CHAPTER 1

Introduction to the Study

Statement of the Problem

The use of modeling has been studied as an effective teaching tool in many realms (Bradley, 1993; Feltz, 1982; Hall & Erffmeyer, 1983). Bradley (1993) found that over time positive self-modeling can have a positive effect on the performance of basketball players. Feltz (1982) reported that participants who had twelve demonstrations had higher form scores than the control group on a Bachman-ladder test. Hall and Erffmeyer (1983) reported an improvement in foul shot performance when modeling with visuo-motor behavior rehearsal (VMBR) was used. The results showed that there was a significant improvement difference for the group who received modeling compared with the group that did not (Hall & Erffmeyer, 1983). Gray (1990) showed that modeling combined with visuo-motor behavior rehearsal can lead to improvements in racquetball performance.

It has been shown that modeling can lead to improvements in self-confidence of the participant (Vealey, Hayashi, Garner-Holman & Giacobbi, 1998; Weinberg, Grove, and Jackson, 1992). It has also been suggested that self-confidence and performance are related. Vealey's model of self-confidence suggests that state sport confidence can lead to improvements in performance (Vealey, 1986). "Self-confidence is widely acclaimed by theorists, researchers, and practitioners as the most critical psychological characteristic influencing sport performance" (Vealey et al., 1998, p. 54). In a study of 335 college athletes and subsequently 208 high school athletes it was reported that the following nine factors are sources of self-confidence for athletes: mastery, demonstration of ability, physical/mental preparation, physical self-presentation, social support, coach's leadership, vicarious experience, environmental comfort, and situational favorableness. Vicarious experience is defined as watching others perform successfully (modeling) (Vealey et al, 1998).

Few studies have examined how verbal cues might facilitate learning when used in conjunction with modeling. Forehand and Yoder (1973) reported that modeling with verbal cues (verbalizations which were used to explain concepts) was more effective than modeling alone when retarded subjects performed on the Leiter Scale. Weiss and Klint

(1987) reported that children exposed to modeling with verbalization about the skill combined with verbal rehearsal and verbal rehearsal with no modeling both performed significantly better than modeling only and the control group on a six part motor skill course. Weiss (1983) found that younger children did better on a sequential motor task when exposed to a verbal model as opposed to a silent model while older children did equally well with a verbal model and a silent model.

One type of modeling is videotaped modeling and it has been used for some time as a teaching tool in tennis. John Yandell, the author of *Visual Tennis*, used modeling when working with top professionals such as John McEnroe and Gabriela Sabatini.

However, there have been no significant studies which assess the effectiveness of modeling both as a performance enhancer and confidence builder with regard to tennis. Furthermore, very few studies assess the effectiveness of verbal cues when used with modeling. The studies which have been performed have taken place in other realms (Forehand & Yoder, 1973; Weiss, 1983).

Purpose of the Study

The purpose of this study was to investigate the use of videotaped modeling of a tennis skill with and without verbal cues. Supplementary investigation examined the skill performance and confidence levels of the participants.

Research Questions

1. What are the participants observing when they watch the model?—Is the group that receives videotaped modeling with verbal cues seeing different concepts than the group who receives videotaped modeling without verbal cues?
2. Does the use of videotaped modeling with verbal cues improve the performance of collegiate tennis players more than videotaped modeling without verbal cues?
3. Does the use of videotaped modeling with verbal cues improve the confidence of collegiate tennis players more than videotaped modeling without verbal cues?

Definitions of Terms

1. *Videotaped Modeling* refers to watching a professional tennis player hit a series of forehand groundstrokes
2. *Verbal cues* are simple statements which guide the participants on the concepts to which they should be attending
3. *Sport self-confidence* refers to Vealey's (1986) concepts of trait (general) sport self-confidence and state (situational) sport self-confidence
4. *I-movie* is an Apple computer program which easily allows clips to be transferred from a camera to a computer and then edited. Clips can be put into slow motion, fast motion, and looped. The program also allows for an audio track to be added.

Significance of the Study

Although it is commonly accepted that modeling is an effective teaching tool in many sports, its effectiveness in tennis has been largely unstudied. Moreover, since the advent of I-Movie which allows a video clip to easily be seen in slow motion and looped several times, very few, if any, studies have used it as a medium to study the effectiveness of modeling. The proposed study will help collegiate and other tennis coaches learn what players are seeing when they view a model. The study will also assess the use of modeling as a method to enhance confidence levels. Finally, the proposed study will also determine what it is about modeling that makes it an effective tool by answering the question "What are the subjects seeing when they view the model?" The study will also determine whether there is an increase in level of performance and confidence levels as a result of the modeling intervention.

