METHODOLOGY

Tactical Decision Competency of Preservice Physical Education Teacher Education Students

Skip M. Williams, Margo M. Coleman,
Mary L. Henninger, Kristin B. Carlson

Abstract

The most recent publication of the National Standards and Guidelines for Physical Education Teacher Education *(National Association for Sport and Physical Education [NASPE], 2009) requires physical education teacher education (PETE) programs to demonstrate that teacher candidates display both tactical knowledge and physical competence. The purpose of this study was to assess the tactical decision-making skills of preservice teachers using the tactical decision-making competency (TDC) framework (Pagnano-Richardson & Henninger, 2008). Participants included PETE majors enrolled in two courses, Teaching Team Sports (N = 61) and Teaching Individual/Dual Sports (N = 89). Tactical knowledge was collected by PETE students during game play through a talk-aloud technique (McPherson, 1993) and analyzed using the TDC framework (Pagnano-Richardson & Henninger, 2008). Each participant was assessed multiple times, resulting in a total number of 121 responses for team sports and 89 responses in individual/dual sports. The coded scores, ranging from 1 to 4 on the TDC scale, were averaged to arrive at a final overall TDC score for each participant for each sport. The four levels of the*

Skip M. Williams is an assistant professor, Margo M. Coleman is an associate professor, Mary L Henninger is an associate professor, and Kristin B. Carlson was an assistant professor, School of Kinesiology and Recreation, Illinois State University. Kristin Carlson is now a lecturer, Department of Kinesiology and Community Health, University of Illinois. Please send author correspondence to swillia@ilstu.edu.

TDC were then aligned with the three NASPE (2009) descriptors of target, acceptable, and unacceptable. Results indicated that 50% of participants were at a target or acceptable level for invasion games compared to only 42% for net/wall games. These findings suggest that many teacher candidates appear to lack a wide knowledge base regarding sport tactics. PETE faculty must make a concerted effort to teach tactics to students and help them recognize the carryover of tactics within each category.

The National Association for Sport and Physical Education (NASPE) recently instituted new standards for physical education teacher education (PETE) programs responsible for preparing certified K–12 teachers in the United States (NASPE, 2009). Although similarities exist between NASPE's 2009 and 2004 standards, the differences have been the focus of much attention in PETE programs. Specifically, NASPE Standard 2 and its corresponding elements (2.1, 2.2, and 2.3) have resulted in many PETE programs reconfiguring their program assessment for the purposes of program development and accreditation.

NASPE Standard 2 asks PETE programs to demonstrate that PETE majors are "…physically educated individuals with the knowledge and skills necessary to demonstrate competent movement performance and health enhancing fitness as delineated in the NASPE K–12 Standards" (NASPE, 2009, p. 5). Although traditional skill and fitness testing can certainly demonstrate Standard 2 Elements 2.1 and 2.2 (skills and fitness, respectively), the assessment of Element 2.3, the tactical knowledge of PETE majors, has been the least explored area of competence in PETE programs throughout the United States. Element 2.3 states that PETE candidates must "demonstrate performance concepts related to skillful movement in a variety of physical activities" (NASPE, 2009, p. 6). PETE majors' tactical knowledge, although inherently important to a person's ability during game play, has received little attention in terms of research. Tactical knowledge allows game players to be more skillful when playing because it allows them to apply tactical concepts and knowledge to react to the complex nature of game play that being skillful alone does not allow (Light, 2008). At this point, little is known about the tactical knowledge of PETE majors in the United States.

Although Teaching Games for Understanding (TGfU) and teaching tactical game concepts have been studied extensively

around the world (Bunker & Thorpe, 1982; Grehaigne & Godbout, 1995, 1998; Griffin & Sheehy, 2004; Kirk & MacPhail, 2002; Light, 2003; Mitchell, Oslin, & Griffin, 2003; Storey & Butler, 2010), little has been done to describe how tactical decision making develops with PETE majors in the United States. Bunker and Thorpe first introduced TGfU as a new way to teach and learn games in 1982. In its earliest form, TGfU consisted of a series of steps that teachers could use to help students develop skillfulness during game play. Grehaigne and Godbout (1995, 1998) shifted the focus of TGfU from the individual learner to learning as a team. This is important because most games require teamwork and development as a whole team to be successful. The next big shift in thinking came in 2003 when Mitchell et al. began to examine and discuss the classification of games based upon major tactical problems and tactics needed to solve those problems (i.e., invasion, net/wall, fielding and run scoring, and target games). Focus on tactical problems shared among and across games was proposed as a way to help facilitate the transfer of tactical knowledge across a variety of similar games rather than teaching each new game as a distinctly unique activity.

