Effects of Play Practice on Teaching Table Tennis Skills

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The purpose of this study was to examine the effects of Play Practice (PP) instruction on the performance of table tennis skills. Fifty-six college students in four intact classes were taught by two instructors using PP and Skill-focused Instruction (SI). A nonequivalent control/comparison group experimental design with pre and post measures was used. Three separate ANOVAs with a repeated measure (time effect) were conducted to examine the effects of PP and SI for each of the three dependent variables: (a) forehand drive accuracy, (b) forehand attack, and (c) serve. Results demonstrated that both PP and SI conditions were effective in improving participants’ skills in forehand drive, forehand attack, and serving from pre- to posttest. However, PP was more effective in improving participants’ skills in forehand attack and serving from pre to post as compared with SI.

Keywords: physical education, instructional methods, table tennis

In 1985, Locke and Dodds described a relationship between research on teaching (ROT) and research on teacher education (ROTE) noting that, “When it is demonstrated that a particular teaching method produces learning in pupils (ROT), that evidence may serve to validate the content of a teacher education program [i.e., ROTE]” (p. 114). Though the term had not yet been coined in educational settings, Locke and Dodds were making a case for what has become known as evidenced-based practice (Biesta, 2007). Providing evidence of effective instructional practice is an important obligation that researchers owe teachers. When new instructional strategies are promoted they should be subject to empirical verification. For more than three decades researchers have argued that skill-focused approaches to teaching sport are responsible for a lack of proficiency in students’ ability to play games (Bunker & Thorpe, 1982; Mitchell, Oslin & Griffin, 2003; Rink, French, & Tjeerdsma, 1996). As a result, there have been alternative approaches proposed.
to skill-focused forms of teaching. The most prominent alternative has been the Teaching Games for Understanding or TGfU (Bunker & Thorpe, 1982; Mitchell et al., 2003). Despite widespread acceptance of the approach, reviews of the literature conclude that studies have not shown convincing support for TGfU over the traditional and technical approaches (Lee & Ward, 2009; Rink, French & Graham 1996). As Lee and Ward (2009) note:

Research on tactics, regardless of approach and emphasis (for example, technique versus tactics or transfer across sports), has produced few significant findings relative to both cognitive outcomes such as declarative and procedural knowledge; and performance outcomes in games... Now in the twenty-first century, there is still little empirical evidence to support the approaches for the teaching for tactics. (p. 190)

In 2001, Launder published “Play Practice” (PP). Though PP and TGfU have similar objectives, PP differs from typical TGfU approaches in two important ways (Holt, Ward, & Wallhead, 2006; Launder, 2001). First, PP uses skillful play as a primary outcome. Launder describes skillful play as the combination of game sense and technical ability. He defines game sense as, “the ability to use an understanding of the rules, of tactics, of strategy, and of oneself to solve the problems posed by the sport or by one’s opponents” (Launder, 2001, p. 36). Developing skillful play and success in sports is grounded in understanding the relationship between games sense (tactics) and technical demands of the sport. As A.G. Launder (Personal Communication, October 14, 2009) notes:

Game sense must inevitably be linked to technical ability. If technical ability is the key to early success we develop games to improve that outcome. For example, we use target table tennis to develop technical play in table tennis. If game sense is critical, we initially reduce the technical demands... [Thus] what is tactically desirable must be technically possible, and what is technically desirable must be physically possible.

In this description Launder distinguishes PP from TGfU by arguing that it is the technical demands of the sport that determines the instructional emphasis on games sense and technique. For example, tennis and table tennis are both racquet sports, but from a PP perspective their technical demands are very different. Due to the fact that technical demands for beginners are less in table tennis than those in tennis, teaching game sense can be more quickly introduced in table tennis. Tennis requires more development of technique before the use of game sense.