CHAPTER 2

Review of Literature

Modeling

Bandura (1986) states the following about modeling:

> Fortunately, most human behavior is learned by observation through modeling. By observing others, one forms rules of behavior, and on future occasions this coded information serves as a guide for action. Because people can learn approximately what to do through modeling before they perform any behavior, they are spared the costs of pain and faulty effort. The capacity to learn by observation enables people to expand their knowledge and skills on the basis of information exhibited and authored by others. (p. 47)

Much of the early research on modeling was completed by Bandura. In one of the most noted studies, Bandura, Ross, and Ross (1963) found that children exposed to an aggressive model on film imitated that model. Bandura, Blanchard, and Ritter (1969) examined modeling with regard to desensitizing individuals who possessed a fear of snakes. Three groups were compared with a control group. The groups were live modeling with participation, symbolic modeling, and systematic desensitization. It was found that modeling with guided participation proved to be the most successful in eradicating phobic behavior (Bandura et al., 1969).

Carroll and Bandura (1985) examined various aspects of modeling such as timing. They found that the timing of modeling had an effect on learning. Subjects were asked to reenact patterns using a paddle device that they saw on a video monitor. Three groups existed who modeled the behavior concurrent to seeing the video, after seeing it, or received no modeling. Within each group subjects were asked to count backwards by threes to prevent cognitive rehearsal. The other half was verbally cued to continue modeling the pattern. It was found that concurrent visual monitoring had the greatest effect on learning. Those who engaged in rehearsal techniques also had higher scores (Carroll & Bandura, 1985).

Carroll and Bandura (1987) found that "subjects displayed a substantial loss in accuracy when they first tried to reproduce the modeled actions from memory before they

had a clear representation of them" (p. 395). One group existed in which the subjects watched the model perform the action using the same paddle device as in the previously described study followed by a retention interval. Then they performed the actions concurrently. They were tested to examine their performance. The other group observed the model, but did not have the opportunity to perform the action concurrently. Rather, they had to produce it from memory. Then they watched the model again and performed the action again while being tested for their performance. Half of the subjects were able to see their actions while being tested and the other half was not. They were tested twice without modeling or visual monitoring. Concurrent modeling produced a near perfect performance. It was found that concurrent matching was preferred for those who could not monitor their performance but separate matching was optimal for those who could. Carroll and Bandura (1987) stated the following:

> After acquiring a more precise cognitive representation, subjects could produce the modeled actions just as accurately from memory of them as from matching the ongoing modeled performances. These patterns of results suggest that production proficiency was mediated by representational acquisition rather than being directly forged by accurate performances cued by modeling stimuli. (p. 395)

Carroll and Bandura (1990) examined the effects of verbal coding and modeling on performance. It was found that when the number of trials is increased verbal coding is a factor in performance. Verbal coding had no effect when there were a small number of trials (Carroll & Bandura, 1990).

In a review of three studies related to modeling Magill (1993) states, "indirect evidence was provided to support our hypothesis that observing a model facilitates the acquisition of appropriate patterns of coordination for the novice" (Magill, 1993, p. 367). Dowrick (1999) reviewed the literature on self-modeling. It was found that the most successful use of self-modeling in sport occurred in activities not previously performed successfully. Thus, they used a feedforward design (Dowrick, 1999).

Adams (1990) states the following about observational learning, "The images that are acquired in observational learning and mental practice are not images that are remembrances of the past, or fanciful bizarre images. Rather, we are talking about

acquiring new images in behalf of realistic skills and, in the case of mental practice, strengthening them; we are talking about image learning" (Adams, 1990, p. 216).

The effects of modeling on the learning of learning disabled students have been studied extensively. Dowrick and Raeburn (1995) studied students with physical disabilities such as cerebral palsy and spina bifida. The subjects were asked to complete basic necessary skills. Self-modeling tapes which lasted two minutes were produced for one of the skills. They viewed this video six times over two weeks. They were also videotaped without self-modeling. Self-modeling resulted in significantly greater performance than the video alone in 14 out of 18 subjects. The findings of this study suggest that self-modeling can be effective in improving certain useful tasks (Dowrick & Raeburn, 1995).

Greeson (1986) studied multiply handicapped preschool children and assessed the effectiveness of modeling on the learning of mental imagery learning skills. The subjects were asked to complete three tasks (two five-item lists of free recall items, and a five-pair list of concrete associative learning items). Then they were exposed to modeling, practice, and verbal reinforcement. It was found that children with verbal and visual problems had significant improvement based on the mental imagery modeling (Greeson, 1986).

Reamer, Brady, and Hawkins (1998) examined the effects of modeling on parents' interactions with children with developmental disabilities. "The direct effects of the intervention were clear. As the video intervention was introduced to each parent, there was a resulting change in the interaction patterns directed toward the children" (Reamer et al., 1998, p. 142). Modeling has also been shown to be effective in helping the conversational skills of learning-disabled boys (Donahue & Bryan, 1983).

Possell, Kehle, Mcloughlin, and Bray (1990) examined self-modeling as it relates to disruptive classroom behavior in males 5 to 8 years old. Four subjects completed a baseline, intervention, and follow-up phase. The intervention took place for two weeks during which the subjects viewed an edited video containing five minutes of appropriate behavior. Each student had a decrease in disruptive behavior (Posell et al., 1990).