Although TGfU has been squarely situated in the constructivist approach to learning, a major shift in thinking about games to one of situated learning (Lave & Wenger, 1991) was promoted in the early part of this century (Kirk & MacPhail, 2002). Learning tactical decision making from this perspective is accomplished as part of a more holistic approach involving individual decisions made based upon the actions of others involved in the game (e.g., teammates and opponents). Finally, as TGfU has continued to grow worldwide, more emphasis has been placed on the complex and ever-changing nature of game play through an ecological approach (Storey & Butler, 2010). Storey and Butler (2010) have begun to focus attention on the ecology or study of adaptation that occurs within a complex system such as game play. Here, characteristics of the system (i.e., individual players, teams, opponents, game situation, and conditions) are identified as barriers or facilitators to the learning process (Davis, Sumara, & Luce-Kapler, 2008).

TGfU is clearly continuing to evolve as a means to teach and learn tactics within game play, but there is still much to learn about how tactical decision making develops. One way that researchers and educators have tried to explain the development of tactical decision making is through the use of learning theories. Information processing is one type of learning theory and is described as

the process of taking in new information and linking it to prior knowledge in networks that make knowledge more easily accessible (Alexander & Judy, 1988; Anderson, 1976; Dodds, Griffin, & Placek, 2001). In a study based on the information processing of novice volleyball students, Henninger, Pagnano, Patton, Griffin, and Dodds (2006) found that novice players had prior knowledge of volleyball before receiving instruction. Students' prior knowledge was seen as interconnected nodes that ranged in depth and detail and were mostly related to offensive play. The authors concluded that novices did not have complex networks of knowledge needed to make accurate and quick decisions during game play, which are key in tactical decision making. This is further demonstrated through McPherson's (1993, 1994, 2000) work in motor development and motor learning.

Motor development and motor learning perspective is another way to describe tactical decision making. From this perspective, novices seem to lack detailed plans of action to successfully participate in complex games (McPherson, 1993). In a comparison of novice and experts in baseball, volleyball, and tennis, McPherson (1993, 1994) concluded that experts operate from a richer and deeper knowledge base that includes more condition–action rules that help them achieve game goals and better access capabilities based on the interactions between how they represent knowledge and how they retrieve concepts for use. This is similar to information processing in that knowledge and how it is stored greatly influence the ability of a person to access it quickly during complex game play.

A third way to examine the decision making of game players is through the theoretical framework of constructivist learning theory (Davis & Sumara, 2003; Light & Fawns, 2001; Rink, French, & Tjeerdsma, 1996; Rovegno, 1998; Rovegno & Dolly, 2006). From a constructivist perspective, learning includes both an implicit understanding of pertinent information and an explicit application of that understanding during game play (Light, 2008). It is the implicit understanding, or the understanding that is not consciously apparent during game play, that is most difficult to assess because it is not easily accessible.

Combining information processing, motor learning, and constructivist learning theory, Henninger and Pagnano-Richardson (2009a) developed the tactical decision-making competency (TDC) framework to access this more implicit knowledge. The TDC framework involves four levels of decision making that students

experience during game play. Level 1 of TDC involves discussing only oneself and skill execution. Level 2 progresses to taking into account self and skill along with information about teammates. Level 3 focuses on taking in and applying information about opponents when making decisions during game play. Finally, Level 4 is reached when a student is able to discuss particular game contexts to make tactical decisions with the purpose of winning the point or game. Pagnano-Richardson and Henninger (2008) indicated that the TDC framework can serve as an efficient and effective measure of students' TDC during game play.

Much theoretical work has been conducted regarding the development of tactical decision making over the past few decades, and TGfU has been embraced around the world as an effective strategy to help teach students and athletes to develop tactical awareness during game play. At this time, however, little research has been conducted in the K–12 school setting regarding students' tactical awareness and decision making, and no research has been conducted with PETE majors.

