technique-focused instruction and tactic-focused instruction. To sharpen the focus of the research problems and to deepen the insight for approach to the problem, chapter 2 was devoted to the literature review based on three primary questions: (a) how tactics have been studies in physical education and sport settings, (b) what have been theoretical rationales that drive the research and teaching of tactics, (c) what are existing sports classification system that can shed understanding of tactics.

An innovative pedagogy has been devised for the current investigation. Data from this study show that there were effects of tactic-focused instruction in the teaching scrimmage and there was also generalization from practice to games, especially for low skilled students who are typically not shown to improve in physical education.

Based these findings, several implications for practice were suggested and future direction of studies were provided. It should be clear that this study of generalization of

tactics from practice to games constitutes an open field and raises many important questions that require continuous scientific investigations in the field. However this study has the potential to shed on knowing how to help students to learn game skills in physical education.

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APPENDIX A

PERMISSION LETTER FROM THE COLUMBUS SCHOOL DISTRICT

Office of Student Assistance, Intervention and Outreach
Evelyn W. Bell, Executive Director
Maurice D. Blake, Director

COLUMBUS PUBLIC SCHOOLS

Pupil Services
61 South Sixth Street
Columbus, OH 43215
Phone: (614) 365-5737 or 365-5763
FAX: (614) 365-6794
Email: mblake@columbus.k12.oh.us

COLUMBUS PUBLIC SCHOOLS

September 4, 2003

Dear Administrator:

I write this letter to introduce Dr. Phillip Ward, a researcher from The Ohio State University. Dr. Ward's proposed research, "An Assessment of Transfer Tactics from Practice to Games in Physical Education Lessons" has been reviewed and approved by the Research Proposal Review Committee.

This letter does not obligate you to participate in the study. Rather, it serves as an introduction and official notification that Dr. Phillip Ward has followed established procedures and has been granted permission to solicit subjects to participate in the study.

If you have any questions or concerns, please contact my office.

Sincerely,

Maurice D. Blake
Director

MDB/smg

cc: Saundra Brennan

APPENDIX B

PERMISSION LETTER FROM THE OHIO STATE UNIVERSITY BEHAVIORAL AND SOCIAL SCIENCE INSTITUTIONAL REVIEW BOARD

T · H · E
OHIO
STATE
UNIVERSITY

Office of Responsible Research Practices

1960 Kenny Road
Columbus, OH 43210-1063
Phone 614-688-8457
Fax 614-688-0366

Dear Investigator(s),

You recently submitted an application for exemption. Your application has been determined to be exempt from review by the Institutional Review Board. The form that is enclosed with this letter is the notice of approval. Please keep this notice with your research materials.

The approval letter is being sent to you because you are listed as the Principal Investigator. Please copy the letter for any co-investigators who wish to have a copy.

Please note that exempt research is intended to be short term in nature - less than one year. It is anticipated that you will conduct the research as written and that you will not make changes to the research design, the selection of subjects, the informed consent process, or the instrumentation during the course of the study. Exempt research cannot be amended or extended.

Investigators are responsible for protecting the rights and welfare of human subjects participating in research.

Please contact me if you have questions about the review process.

Sincerely,

Janet

Janet Schulte, CIP
Office of Responsible Research Practices
Biomedical Sciences IRB
Phone: 688-0389 / Fax: 688-0366
E-mail: Schulte.58@osu.edu

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TITLE PAGE - APPLICATION FOR EXEMPTION
FROM REVIEW BY THE INSTITUTIONAL REVIEW BOARD
The Ohio State University, Columbus OH 43210

For office use only
PROTOCOL NUMBER: 2003E0282

▶Principal Investigator	Name: **Phillip Ward**	Phone: 6888435
University Title: ☐ Professor ☒ Associate Professor ☐ Assistant Professor ☐ Instructor ☐ Other. Please specify. (May require prior approval.)	Department or College: College of Education	E-mail: ward.116@osu.edu
	Campus Address (room, building, street address): 305 Pomerene Hall 1760 Neil Avenue	
	Signature: P Ward Date: 9-2-03	Fax: 292-7229

▶Co-Investigator	Name: **Myung-Ah Lee**	Phone: 404-6340
University Status: ☐ Faculty ☐ Staff ☐ Graduate Student ☐ Undergraduate Student ☐ Other. Please specify.	Campus Address (room, building, street address) or Mailing Address: 309E Pomerene Hall 1760 Neil Avenue	E-mail: lee.1836@osu.edu
	Signature: Lee Ah Date: 9-2-03	Fax:

▶Co-Investigator	Name:	Phone:
University Status: ☐ Faculty ☐ Staff ☐ Graduate Student ☐ Undergraduate Student ☐ Other. Please specify.	Campus Address (room, building, street address) or Mailing Address:	E-mail:
	Signature: Date:	Fax:

▶Protocol Title	**GENERALIZATION OF TACTICS FROM PRACTICE TO GAME IN SECONDARY PHYSICAL EDUCATION**

▶Source of Funding	NA

For Office Use Only

☒ **Approved.** ▶ Research has been determined to be exempt under these categories: #1 #2. Research may begin as of the date of determination listed below.

☒ **Disapproved.** ▶ The proposed research does not fall within the categories of exemption. Submit an application to the appropriate Institutional Review Board for review.

Changed JAS 9/18/03

Date of determination: 9/18/03 **Signature:** Janet A. Schulte
Office of Research Risks Protection

APPENDIX C

SAMPLE PARENTAL CONSENT LETTER AND CONSENT FORM

Dear Parent or Guardian

My name is Myung-Ah Lee. I am a Ph. D. student enrolled in the Sport and Exercise Education program at The Ohio State University under the supervision of Dr. Phillip Ward. As a part of my studies I am interested in working on a research study of teaching tactical skills in tag rugby unit. You are being asked to allow your child to participate in this study. Your child's teacher has agreed to work with me on this study.

The purpose of the research is to investigate whether or not middle school students in grades 6-8 can be taught and then can apply the tactics of sports. Physical education teachers routinely teach students basic skills such as passing, catching, and running. But knowing when to pass the ball and how to maintain possession of the ball in tag rugby is a tactic. Other tactics include moving to the open space to receive a pass and advancing forward after passing the ball. These tactics are often taught in classes but we know very little about whether students generalize these tactics from practice to games. As a result of this research we hope to emphasize to the profession the importance of teaching tactic as well as basic skills in physical education.

We are writing to ask your permission to allow your child to participate in this study. We will be making some small organizational changes to the lesson but by and large your child will not be asked to do anything different from his or her regular physical education and the class will be taught as usual by Ms. Kathy Mize and Toby Rodichock. During each class, your child will be videotaped and by the end asked their perception of the physical education class. Only the researcher to study each student's tactical skill performance will use the videotape. The results of this study regarding to your child is available to you and if you wish. The results of this study may be published but the school or name of your child will never be mentioned. All information about your child will be kept confidential. Each child will be assigned a number. If you wish your child to withdraw from the study or if your child wishes to withdraw from their participation in the study, this may occur at any time during the study.

We expect to start the study early October. Would you please return one of the attached informed consent forms signed if you give your permission for your child to participate? If you have any questions about the study, please feel free to contact with Myung-Ah Lee (ph: 459-2760) or Dr.Ward (ph: 688-8435). Please return the attached consent form as soon as possible and keep one copy.

Sincerely,

Dr.Phillip Ward
Ward.116@osu.edu
688-8435

Myung-Ah Lee
lee.1836@osu.edu
459-2760

CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

Parent Consent Form

Protocol title: Generalization of tactics from practice to game in secondary physical education

Protocol number: Investigators: Dr. Phillip Ward
Myung-Ah Lee

I consent to my child's participation in research being conducted by Dr. Phillip Ward and Myung-Ah Lee of The Ohio State University.
The investigator(s) has explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my child's participation.
I know that I can and/or my child can choose not to participate without penalty to me and/or child. If I agree for my child to participate, my child can withdraw from the study at any time, and there will be no penalty.
I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at (614) 688-8435. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.
I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

I agree to my child's participation in this research.

Print the name of the participant: Print the name of the parent:

_____ _____

Signed:_____ Signed: _____
(Participant) (Date) *(Parent) (Date)*

Signed: _____ Signed: _____
(Principal Investigator) *(Person authorized to consent for participant, if required)*

I agree to my child to be videotaped during this investigation.

Print the name of the participant: Print the name of the parent:

_____ _____

Signed:_____ Signed: _____
(Participant) (Date) *(Parent) (Date)*

Signed: _____ Signed: _____
(Principal Investigator) *(Person authorized to consent for participant, if required)*

APPENDIX D

SCRIPT FOR TEACHING SPORTS TACTICS IN PHYSICAL EDUCATION.

SCRIPT FOR TEACHING SPORTS TACTICS IN PHYSICAL EDUCATION.