In contrast TGfU prioritizes tactical demands ahead of technique as a basic strategy. As Griffin, Butler, Lombardo, and Nastasi (2003) note

First, the games are modified appropriately to encourage students to think about the tactical problem... Second, questions are designed to develop tactical awareness... Third skill practices teach essential skills to solve problems in a game like manner. Finally the final game provides students with the opportunity to apply their practice in an authentic setting. (p. 2-3)
Secondly, PP uses three pedagogies that Launder (2001) calls shaping, focusing, and enhancing play. Shaping involves the modification of practice variables to specifically address elements of skillful play. Simplified games and challenges are used to shape both games sense and technique. The games and challenges are modified in terms of practice variables such as the number of players, size of the field, ratio of attackers to defenders, secondary rules, and the type of goal. The games then progress in increasing complexity to develop game sense and technical proficiency.

Focusing refers to teaching during game play by emphasizing specific aspects of game play. For example, in badminton the court might be marked to identify target zones. If the goal of the task is to force the opponent to move to the back of the court, points can be scored during the game if the shuttle lands in a particular marked area toward the back of the court. Freeze replay is used by the teacher to replay a particular scenario to identify key elements and to examine choices that students can make. Tactical timeouts during the game can be used to discuss how players respond to specific tactics used by their opponents. Enhancing play is used to generate learner motivation by increasing or decreasing the challenge and difficulty of the play. This can be accomplished by changing aspects of the learning environment such as varying game time (2–3min games), establishing challenges to be accomplished in a specified period of time, and giving players particular roles that increase motivation during the game (e.g., coach or captain responsibilities).

Holt, Ward, and Wallhead (2006) conducted the first study using PP to examine the transfer of learning from closely aligned practice sequences to game play in soccer with college students enrolled in a basic instruction class. Holt et al.’s conclusion was that the more experienced soccer players benefited from the task sequence. In addition, while there was evidence that the less skilled students benefited as well, their performance was inconsistent. There are several limitations in the design of the Holt et al. study. The most significant limitation was that the instruction shifted quickly from small-sided game conditions to full-sided soccer games. This shift may have been too large a leap. More small-sequenced steps were likely needed to show the transfer effect. In short, by focusing on the sequencing of the two tasks to demonstrate experimental control, Holt et al. may have limited the PP instruction that could have been delivered. The present study was designed to avoid that situation by assessing PP instruction in an intact instructional unit.

Similar to the Holt et al. (2006) study, this investigation is grounded in the theory of behavior analysis (Rushall & Siedentop, 1972; Ward, 2006). Viewed from a behavior analytic perspective environmental arrangements made by the teacher as they shape, focus, and enhance student performance serve as discriminative stimuli that occasion changes in student performance (Rushall & Siedentop, 1972). Different tactical situations function as specific discriminative stimuli that occasion different responses. For example one responds differently to different social situations (i.e., specific discriminative stimuli) like attending church, dinner with friends, or playing a pickup game. In the same way students are taught to move in particular ways when they encounter certain situations (Rushall & Siedentop, 1972). These situations can be taught initially as set plays. Once a student demonstrates competency for one scenario, different variations of the original scenario (i.e., stimulus generalization) can be presented and these variations result in variations
in the responses of the student to similar scenarios (i.e., response generalization). Thus, the environmental arrangements (i.e., tasks) in table tennis using PP occur with the purpose of creating responses to specific discriminative stimuli (e.g., placing the ball in a particular area of the table in response to the movement of the opponent) by focusing play; and then creating variations of that scenario (stimulus and response generalization) using shaping play.

Focusing and shaping play develops in complexity as students develop competency. For example, in soccer Launder (2001) describes the use of 4v1, 3v1 and then 5v2 possession games to develop the learner’s ability to read play, make decisions, and execute accurate passing and receiving skills in contexts that gradually increase in pressure from opponents. In turn these tasks increase in complexity moving to large-sided games and finally the formal version of the game. Throughout the progression, however, the setting events and discriminative stimuli remain similar. This allows for the transfer of game sense from 4v1 modified games through to full sided versions of the games.