Significance and Purpose

There is little debate that teachers need to have an understanding of the implicit knowledge needed to make good tactical decisions during game play to assist their students to become competent game players. Even though most educators would agree that tactical knowledge is an important component of becoming a competent mover (NASPE, 2004), no research has been conducted to determine the TDC of PETE majors. Thus, the purpose of this study was to assess the tactical decision-making skills of PETE majors enrolled in a large Midwestern PETE program. Research questions that drove the study were as follows: (1) What do these PETE majors know in terms of tactical knowledge? (2) Are their differences in tactical knowledge of PETE majors for invasion versus net/wall games?

Methods

Participants and Setting

Participants in the study included PETE majors from one large Midwestern University (see Table 1). Within this University's PETE program, which generally takes six semesters to complete, majors are required to enroll in four activity courses. All of the activity classes for majors are taught by full-time PETE faculty. For the purposes of

Table 1

Participants by Sport

	Males (*n*)	Females (*n*)	Total (*n*)
Basketball	43	17	60
Soccer	43	18	61
Volleyball	43	18	61
Badminton	62	26	88
Tennis	64	25	89

this study, two of the required courses, Teaching Team Sports and Teaching Individual/Dual Sports and Activities, were used for data collection. PETE majors typically enroll in the Team Sports class during their second semester in the major, and the average class size over the course of this study was 25 students. The Individual/Dual Sports and Activities course is normally taken during the third semester in the major and had an average class size of 22 students. During these two courses, students learn specific content knowledge and teaching skills for a variety of net/wall, invasion, striking/fielding, and target games. These two classes were used for data collection in order to provide several activities in at least two games for understanding classifications: net/wall and invasion games.

Research Design and Data Collection Procedures

This is a mixed-method descriptive study using the theoretical framework of TDC. Data were collected using qualitative methods and were analyzed using both qualitative and quantitative methods. All participants provided written informed consent prior to data collection. Teaching Team Sports participants' tactical knowledge was assessed during game play of volleyball, basketball, and soccer. Tactical knowledge was assessed in the Teaching Individual/Dual Sports and Activities class during game play of tennis and badminton. Both invasion and net/wall games were used to represent a variety of game strategies. Data from the two classes were organized into net/wall (badminton, tennis, volleyball) and invasion (basketball, soccer) game classifications.

Because entire classes would need to be assessed, the talk-aloud protocol developed by McPherson (1993, 1994) was considered the most effective way to collect data. This protocol allows for quick data collection so disruption of game play is minimal. At designated times during game play, peers would ask a question and were instructed to write the responses verbatim on a score sheet. Because

the average class sizes were 25 and 22 (Team Sports and Individual/Dual, respectively), it would be impossible for the class instructors to go through the protocol with each student at an appropriate point in the game. Thus, the researchers used the participants to help collect the talk-aloud responses. Participants were trained to collect data from their peers, keeping in mind that the instructors would be doing the data analysis. During game play, participants in the game were paired with another student who would be recording their responses. Participants were instructed to go to opposite sidelines to respond to the tactical question so that one participant's response was not influenced in any way by the response of another participant. The same questions were asked each time: "What were you thinking about on that last play?" and "Is there anything else?" The timing of the questions varied slightly by sport to accommodate the differences in game play between the team sports and the dual sports to ensure that time was allowed for tactical complexity to occur before asking the talk-aloud questions (see Table 2). For

Table 2

Talk-Aloud Protocol for Each Sport

Basketball, Soccer, and Volleyball Protocol	Badminton Protocol	Tennis Protocol
When play is stopped by the instructor the evaluator should ask the following questions: "What were you thinking about during game play?" and "Is there anything else?"	Watch your assigned doubles player. There will be 3 times during the game when you will ask the player questions about their play and jot down their responses. Anytime there is a 4 contact rally (excluding the serve), stop play and ask the questions until you have recorded 3 responses. To ensure that each player has 3 responses, if the combined score of the game reaches 15 points (i.e., 9–6, 8–7), and if you haven't gotten 3 responses, then stop play every 4 serves and ask the questions until you get the 3 responses. Questions: What were you thinking? Is there anything else?	Watch your assigned doubles player. During the first game of the match, do not ask any questions. Begin the tactical assessment during the second game. There will be 3 instances when you will ask the player questions about their play and jot down their responses. These instances are as follows: Every 4 serves, stop play and ask the questions until you get 3 responses. Questions: What were you thinking? Is there anything else?

example, during badminton play, there was the possibility of a series of missed serves and little rallying. Thus, peers were taught to look for a four contact rally before stopping the play to ask the questions. During tennis testing, participants played no-add scoring games and questions were asked after every four serves until there were three instances of player responses.