To be read by the physical education teacher

Good morning.

I want to invite you to participate in a study, a project, that I am doing with The Ohio State University. This project is very similar to things we have done before like this. During the study people from the university will videotape our class and sit on the sides to observe you and also me as you participate in class. They will be looking to see how well we perform tactics in our sports that we play. I will be giving you some letters to take home and to bring back to school that explain to your parent what I have just explained to you. If you or your parent do not wish for you to participate in this study, that is OK. You can stop anytime you want. You will still be participating in our physical education lesson but the people from the university will not be looking at you as we practice. Are there any questions?

APPENDIX E

SAMPLE OF COVER LETTER AND TEACHER CONSENT FORM

Dear ,

My name is Myung-Ah Lee. I am a Ph. D. student enrolled in the Sport and Exercise Education program at The Ohio State University under the supervision of Dr. Phillip Ward. As a part of my studies I am interested in working on a research study of teaching tactical skills in a tag rugby unit. I am asking for your agreement to participate in this study.

The purpose of the research is to investigate whether or not middle school students in grades 6-8 can be taught and then can apply the tactics of sports. Physical education teachers routinely teach students basic skills such as passing, catching, and running. But knowing when to pass the ball and how to maintain possession of the ball in tag rugby is a tactic. Other tactics include moving to the open space to receive a pass and advancing forward after passing the ball. These tactics are often taught in classes but we know very little about whether students generalize these tactics from practice to games. As a result of this research we hope to emphasize to the profession the importance of teaching tactic as well as basic skills in physical education.

We are writing to ask your permission to allow your students to participate in this study and to allow videotaping your class. We will be making some small organizational changes to the lesson but by and large your students will not be asked to do anything different from his or her regular physical education. During each class, your class will be videotaped and by the end asked their perception of the physical education class. Only the researcher can access these data and all information about your child will be kept confidential. If you wish to withdraw from the participation in the study, this may occur at any time during the study.

We expect to start the study early October. Would you please return one of the attached informed consent forms signed? If you have any questions about the study, please feel free to contact Myung-Ah Lee or Dr.Ward. Please return the attached consent form as soon as possible and keep one copy.

Sincerely,

Dr.Phillip Ward
Ward.116@osu.edu
Phone: 688-8435

Myung-Ah Lee
lee.1836@osu.edu

CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

Teacher Consent Form

Protocol title: Generalization of tactics from practice to game in secondary physical education

Protocol number: Investigators: Dr. Phillip Ward
Myung-Ah Lee

I consent to my participation in research being conducted by Dr. Phillip Ward and Myung-Ah Lee of The Ohio State University.

The investigator(s) has explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my participation.

I know that I can choose not to participate without penalty to me and/or my students. If I agree to participate, I can withdraw from the study at any time, and there will be no penalty.

I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at (614) 688-8435. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.

I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

I agree to my participation in this research.

Print the name of the participant: _____

Date: _____ Signed: _____
(Participant)

Signed: _____ Signed: _____
(Principal Investigator) *(Person authorized to consent for participant, if required)*

I agree to be videotaped in my class for this investigation.

Print the name of the participant: _____

Date:_____ Signed: _____
(Participation)

Signed: _____ Signed: _____
(Principal Investigator) *(Person authorized to consent for participant, if required)*

CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

Teacher Consent Form

Protocol title: Generalization of tactics from practice to game in secondary physical education

Protocol number: Investigators: Dr. Phillip Ward
Myung-Ah Lee

I consent to my participation in research being conducted by Dr. Phillip Ward and Myung-Ah Lee of The Ohio State University.

The investigator(s) has explained the purpose of the study, the procedures that will be followed, and the amount of time it will take. I understand the possible benefits, if any, of my participation.

I know that I can choose not to participate without penalty to me. If I agree to participate, I can withdraw from the study at any time, and there will be no penalty.

I have had a chance to ask questions and to obtain answers to my questions. I can contact the investigators at (614) 688-8435. If I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at (614) 688-4792.

I have read this form or I have had it read to me. I sign it freely and voluntarily. A copy has been given to me.

I agree to my participation in this research.