The purpose of this paper was to investigate the effects of PP on the performance of four table tennis skills (i.e., forehand drive, forehand attack, serving, and creating space) among college students when compared with skill-focused instruction (SI). In skill-focused instruction the tasks are represented in terms of modeling in the context of playing the game. In PP tasks often involve placing a target on the table to challenge players to hit that target as they play a modified game. Points are awarded for hitting the target. The goal is to hit the target more frequently than your opponent. We hypothesized that participants in PP would perform better in four table tennis skills than those in traditional SI because of the emphasis on shot placement and technique used in PP.

**Method**

**Participants**

A convenience sample of 56 college students (10 females and 46 males) from four intact classes were recruited to participate in this study. All participants were enrolled in beginning table tennis classes in a university-wide sport basic instruction program at a large midwestern university. Table tennis in this setting was chosen because (a) there were expert instructors teaching the classes, (b) each instructor taught two classes, and (c) the sport allowed for the use of multiple cameras to collect data on relatively stationary practice areas. All four table tennis classes shared the following common objectives: (a) demonstrated the appropriate level of competence in grip and racket control, forehand and backhand drives, serves and blocking; (b) demonstrated the knowledge of basic tactics and strategies to play singles games; and (c) demonstrated the ability to apply basic skills and tactics in singles games. All participants reported receiving no prior formal teaching in table tennis and were considered novice table tennis players. The common experience that participants had in table tennis was recreational play with family members and friends at home.

Two Ph.D. candidates Mr. Ping and Ms. Pong (pseudonyms) were recruited as instructors for the study. Mr. Ping was an experienced player and teacher in table
tennis. Mr. Ping taught table tennis classes at the secondary school level during his student teaching practicum and at the college level as a graduate teaching assistant. He typically received 4.5 out of 5 in his teaching evaluation with high scores representing excellent teaching. Ms. Pong was an experienced teacher who taught physical education for four years in a public middle school in Korea. She had a strong background in table tennis. She received three-years of formal training in table tennis as a teenager and was a Junior National Champion tennis player in Korea. Her teaching evaluation scores ranged from 4.9 to 5.0, which have been consistently higher than the average of the university (4.0).

Class size ranged from 11 to 18 students. The table tennis classes met for 48 min per session twice a week and were taught in a multipurpose physical activity room with 10 regulation size table tennis tables. Before the study, consent forms were obtained from all participants according to the University Instructional Review Board.

**Experimental Design and Conditions**

A nonequivalent control/comparison group experimental design with pre and post measures was used to assess two experimental conditions: PP versus SI comparison group (Thomas, Nelson, & Silverman, 2011). The design lacks random assignment of participants to treatment groups and therefore has a potential selection threat. However the design does ensure strong control of threats to internal validity due to history, maturation, testing, instrumentation, and regression (Thomas et al., 2011). The experimental conditions lasted ten weeks with a total of 18 lessons. Both PP and SI groups received a series of specific, but different progressions, tasks, and game play. Instructors were provided with detailed descriptions of the content and procedures of PP instructions and complete lesson plans based on the PP textbook (Launder, 2001). The two instructors cowrote the lesson plans for the SI used with the comparison group. Table 1 shows the content and timing for pre and posttest measures in each condition. The preintervention instruction was the same for both conditions. Within these three sessions, all classes received the same instruction to accomplish two tasks: introduction and test preparation. The instructors used the sessions to introduce participants in both groups to four basic table tennis techniques: backhand drive, flat service, forehand drive, and lateral two-step footwork. Two of the four classes were randomly assigned to the PP condition, whereas the other two classes were randomly assigned to the SI control condition. To decrease the potential influence of teacher effects, both instructors taught one of the two classes from each of the two experimental conditions.