Consistency of data collection was achieved by having the instructor of each class monitor the game play and response recording. The participants were instructed to ask the talk-aloud question and then record the response verbatim. Training for this protocol consisted of simply reinforcing the importance of getting a verbatim response each time. To enhance reliability, instructors stressed to participants that their responses and their TDC level would have no impact on their grade. The instructors periodically did spot checks to ensure that the responses were being accurately recorded.

Data Analysis

Each participant responded to at least three talk-aloud episodes for each of the five sports where they were asked to comment on their tactical decisions during game play. Responses were analyzed using the process of selective coding based on the TDC framework, which was designed to assess the tactical knowledge of game play of the participants (Pagnano-Richardson & Henninger, 2008). The four primary researchers were trained in qualitative research and specifically in the use and coding of the TDC framework as a data analysis tool. The primary researchers coded participants' responses into one of the levels of the TDC defined by Pagnano-Richardson and Henninger (2008). A slight modification to the TDC framework was the addition of a Level 0 to the existing four levels to indicate comments that had no tactical significance, and specificity was added to the descriptors for each level. Level 1 represented the least amount of TDC and Level 4 represented the highest level of TDC. A coding log was developed to make the coding of statements more reliable and consistent within each of the various games. Table 3 includes examples of the type of comments indicating the difference between the tactical levels. The coded scores, ranging from Levels 1 to 4 on the TDC scale for each comment, were averaged to arrive at a final overall TDC score for each participant for each sport. During the coding procedures, interrater reliability was established through

constant comparison and by discussing variations in scores until agreement was reached.

Table 3

Levels of the Tactical Decision-Making Competency Framework

Level 0	Comment has no tactical significance. Responses indicate lack of engagement in the game.	"Just trying to have fun and enjoy the day" (Tennis)
Level 1	Student focuses on self and skill execution. No thinking beyond the actual play on the ball is present; no conditions are used to influence the decision.	"To get my serve over after missing the first one" (Tennis)
Level 2	Student focuses on self and teammates. Comments may indicate a stronger awareness of teammates, but they are not able to use that information in their decision making.	"Remain in good position with my partner" (Badminton)
Level 3	Student focuses on self, teammates and opponents. Comments indicate a more complex understanding of the play and may indicate how a scenario may play out beyond the initial play on the ball.	"I was trying to place the ball away from the other team" (Tennis)
Level 4	Student focuses on self, teammates, opponents, and the game situation.	"I should have lobbed that last one because they were both up at the net" (Tennis)

The average TDC score for each participant for each sport was aligned with the NASPE (2009) descriptors of target, acceptable, and unacceptable. The NASPE descriptors provided the researchers with a means of documenting the results with performance levels that could be quantified and compared with future TDC research. The primary researchers decided what level of TDC aligned with what NASPE descriptor. Level 1 of TDC was considered unacceptable, Levels 2 and 3 of TDC were deemed acceptable and Level 4 of TDC was noted as target because it represented higher tactical awareness and decision-making abilities. Once the TDC scores were coded into the three descriptors, a peer auditor reviewed the coding for

accuracy. The peer auditor had extensive experience with the TDC as a cocreator of the instrument and active researcher in the field. Once coding had been completed, percentages for each of the three levels were calculated. Results are presented through percentages of classification (target, acceptable, and unacceptable) by game classification and sport (see Table 4).

Table 4

Percentage of Male and Female Participants in Each of the Three TDC Classifications Based on Sport and Game Classification

Sport/Game Classification	*N*	Target	Acceptable	Unacceptable
Basketball	60	15 (25%)	20 (33%)	25 (42%)
Soccer	61	3 (5%)	22 (36%)	36 (59%)
Invasion Games	121	18 (15%)	42 (35%)	61 (50%)
Volleyball	61	1 (2%)	5 (8%)	55 (90%)
Badminton	88	7 (8%)	27 (31%)	54 (61%)
Tennis	89	14 (16%)	47 (53%)	28 (31%)
Net/Wall Games	238	22 (9%)	79 (33%)	137 (58%)

Results

Results of this study indicated that 50% of participants were at the target or acceptable level for invasion games. Specifically, 58% were at the target/acceptable level for basketball and 41% for soccer. Results also indicated that 42% of participants were at the target/acceptable level for net/wall games. Ten percent were at the target/acceptable level for volleyball, 39% for badminton, and 69% for tennis.