Print the name of the participant: _____

Date: _____ Signed: _____
(Participant)

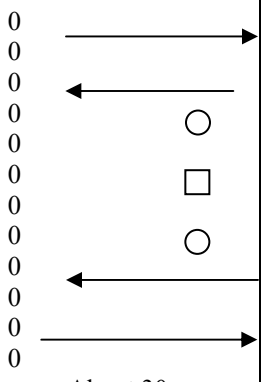
Signed: _____ Signed: _____
(Principal Investigator) *(Person authorized to consent for participant, if required)*

APPENDIX F

A SAMPLE LESSON PLAN FOR

TECHNIQUE-FOCUSED INSTRUCTION

Lateral Pass in 2 and 3

	Learning Tasks	Organization	Teaching Cues	What Happened
8min. Practice	Lateral pass **How to perform lateral pass in 2** 1. by jog @ 3 lap (about 30m) 2. by run @ 3 lap **Lateral pass in 3** 1. by jog @ 3 lap 2. by run @ 3 lap 3. One of each 4 will assess their team if they perform properly. Then switch the role	1. Teacher demonstration on pass with a partner and students practice  2. Teacher demonstration on pass in 3 and students practice	**- Hold the ball with your thumbs pointed down** **- Do not let the palms of your hands touch the football** **- Pass "softly"** **- Make eye contact with the person you are passing to** **- Ball in both hands, only fingers in contact** - Swing arms toward receiver Push ball with rear hand - Flick wrists and fingers as ball leaves hands	
8 min. Teaching scrimmage	**<u>4 vs. 4 game setting with FB</u>** - Students play game in 4 vs. 4 but the teacher can stop whenever STs do not properly perform lateral passes or violate rules. - Freeze and provide FB on the lateral pass (**teach again**). -	- 4 vs. 4 game format in a half court	- Teacher can stop the game and provide FBs **on lateral pass** (how to perform lateral pass) and correct fingers, hands, follow through forms. - Thumbs point along the length of the ball - Pass sideways or behind	Please, don't mention about any tactics (e.g., "Pass to the open space!" "Pass when you are

	Stop the game when STs do not know the rule (pass to the side of backward rule). Explain with **good examples and non examples**		- Receive the ball - Passing the ball - Freeze when tagged -Pass to side or behind	blocked by the opponent" "Support your teammates," etc.)
8min. **Mini Game**	<u>4 vs. 4 Mini Game</u> Students play game. - Try to tag to stop the attacking - Try to score by touch down on the opponent endline area	- 4 vs. 4 game format in a half court	When the ball carrier carry the ball over the opponents' goal line and press the ball down on the ground, score a point. After a try is scored the game restarts from the center of the field with a free pass by the non-scoring team When the ball carrier tagged, he or she has to pass in 3 seconds	No interruption but teacher's role as a referee
Closure	Ask questions on rules of tag rugby Can you pass backward or to side? There is NO TRY if tag stolen before player takes ball over endline			

APPENDIX G

A SAMPLE LESSON PLAN FOR

TACTIC-FOCUSED INSTRUCTION

Scissor Cut in 4v 4

	Learning Tasks	Organization	Teaching Cues	What Happened
8min. Practice	From freepass X passes to A or C both players criss-cross behind X and in front of B. Whoever has the ball passes to B as they go in front of B. Both A and C now on opposite sides from where they started look for a pass back from B and continue to support the ball carrier.	O O O O _____ X Ball Carrier O O O A B C	- **Follow the ball carrier** - **Keep proper distance (that STs able to catch the ball)** - **Pass quickly** - **Move to the position quickly**	
8 min. Teaching scrimmage	**<u>4 vs. 4 game setting with FB</u>** - Students play game in 4 vs. 4 but the teacher can stop STs to make them perform "support" properly. - Freeze and provide FB on the supporting behavior (**teach again**). - **Use good examples and non examples** - **Frequently freeze and FB on support (quick pass, move, cut)**	- 4 vs. 4 game format in a 20 x 40 grid	-When needed, the teacher stops the game and provide FBs **on support,** "Pass quickly," "After the ball carrier restarts, move to the position practiced"	Please, mention about any tactics (e.g., "Move to the position, and follow the ball carrier," "Support your teammates" "Pass to the open space!" "Pass quickly when you are blocked by the opponent" etc.)
8min. Mini Game	<u>4 vs. 4 Mini Game</u> Students play game.	- 4 vs. 4 game format in a 20 x 40 grid		No interruption but teacher's role as a referee
Closure	Ask questions on proper position. What is the purpose of switch pass?			