The SI condition focused on instruction of basic skills using demonstrations and then feedback was provided to players as players practiced the discrete skills. The lessons, as shown in Table 1, were characterized by both game play and skill instruction. In contrast, the PP condition focused on first focusing specific responses to set performances (discriminative stimuli) which were then systematically varied (i.e., stimulus generalization) by shaping the plays to produce response generalization. These performances were applied in modified games, often with modified rules and short table tennis games.
Both instructors were trained in PP over two phases: preinstruction training and within-instruction training. The preinstruction training occurred before the interventions and lasted for one week. Instructors were expected to (a) understand the PP theory and clarify the questions they might have relevant to it; and (b) demonstrate their understanding of the content of PP theory and its application to table tennis. Both instructors read the PP book (Launder, 2001), were provided with lesson plans, which they reviewed, and then observed teaching demonstrations of the lessons. Both instructors took a quiz on the PP content, which consisted of 15 multiple-choice questions to demonstrate their understanding of PP.

The within-instruction training occurred before the instructions of every class during the intervention. The objective of the within-instruction training was to ensure that the instructors knew exactly what to teach and how to teach it. Feedback was provided for the next lesson from an analysis of the lesson plan compared with what was actually taught.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Session</th>
<th>Play Practice</th>
<th>Skill-Focused Instruction</th>
</tr>
</thead>
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<tr>
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<td>Introduction of the Syllabus</td>
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<tr>
<td></td>
<td>2</td>
<td>Grip &amp; Backhand</td>
<td>Backhand &amp; Serve</td>
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<td>Pretest</td>
<td>3</td>
<td>Forehand &amp; Serve</td>
<td>Forehand &amp; Footwork</td>
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<td>Holiday No class!</td>
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</tr>
<tr>
<td></td>
<td>8</td>
<td>Ball Placement 2</td>
<td>Forehand Drive: down-the-line and Crosscourt (2)</td>
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<td>Ball Placement 3</td>
<td>Serve Advanced (1)</td>
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<td>Serve Advanced (2)</td>
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<td>Attack Performance 1</td>
<td>Tournament 2</td>
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<tr>
<td></td>
<td>13</td>
<td>Attack Performance 2</td>
<td>Tournament 3</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Serve Placement &amp; Attack</td>
<td>Tournament 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance 3</td>
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<td>15</td>
<td>Serve Placement &amp; Attack</td>
<td>Tournament 5</td>
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<td>Performance 4</td>
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<td>Comprehensive Performance</td>
<td>Tournament 6</td>
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<tr>
<td></td>
<td>19</td>
<td>Game Play-Posttest</td>
<td>Game Play Posttest</td>
</tr>
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</table>
Validity and Fidelity of Interventions

The lead author designed the lesson plans for the PP condition. He had a strong background in table tennis and college teaching experience and during the previous two years, had trialed and refined the tasks and progressions during the teaching of table tennis in basic instruction classes to this student population. Before the start of the study the fidelity of the PP lesson plans were validated by Alan Launder, the author of Play Practice, by reviewing the plans in terms of their conceptual and practical congruency to the play practice model. The two instructors in this study wrote the lesson plans for the SI. The content validity of the SI lesson plans was validated by the first and second authors, who reviewed the lesson plans for both content and pedagogical appropriateness. These plans were consistent with the standard instruction occurring in the basic instruction classes of the university.

The fidelity of the interventions (i.e., the extent to which the PP and SI conditions were taught as described) occurred using checklists for both conditions. The checklists were organized according to the content of the lesson plan. Each checklist had 10 lesson features such as planned duration of activities (e.g., 10 min of game play), progression described consistent with the lesson plan, progression sequence was as described in the lesson plan, and there were no additional activities included. If the content was delivered as planned, a check was then placed next to each item on the checklist. Similarly, if the content was presented differently than planned, this was noted. There were different checklists for the SI and PP conditions. Every lesson in both conditions was coded using the checklist.