Results by gender are presented by game classification and sport in Tables 5 and 6. Results indicated that 48% of the female participants were at the target/acceptable level for invasion games and males were at 50% (see Table 5 and 6). For net/wall games, 43% of male and female participants were at the target and acceptable level. By sport, more than 50% of male and female participants were at the target or acceptable level for basketball and tennis. However, less than 50% were at the target or acceptable level for soccer, volleyball, and badminton.

Table 5

Percentage of Female Participants in Each of the Three TDC Classifications Based on Sport and Game Classification

Game Classification	*N*	Target	Acceptable	Unacceptable
Basketball	17	5 (29%)	4 (24%)	8 (47%)
Soccer	18	1 (5%)	7 (39%)	10 (56%)
Invasion Games	35	6 (17%)	11 (31%)	18 (51%)
Volleyball	18	0 (0%)	2 (11%)	16 (89%)
Badminton	26	0 (0%)	8 (31%)	18 (69%)
Tennis	25	7 (28%)	13 (52%)	5 (20%)
Net/Wall Games	69	7 (10%)	23 (33%)	39 (57%)

Table 6

Percentage of Male Participants in Each of the Three TDC Classifications Based on Sport and Game Classification

Game Classification	*N*	Target	Acceptable	Unacceptable
Basketball	43	10 (23%)	16 (37%)	17 (40%)
Soccer	43	2 (5%)	15 (35%)	26 (60%)
Invasion Games	86	12 (14%)	31 (36%)	43 (50%)
Volleyball	43	1 (2%)	3 (7%)	39 (91%)
Badminton	62	7 (11%)	19 (31%)	36 (58%)
Tennis	64	9 (14%)	33 (52%)	22 (34%)
Net/Wall Games	169	17 (10%)	55 (33%)	97 (57%)

Discussion

To effectively teach children to be competent movers, it is imperative teacher candidates display tactical knowledge that will allow them to be successful and competent movers in a variety of physical activities. The present study examined the tactical decision-making skills of PETE majors in a large PETE program using the TDC framework developed by Pagnano-Richardson and Henninger (2008).

PETE Majors' TDC

Findings from this study seem to support the general belief that many current and future physical education teachers lack tactical knowledge about a wide variety of games. One explanation for this may be in the traditional approach to teaching complex games in the

United States. Traditionally, games have been taught from a "part, part, part, whole" perspective where skills (i.e., part) are taught in isolation and then combined to create game play (i.e., whole). There is little to no emphasis on game tactics or on the basic tactical problems to be solved within game classifications. PETE majors in this study were found to be acceptable or higher in their TDC less than 50% of the time (50% invasion, 42% net/wall). The courses in which content is taught in this PETE program have been done from a traditional perspective, and thus it is not surprising that fewer than half of the participants were tactically sound.

Game Classification and TDC

PETE majors' tactical knowledge in this study is similar to prior research that has indicated tactical knowledge is content specific (McPherson, 2000). In other words, the game classification and the level of tactical complexity of activities impact students' TDC. This is particularly apparent when examining the results of students' responses during net/wall games. Although the overall results indicated that 42% of PETE candidates were at the target/acceptable level for net/wall games, when the candidates were examined individually, there was a large difference between the various net/wall activities. Specifically, 69% of student responses fell within the target/acceptable range during tennis activities, and only 39% and 10% were at the target/acceptable level for badminton and volleyball activities, respectively. Despite that similar tactics are used in each of the net/wall activities, the level of depth and maturity of the tactical decisions students made during these activities varied greatly. One reason for this finding is that in the United States, physical activities are often taught as discrete game forms. Rarely will physical educators teach about the tactics of a game, but rather the focus is on skill. This results in K–12 students' inability to learn across and within game types (i.e., invasion, net/wall, fielding and run scoring, and target). An increased emphasis on the tactics of games may help students to generalize their knowledge across games that possess similar tactical problems to solve to win.

Another explanation for this finding may be a result of the increasingly common practice of youth sport athletes specializing in sports at a young age (Wiersma, 2000). Because youth focus their efforts on one or two specific sports, it is possible they are unfamiliar with tactics related to physical activities outside of their chosen

sports. As a result, upon entering a teacher education program, many teacher candidates appear to lack a wide knowledge base regarding sport tactics.