APPENDIX H

SOCIAL VALIDITY RATING FORM (for the intervention teachers)

_____

Tactical Approach Questionnaire (For the intervention teachers)

Directions: Thank you for participating in this experience. This questionnaire will seek information about your tactical skill learning in the rugby unit. It consists of two parts. The first part asks the extent of your acceptance of tactical approach. The second part asks for your comments for the intervention. You have the right to stop participation at any time. Please be assured that the researcher is the only person who will see your answer. Read each question carefully and circle on the scale where the range is from 5 to 1(i.e., Strongly agree to Disagree). Please answer the open ended questions following the questionnaire.

Section I.

		Strongly agree				Disagree
Goal	1. Tactics should be taught in physical education	5	4	3	2	1
	2. The tactical approach is more beneficial for students than the technique approach	5	4	3	2	1
Procedure	3. The tactical approach is more difficult to implement than the technique approach	5	4	3	2	1
	4. Overall, the tactical approach is a good pedagogy	5	4	3	2	1
Effects	5. Students can play better in a tactical approach than in a technical approach	5	4	3	2	1
	6. Students can understand better how to play the game in a tactical approach than in a technical approach	5	4	3	2	1
	7. Students can perform technique better in a tactical approach than in a technical approach	5	4	3	2	1
	8. Overall, students learn more in a tactical approach than in a technical approach	5	4	3	2	1

Section II

Question 1. What things didn't work well while you were implementing the tactical approach?

Question 2. If you were to use the tactical approach again, how would you change it?

Comments:

APPENDIX I

SOCIAL VALIDITY RATING FORM (for a panel of physical educators)

_____

Tactical Approach Questionnaire (For a panel)

School level_____ Teaching experience _____ Gender _____

Directions: Thank you for participating in this experience. This questionnaire will seek information about your tactical skill learning in the rugby unit. You have the right to stop participation at any time. Please be assured that the researcher is the only person who will see your answer. After watching two videotapes of a technical approach and tactical approach of teaching tag rugby, please answer the following questions. Questions consist of two parts. The first part asks the extent of your acceptance of a tactical approach. The second part asks your overall opinions and comments. Read each question carefully and circle on the scale where the range is from 5 to 1(i.e., Strongly agree to Disagree) in section I and provides your answers to the open ended questions in the section II.

Section I

		Strongly agree				Disagree
Goal	1. Tactics should be taught in physical education	5	4	3	2	1
	2. The tactical approach is more beneficial for students than the technique approach	5	4	3	2	1
Procedure	3. The tactical approach is more difficult to implement than the technique approach	5	4	3	2	1
	4. Overall, the tactical approach is a good pedagogy	5	4	3	2	1
Effects	5. Students can play better in a tactical approach than in a technical approach	5	4	3	2	1
	6. Students can understand better how to play the game in a tactical approach than in a technical approach	5	4	3	2	1
	7. Students can perform technique better in a tactical approach than in a technical approach	5	4	3	2	1
	8. Overall, students learn more in a tactical approach than in a technical approach	5	4	3	2	1

Section II

Question 1. If you would use a technical approach, how would you change it?

Question 2. If you would use the tactical approach, how would you change it?

Comments:

APPENDIX J

TREATMENT INTEGRITY CHECKLIST

Treatment Integrity Checklist

Sessions	Corrections occurred on lesson plans	Rehearsal sessions	Training sessions	*Correct implementation		
				A	B	C
1	√	√	√	√	√	√
2	√	√	√	√	√	√
3	√	√	√	√	√	√
4	√	√	√	√	√	√
5	√	√	√	√	√	√
6	√	√	√	√	√	√
7	√	√	√	√	√	√
8	√	√	√	√	√	√
9	√	√	√	√	√	√
10	√	√	√	√	√	√
11	√	√	√	√	√	√
12	√	√	√	√	√	√
13	√	√	√	√	√	√
14	√	√	√	√	√	√
15	√	√	√	√	√	√
16	√	√	√	√	√	√
17	√	√	√	√	√	√
18	√	√	√	√	√	√
19	√	√	√	√	√	√

* Coded during experimental sessions

APPENDIX K

RAW DATA

CLASS A

Teaching Scrimmage Raw Data

Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Suzy	0	0	0	AB	0	0	0	18	50	AB	80	AB	63.6	75	64.7	62.5	45.5	60	92.3
Jane	AB	0	14.3	0	0	0	66	11	20	77.7	77.7	33	50	43	35.7	100	80	53.8	81.8
Jack	0	0	0	0	0	16.7	25	57	57	72.7	AB	AB	AB	AB	AB	AB	AB	AB	AB
Ron	0	0	0	0	0	0	50	40	83	63.6	62.5	50	25	80	60	75	55	63.6	66.7
TE*	**3**	**10**	**13**	**10**	**15**	**8**	**9**	**12**	**13**	**15**	**14**	**22**	**16**	**10**	**17**	**8**	**17**	**17**	**15**