Instrumentation

Due to the lack of valid and reliable skill assessments in the table tennis literature, four skill assessments were developed based on the literature to measure forehand and serve performance in table tennis, which could be independently taught in both conditions. The content validity of these four skill tests were evaluated by four experts in Table Tennis instruction who were asked (a) if these tests were performances that commonly occurred in table tennis, and (b) if these were measures that they would consider using to measure forehand performance. The test-retest reliability of these four skill tests on a 7-day interval was assessed by the lead author among 20 college students (13 males and 7 females). Participants’ age ranged from 19 to 28 years old, with a mean of 21. The test-retest reliability coefficients were 0.75 for forehand drive accuracy test, 0.83 for serving test, 0.66 for forehand attack test, and 0.48 for creating space. The overall results provided evidence supporting the validity and reliability of three of the four skill tests. Because of their low reliability, the creating space test scores were not included in subsequent analyses.

Forehand Drive. This assessment measured the ability to control the ball in playing table tennis as controlling the ball is critical in racket sports (Launder, 2001) and plays a significant role in game play in table tennis (Seemiller & Holowchak, 1997). This assessment required that a ball be bounced to the player 30 times at an interval of one every 4 s. A beeper was set up to send a signal every four
seconds. The ball was delivered to a 16-inch squared area on the right corner of
the table. The participants returned the ball crosscourt toward a 14-inch squared
target area on the other side of the table. If the participant returned the ball outside
of the target it would be scored as zero. The overall score ranged from 0 to 30.
The 4-s interval was used because it reduced the timing variation of the trials. If
the initial bounce landed outside the zone, participants had an extra opportunity
to make up the trial.

**Forehand Attack.** Actively attacking the ball plays a key role in winning
table tennis games. To begin the test, participants first served the ball to the test
administrator. The test administrator then returned the ball to participants’ fore-
hand side. Participants must attack the ball crosscourt to the target zone, which
was defined by a line 10 feet away from the table. The test score for each trial
ranged from zero to two. Participants received two points if the ball landed on
the table and bounced to the target zone, one point if the ball landed on the table
but not to the target zone, and zero points if the ball did not land on the table
(i.e., hit the net, played out, or a missed shot). All participants had 20 effective
trials. Therefore, the overall test score ranged from 0 to 40 points. An effective
trial was defined as the situation when the ball was successfully returned to the
participants’ forehand side with an easy drive by the test administrator. If the
administrator failed to produce an effective trial, participants would redo the trial
until an effective one was produced.

**Serving.** Participants’ serving skill was assessed by asking them to serve the
ball to two specific target areas at two corners of the table in a randomized order.
The serve is the first shot of a rally but is more than merely putting the ball into
play. The literature indicated that players would be more likely to control the
flow of play if they are skillful on the serve, and should also be able to place the
ball down the line and crosscourt for greatest benefits (Seemiller & Holowchak,
1997). The score for each trial was coded as either one “on target”, or zero “off
target.” Participants received a zero if they missed the serve, served into the net,
or the ball was served outside the target zone. All participants had twenty trials.
The overall test score ranged from 0 to 20 points.

**Creating Space.** Participants’ skill performance in creating space was assessed
by an alternation task. The main purpose of the alternating task was to measure
players’ performance on creating space, which served as the main goal of playing
racket sports (Mitchell & Oslin, 1999). Creating space means that when playing a
table tennis game the player puts the opponent out of position so that the opponent
is pressured defensively to cover the whole table. The player obtains the benefit
of creating space because under the pressure of covering the space, the opponent
is more likely to make mistakes on the return, and less likely to attack the player’s
shot. This study identified creating space as driving the ball side to side on the table.
When the player alternately hits the ball to the left and right part of the table, he
or she is creating space. The left and right side of table was differentiated by the
centerline marked on the table, which evenly divides the table into two parts. In
the alternating task, the test administrator measured how many times in 20 trials
the player hit the ball alternating to the left and right parts of the table. The overall
score ranged from 0 to 20. The score for each trial was coded as either one “alternating” or zero “not alternating.”

**Inter-Observer Agreement**

Cooper, Heron, and Heward (2007) recommend 90% as the standard of high interobserver agreement. Interobserver agreement (IOA) was calculated on all three skill measures at both pretest and posttest for each trial recorded. IOA was conducted by four graduate students who had prior experience in the coding of the dependent measures from a pilot study. The observers were trained first on the definitions of the variables. To ensure understanding of the definitions, the observers coded 20 practice trials as a group. This was followed by independent coding of 20 trials for each variable to an IOA agreement with the lead author of 90% or better before starting data collection.