Implications for PETE programs

Perhaps the most important finding from this study is that PETE majors seem deficient in the area of tactical decision making. This is disconcerting, as it indicates PETE majors are failing to meet NCATE/NASPE Standard 2.3, which has been deemed a necessary trait of high-quality teachers. If PETE majors are to effectively prepare students to meet the criteria of a physically educated person, it is essential they have a broad awareness and understanding of tactical knowledge. Based upon the findings of this study, however, no more than half of PETE majors are making tactical decisions at the target or acceptable level. When analyzed by specific sports, these results become even more alarming with the exceptions of tennis and basketball, the only sports assessed that garnered results above 50%. In fact, in the case of volleyball, it was found that only 10% of students were able to make tactical decisions at the target or acceptable level.

From these results, it is evident tactical knowledge needs to be emphasized within teacher education programs. Faculty from teacher preparation programs often struggle when determining which content to emphasize within their curriculum. PETE programs generally include study in required liberal arts courses, instruction in skills and knowledge in sports and fitness activities, pedagogical knowledge in classroom management and teaching methods, and field experience opportunities (Hill & Brodin, 2004). It is challenging, however, to adequately cover each of these areas in depth. In addition, with the most recent publication of the *National Standards and Guidelines for Physical Education Teacher Education* (NASPE, 2009), PETE faculty members are now being required to address additional topics within their programs. Based upon the findings from this study, tactical knowledge is clearly not receiving the necessary attention.

Limitation and Future Directions

Although generalizations from the results of this study may be made, there are also possible limitations of this study to consider. First, data were collected within the context of mandatory courses where primary researchers were assigned as instructors. Although steps were taken to inform participants that their responses during

talk-alouds had no bearing on their grade in the course(s) and data were not collected directly by the researchers, it is conceivable that participant responses may have been biased by the presence of the researchers during data collection. Second, due to the nature of the study and the research questions being asked, no demographic data about the participants were collected. Researchers at this stage were only interested in gauging the current level of TDC of participants and acknowledge that past sport experience could have influenced the data. Future research on TDC development should include demographic information about participants such as age, prior experience with the physical activity and other activities in the same game classification, and interest in the activities being studied.

Conclusions

To best prepare teacher candidates, faculty members at PETE programs must develop a detailed plan of action that will aid them in addressing and rectifying deficiencies among PETE majors. One useful pedagogical tool teacher educators may use to help preservice PETE students learn the necessary tactical knowledge to help their future students is the TDC framework. Henninger and Pagnano-Richardson (2009b) described a series of steps used in conjunction with the TDC framework that would allow teachers to instruct on and assess the development of students' TDC. The TDC framework provides a focused language necessary to discuss game tactics within the context of physical education lessons. It is through a variety of questioning techniques, feedback, and student reflection that the teacher and their students become more explicitly aware of the knowledge they are using to solve tactical problems during game play. With regard to the current study, PETE professionals must make a concerted effort to teach tactics to students and to help them make connections between their previous knowledge and experiences and their newly obtained knowledge. It is not enough to simply be skillful movers; in order to effectively teach students, PETE majors must also comprehend the movements and the decision-making process that is responsible for dictating these movements.

References

Alexander, P., & Judy, J. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research, 58*, 375–404.

Anderson, J. (1976). *Language, memory, and thought*. Hillsdale, NJ: Erlbaum.

Bunker, D., & Thorpe, R. (1982). A model for teaching games in secondary schools. *Bulletin of Physical Education, 18*, 5–8.

Davis, B., & Sumara, D. (2003). Why aren't they getting this? Working through regressive myths of constructivist pedagogy. *Teaching Education, 14*, 123–140.

Davis, B., Sumara, D., & Luce-Kapler, R. (2008). *Engaging minds: Changing teaching in complex times* (2nd ed.). New York, NY: Routledge.

Dodds, P., Griffin, L., & Placek, J. (2001). A selective review of literature on development of learners' domain-specific knowledge. *Journal of Teaching in Physical Education, 20*(4), 301–313.

Grehaigne, J., & Godbout, P. (1995). Tactical knowledge in team sports from a constructivist and cognitivist perspective. *Quest, 47*, 490–505.

Grehaigne, J., & Godbout, P. (1998). Formative assessment in team sports in a tactical approach context. *Journal of Physical Education, Recreation, and Dance, 69*(1), 46–51.