Free Scrimmage Raw Data

Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12****	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Suzy	N/A	0	0	AB	0	N/A	9	33	12.5	N/A	68.8	N/A	45	57	50	28.6	50	61.5	75
Jane	N/A	0	0	7.7	0	N/A	0	44	35.3	N/A	64	N/A	33	60	100	12.5	88	70	60
Jack	N/A	0	0	0	0	N/A	60	14.3	31.3	N/A	AB	N/A	AB	AB	AB	AB	AB	AB	AB
Ron	N/A	0	12.5	0	0	N/A	66	57	78.6	N/A	58	N/A	10	50	33	75	22	63.6	72.7
TE*	**N/A**	**7**	**9**	**17**	**15**	**N/A**	**13**	**11**	**24**	**N/A**	**20**	**N/A**	**14**	**12**	**8**	**10**	**18**	**16**	**19**

*TE=Total number of Episodes
**Weather inclement.
AB=Absence
N/A = Not applicable

CLASS B

Teaching Scrimmage Raw Data

Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12***	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Terry	AB	0	0	0	0	0	43	0	16.6	18	7.7	N/A	12.5	22	9	40	83	87.5	41.6
Kerry	AB	0	0	AB	9	0	AB	0	33.3	7.7	0	N/A	0	28.6	0	28.6	60	50	66.6
Andy	0	0	16.7	0	0	11	10	28.6	16.6	22	20	N/A	28.6	33	0	75	14.3	40	75
Don	0	50	0	14.3	9	11	9	40	16.6	37.5	N/A	N/A	N/A	N/A	36	36	14.3	45.5	AB
TE*	**6**	**4**	**8**	**11**	**15**	**13**	**12**	**10**	**9**	**15**	**17**	**N/A**	**11**	**14**	**15**	**20**	**16**	**12**	**17**

Free Scrimmage Raw Data

Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12***	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Terry	N/A	10	0	0	0	N/A	4.5	5	6.6	NA	16.6	N/A	16	0	16.7	80	83	78.6	64.7
Kerry	N/A	0	0	AB	0	N/A	AB	0	20	NA	0	N/A	16	0	7.7	36.4	30.8	43	63.6
Andy	N/A	0	0	0	0	N/A	20	28.6	16	NA	0	N/A	20	33	0	33.3	36.4	77.8	90
Don	N/A	33	0	0	11	N/A	28.6	31.3	60	NA	N/A	N/A	N/A	36	36	54.5	36.4	71	AB
TE*	**N/A**	**11**	**9**	**10**	**13**	**N/A**	**22**	**22**	**16**	**NA**	**8**	**N/A**	**10**	**10**	**16**	**15**	**20**	**21**	**23**

CLASS C

Teaching Scrimmage Raw Data

Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Pam	0	AB	0	0	0	0	10	17	0	33	28	AB	AB	AB	AB	40	AB	AB	AB
Cherry	33	0	16	42.8	0	0	37	25	37.5	AB	AB	50	41.7	33	54	45	33	58	45
David	25	28.6	0	0	0	0	20	10	37.5	75	AB	33	50	28	40	0	33	25	25
Dennis	0	40	50	0	0	0	10	16	30	60	45	37.5	11	33	70	54.5	28	35	50
TE*	**5**	**10**	**7**	**9**	**11**	**8**	**13**	**15**	**13**	**8**	**20**	**10**	**16**	**14**	**14**	**16**	**8**	**27**	**20**

Free Scrimmage Raw Data

Session	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Pam	N/A	AB	0	0	0	N/A	20	6	21	N/A	14	AB	AB	AB	AB	33	AB	AB	AB
Cherry	N/A	33	11	0	33	N/A	14	16	50	N/A	AB	45	50	25	20	30	55	36.8	0.5
David	N/A	0	0	0	0	N/A	20	9	30	N/A	AB	30.7	12.5	25	33	44	28	31	15.4
Dennis	N/A	0	0	0	20	N/A	16	18	30	N/A	33	0	20	22	20	45	0	35.3	27
TE*	**N/A**	**8**	**12**	**9**	**7**	**N/A**	**10**	**17**	**17**	**N/A**	**19**	**19**	**12**	**15**	**13**	**18**	**10**	**26**	**22**