**Data Analysis**

Pearson-product correlations were conducted to examine the relationships among the three dependent variables: forehand drive skill, forehand attack skill, and serving skill. Scatter plots among three dependent variables were plotted to visually identify any potential outliers. Normality and homogeneous variances were also checked.

For the inferential statistical analyses, two steps were taken. First, the intraclass correlations coefficients (ICC) for classes were calculated to determine whether students or classes would be used as a unit of analysis in the regression models (Kenny & Judd, 1996). The high ICCs with a range from 0.25 to 0.76 demonstrated that students within classes were interdependent rather than independent and classes should be used as the unit of analysis. Due to small sample size and the limitation of current study design, individual students rather than classes were used as a unit of analysis. The percentage of variance explained by the classes was reported when we discussed the limitations of the current study.

Then, three separate ANOVA with a repeated measure (time effect) was conducted to examine the effects of PP and SI for each of the three dependent variables. The independent variables included time, conditions, and teachers (as a block). An alpha level of .0167 was used based on a bonferroni adjustment. For any significant interaction effects between time and experimental conditions, scatter plots were used to interpret the results.

**Results**

**Fidelity of Interventions**

In the PP group, the overall fidelity level was 93.6%, (92.7% and 94.5% from each PP class respectively). In the SI group, the fidelity level was 96.9% (96.4% and 97.3% from each SI class respectively). The results of the integrity checks showed that the teaching in each instructional group was aligned with the predetermined lesson plans and instructional objectives. Overall the data show that the instruction in PP and SI group followed the intervention goals and procedures.
Interobserver Agreement

Interobserver agreement was conducted on 78% of all dependent variables coded. Overall IOA for all dependent measures was 95.6%. The IOA for the forehand drive accuracy test was 96.7% (a range of 83.3–100%). For the attacking test, the IOA was 94.1% (a range of 85–100%). The IOA for the serving test was 95.0% (a range of 85–100%).

Descriptive Statistics and Assumptions

Means and standard deviations for all variables by pre- and posttest and experimental conditions are presented in Table 2. Visual inspections of the scatter plots did not show any significant outliers. The tests on homogeneous variances of all pre- and post- measures by experimental conditions (PP versus SI) or instructors failed to show any violations of the assumption of homogeneity except that there was a moderate violation on the postmeasure of forehand attack by instructors ($F(1, 54)=4.65, p < .036$). No further action was taken on this variable as the overall F-test is very robust against a mild violation of homogenous variances. The tests on normality and normal probability plots did not indicate any serious violation of normality for all the three statistical models.

Correlational and ANOVA Analysis

The Pearson-product correlations indicated mutual positive relationships among forehand drive, forehand attack and serve skills. The correlational matrix is presented in Table 3.

The ANOVA analysis with the forehand drive as a dependent variable indicated no significant interaction effect between time and conditions, $F(1, 53)=.26, p = .6$. There was no significant main effect of conditions, $F(1, 53)=1.72, p = .19$. A significant main effect of time, $F(1, 53)=11.96, p < .0011$, $\eta^2_p=.18$ was observed. The results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Condition</th>
<th>N</th>
<th>Pretest Mean</th>
<th>Pretest SD</th>
<th>Posttest Mean</th>
<th>Posttest SD</th>
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</thead>
<tbody>
<tr>
<td>Forehand drive accuracy</td>
<td>PP</td>
<td>31</td>
<td>15.45</td>
<td>4.74</td>
<td>17.74</td>
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<td></td>
<td>SI</td>
<td>25</td>
<td>13.84</td>
<td>4.30</td>
<td>16.76</td>
<td>4.17</td>
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<tr>
<td></td>
<td>Total</td>
<td>56</td>
<td>14.73</td>
<td>4.58</td>
<td>17.30</td>
<td>4.42</td>
</tr>
<tr>
<td>Forehand attack</td>
<td>PP</td>
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<td>13.87</td>
<td>6.34</td>
<td>23.42</td>
<td>5.99</td>
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<tr>
<td></td>
<td>SI</td>
<td>25</td>
<td>15.04</td>
<td>6.67</td>
<td>20.64</td>
<td>5.84</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>56</td>
<td>14.39</td>
<td>6.46</td>
<td>22.18</td>
<td>6.04</td>
</tr>
<tr>
<td>Serving</td>
<td>PP</td>
<td>31</td>
<td>6.65</td>
<td>4.06</td>
<td>12.00</td>
<td>3.99</td>
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<tr>
<td></td>
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<td></td>
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<td>6.82</td>
<td>3.72</td>
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</table>
showed that participants in both PP and SI conditions significantly improved their forehand drive skills from pre to post. However, there was no significant difference in the forehand drive performances between PP and SI conditions.