Griffin, L., & Sheehy, D. (2004). Using a tactical games model to teach problem solving in physical education. In J. Wright, D. MacDonald, & L. Burrows (Eds.), *Critical inquiry and problem solving in physical education: Working with students in schools*. London, England: Routledge.

Henninger, M., Pagnano, K., Patton, K., Griffin, L., & Dodds, P. (2006). Volleyball players construct knowledge of games, strategies, tactics, and decision-making in the context of game play. *Journal of Physical Education New Zealand, 39*(1), 36–48.

Henninger, M., & Pagnano-Richardson, K. (2009a). A framework and tools for developing and assessing tactical decision-making competency. In T. Hopper, J. Butler, & T. Storey (Eds.), *Teaching games for understanding: Simply good pedagogy: Understanding a complex challenge* (pp. 109–126). Ottawa, Canada: Physical and Health Education Canada.

Henninger, M., & Pagnano-Richardson, K. (2009b). Tactical decision-making competency in action: Learning decision-making during game play. In J. Butler & T. Hopper (Eds.), *Teaching games for understanding: Simply good pedagogy*: *Understanding a complex challenge* (pp. 53–60). Ottawa, Canada: Physical and Health Education Canada.

Hill, G., & Brodin, K. L. (2004). Physical education teachers' perceptions of the adequacy of university coursework in preparation for teaching. *The Physical Educator, 61*(2), 74–87.

Kirk, D., & MacPhail, A. (2002). Teaching games for understanding and situated learning: Rethinking the Bunker-Thorpe model. *Journal of Teaching in Physical Education, 21*, 117–192.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York, NY: Cambridge University Press.

Light, R. (2003). The joy of learning: Emotion and learning in games through TGfU. *Journal of Physical Education New Zealand, 36*(1), 93–108.

Light, R. (2008). Complex learning theory: Its epistemology and its assumptions about learning: Implications for physical education. *Journal of Teaching in Physical Education, 27*, 21–37.

Light, R., & Fawns, R. (2001). The thinking body: Constructivist approaches to games teaching in physical education. *Melbourne Studies in Education, 42*, 69–87.

McPherson, S. (1993). Knowledge representation and decision making in sport. In J. Starkes & F. Allard (Eds.), *Cognitive issues in motor expertise* (pp. 159–188). Amsterdam, The Netherlands: Elsevier.

McPherson, S. (1994). The development of sport expertise: Mapping the tactical domain. *Quest, 46*, 223–240.

McPherson, S. (2000). Expert–novice differences in planning strategies during collegiate singles' tennis competition. *Journal of Sport and Exercise Psychology, 22*, 39–62.

Mitchell, S., Oslin, J., & Griffin, L. (2003). *Sport foundations for elementary physical education: A tactical games approach*. Champaign, IL: Human Kinetics.

National Association for Sport and Physical Education. (2004). *Moving into the future: National standards for physical education* (2nd ed.). Reston, VA: Author.

National Association for Sport and Physical Education. (2009). *National standards and guidelines for physical education teacher education* (3rd ed.). Reston, VA: Author.

Pagnano-Richardson, K., & Henninger, M. (2008). A model for developing tactical decision-making competency during game play. *Journal of Physical Education, Recreation, and Dance, 79*, 24–29.

Rink, J., French, K., & Tjeerdsma, B. (1996). Foundations of the learning and instruction of sport and games. *Journal of Teaching in Physical Education, 15*, 399–417.

Rovegno, I. (1998). The development of in-service teachers' knowledge of a constructivist approach to physical education: Teaching beyond activities. *Research Quarterly for Exercise and Sport, 69*, 147–162.

Rovegno, I., & Dolly, P. (2006). Constructivist perspectives on learning. In D. Kirk, D. Macdonald, & M. Sullivan (Eds.), *The handbook of physical education* (pp. 226–241). London, England: Sage.

Storey, B., & Butler, J. (2010). Ecological thinking in TGfU: Understanding games as complex adaptive systems. In J. Butler & L. Griffin (Eds.), *More teaching games for understanding: Moving globally* (pp. 139–154). Champaign, IL: Human Kinetics.

Wiersma, L. (2000). Risks and benefits of youth sport specialization: Perspectives and recommendations. *Pediatric Exercise Science, 12*, 13–22.