The ANOVA analysis with the forehand attack as a dependent variable indicated a significant interaction effect between time and conditions, $F(1, 53)=8.57, p < .005, \eta^2=.14$ (see Figure 1) and a significant main effect of time, $F(1, 53)=120.96, p < .0001, \eta^2=.7$. There was no significant main effect of conditions, $F(1, 53)=.29, p = .59, \eta^2=.006$. The results indicated that participants in both PP and SI conditions significantly improved their forehand attack skills from pre to post. However, participants in PP condition had better significant improvements in the forehand attack skills from pre to post as compared with those in SI condition, as reflected in Figure 1.

The ANOVA analysis with the serve skill as a dependent variable indicated a significant interaction effect between time and conditions, $F(1, 53)=13.02, p < .0007, \eta^2=.2$ (see Figure 2) and a significant main effect of time, $F(1, 53)=75.61, p < .0001, \eta^2=.59$. There was no significant main effect of conditions, $F(1, 53)=1.53, p = .22, \eta^2=.03$. The results indicated that Participants in both PP and

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Table 3 Correlational Matrix for all the Variables

<table>
<thead>
<tr>
<th></th>
<th>FDA</th>
<th>FA</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forehand drive accuracy (FDA)</td>
<td>1.00</td>
<td>.42*</td>
<td>.34*</td>
</tr>
<tr>
<td>Forehand attack (FA)</td>
<td>1.00</td>
<td>.36*</td>
<td></td>
</tr>
<tr>
<td>Serving (SER)</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05

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Figure 1 — Time x Condition Effect on Forehand Attack Skill
SI conditions significantly improved their serving skills from pre to post. However, participants in PP condition had better improvements in serving skills from pre to post as compared with those in SI condition, as reflected in Figure 1.

**Discussion**

The results demonstrated that both PP and SI conditions were effective in improving participants’ skills in forehand drive, forehand attack, and serving from pre- to posttest. However, PP was more effective in improving participants’ skills in forehand attack and serving from pre to post as compared with SI. We did not use a control group in the design of this study, which makes definitive conclusions about the efficacy of both conditions impossible. However, if one accepts that the SI condition represents a high quality of instruction as evidenced by (a) meaningful prepost gains in student learning, and (b) high expertise of the instructors in terms of content and pedagogy which was documented in our procedural fidelity measures, then PP was as effective as the SI condition or even more effective in two of the three skills than SI. This provides initial validation of the efficacy of PP.

The findings of the current study showed that participants improved their skills in serving, forehand drive, and forehand attacking from pre to post, which were consistent with those reported in previous studies (French, Werner, Rink, Taylor, & Hussey, 1996; French, Werner, Taylor, Hussey, & Jones, 1996). In these two studies, 9th-grade students participated in one of three instructional conditions for three or six week duration: a skill focused approach focusing on the teaching of specific badminton skills, a tactics based approach focused on the teaching of tactics, and a combination of skills and tactics approach. All conditions were compared with a control group. While there were some differences at the end of the three week study, the results showed that at the end of six weeks of instruction, the performances
of students in the three experimental groups were similar, but significantly better than those in the control group. These results have been interpreted typically in terms that there was no difference between the treatment groups. However, one consideration which is not often discussed is that the instructors in these classes were skilled pedagogists using well-designed plans and thus represented examples of very effective instruction in each of the three conditions. Thus, one conclusion is that all three instructional approaches were effective because they were taught by highly skilled instructors, who were knowledgeable in content and pedagogy.

Rink, French, and Graham (1996) raised two issues in their discussion, which are relevant to our findings. First, players must have basic object control skills to participate in games. In the current study basic object control skills were achieved quickly in both conditions because, as Launder (2001) notes, the technical demands in table tennis for basic object control are relatively minimal. Thus, refining and applying object control in game situations could begin relatively quickly in the instructional unit as compared with other racquet sports such as tennis or badminton.

Second, although skill-focused approaches focus primarily on skills, Rink, French & Graham (1996) noted that general tactics (game sense) can be acquired through playing the game. A common pedagogical strategy in a number of instructional approaches (e.g., PP, TGfU, Sport Education) is to use small-sided games to simplify the task demands. In table tennis single and doubles plays are small-sided games. As the PP and SI groups played games of one form or another every day it is likely that students in both conditions developed similar levels of games sense and technical competencies. The conditions of (a) knowledgeable instructors who develop object control skills in their students and (b) daily small-sided games, may explain the significant prepost gain in both conditions.

The findings also showed greater gains in forehand attack and the serve for participants in PP as compared with those in SI. An important difference between the PP and SI condition was the use of tasks in the form of challenges. In PP, target challenges were used to encourage placement of the ball on the table. These set plays with specific foci may explain why PP was more effective than SI in teaching the serve and the forehand attack. These strategies represent the core pedagogy of PP and are an essential difference between the SI instruction and PP.

There are however, four caveats to consider in interpreting these findings. First, the study used a convenience sample. As such generality of these findings is limited by the absence of a random sample. Second, we did violate the statistical assumption of independent observations and used individual students rather than classes as the unit of analysis. The percentages of variance explained by classes for forehand drive, forehand attack, and serving at the pre and post test scores were 7%, 7%, 1.3% and 1%, 6% and 8%, respectively. Due to the nature of field studies and the availability of the number of classes for the current study, we could not use class as the unit of analysis (aggregated means) to achieve any meaningful power or enter classes (one class per condition per teacher) into the statistical model as a nesting effect. Thus generalization and interpretations of the results of the current study need to be viewed with caution due to this design issue.

Third, this study occurred in a college basic instruction setting. The characteristics of that setting included a 19-day unit of instruction, college students with little or no skillfulness in table tennis, and instructors who were skilled and highly competent. Thus, these results are limited to this setting. Fourth, many
intervention studies in physical activity settings compare experimental conditions to comparison conditions that are not effective instructional settings to begin with. In this study, both conditions were taught by instructors who were highly effective and knowledgeable in the table tennis content. Finally, it should be noted that we did not directly assess game sense in this study and this remains an unexamined evaluation of PP.

This study was a quasi-experimental study examining the effects of PP instruction on student learning. Limitations notwithstanding, experimental studies validating the efficacy of instructional approaches are too few. Clearly, more research needs to be conducted using PP instruction, but as an initial effort this study contributes to the evidence-based practice of physical education pedagogy. In addition, the role of content knowledge as a central feature of teaching effectiveness is an underlying assumption of this study. The ultimate goal of PP is to teach learners the basic competencies to effectively play sport. However, PP does not directly identify the specific skills used for effective play for a particular sport, but rather provides a framework to guide teachers to discern those skills for themselves. Before PP instruction begins, teachers must already be knowledgeable in areas such as techniques, tactics, rules, and game play procedures of the sport so that they can select the critical sport skills for effective game play. If teachers lack sufficient content knowledge, teaching using PP will be challenging.

References