Forehand and Yoder (1973) examined the effects of modeling on the learning of retarded children. Thirty children completed a matching objects task using the Leiter

Scale. The subjects were placed into one of the following: modeling only group, modeling plus verbal concept, and no modeling. It was found that the modeling plus verbal condition resulted in fewer errors than the modeling only and no modeling conditions (Forehand & Yoder, 1973).

Espin and Deno (1989) studied modeling compared to prompting on sight word reading in learning disabled students. Two experimental groups existed which were prompting or modeling. Subjects were divided into two groups based on their ages. It was found that the younger group (group I) learned 100% of the modeled words and 72.97% of the words that were prompted while group II learned 92% of the modeled and only 60% of the prompted words. At both one and three month follow-up testing, both groups had retained a higher percentage of modeled words than prompted words (Espin & Deno, 1989).

Self-modeling has been studied to determine whether it decreases stuttering behavior in four students in grades K-8. Self-modeling intervention occurred for 6 weeks and there was follow-up at 8, 6, 5, and 4 weeks. There was no self-modeling occurring during the follow-up phase. Stuttering was reduced in two of the four students and the effects remained throughout follow-up (Bray & Kehle, 1998).

The same subjects in the previously mentioned study were examined two years later in a follow-up study. Two of the students maintained the effects of the study two years later judging from the percentage of stuttered words across phrases. The other two students did not maintain their results, but did have better results than their baseline data indicate. Two of the subjects continued to view their self-modeling videotapes during the two years following the study which might have contributed to the positive results (Bray & Kehle, 2001).

Modeling has also been used to improve music performance. Hewitt (2001) found that modeling improved performance in tone, technique/articulation, rhythmic accuracy, tempo, interpretation, and overall performance. Henley (2001) found that modeling helped the areas of rhythm and tempo mastery, but did not have an effect on pitch discrimination.

Manderino and Bzdek (1984) examined the effects of modeling and reactions to pain using the Forgione-Barber pain stimulus. The researchers wanted to find out how

pain in childbirth could be affected by the use of modeling. Four treatment groups existed which were videotaped modeling (showed six models coping with pain), videotaped verbal information (showed a narrator giving information on coping with pain), videotaped modeling and videotaped verbal information, and a control videotape (viewed a videotape not related to the experiment). It was found that the combination of verbal information and modeling produced subjects who reported less pain (Manderino & Bzdek, 1984).

Knapczyk (1991) examined the effects of modeling on question asking and question answering. The students were shown a videotape of a world geography class presentation and then trained using modeling to modify their question asking behavior. The videotape was stopped when the student had a question or did not understand the material. The student was directed in certain elements when asking a question. In the question answering training session, the students viewed a videotape of a class presentation and were asked to stop the tape when he or she had a question. "The results of the study indicated that videotaping segments of the world geography class and using them to create opportunities for modeling, rehearsal, and feedback were effective strategies for facilitating generalization of performance" (Knapczyk, 1991, p. 81).

Ironsmith and Whitehurst (1978) investigated the effects of modeling on children's communication performance. Specifically, the researchers were interested in examining the effect of modeling on children's listening feedback. There were three modeling conditions: model asking general questions in response to ambiguous messages, model asking specific questions and model asking specific questions and also explaining the underlying cognitive strategy for producing those questions. Kindergartners and second-graders served as the subjects. For the younger group, there was not a significant difference between the modeling conditions and the control group. For the second-graders, it was found that the modeling group had a significantly greater number of appropriate responses than did the control group (Ironsmith & Whitehurst, 1978).

The effects of modeling on training assertive behavior were studied by McGuire and Thelen (1983). Specifically, it was found that the treatment groups were more effective than the control groups in eliciting assertive behavior. There was no difference

among the groups that received modeling only, instruction-rehearsal only, and modeling plus instruction rehearsal (McGuire & Thelen, 1983).

Walter (1975) found that models who acted were more affected than natural models in changing the behaviors of individuals when completing a problem-solving task.

The effects of modeling on the performance of various tasks and skills have been studied. Riolo (1997) examined modeling and its effects on the task of sterile hand washing with first-year nursing students. There were four groups: observed task demonstration, observed task demonstration with five errors, observed task demonstration with correct presentation of the five errors, and a control group who was told the importance of hand washing from a clinical perspective. The four groups were tested on their acquisition and retention of the technique. It was found that the control group had the least accuracy for acquisition and retention. The viewing of errors did not have an effect on the performance of the subjects (Riolo, 1997).

The Bachman ladder-balance task was used to study the effects of age and number of demonstrations on modeling (Feltz, 1982). Sixty college students and sixty elementary students performed the Bachman ladder-balance task. The conditions were no demonstration, four demonstrations, eight demonstrations, and 12 demonstrations. Each group was given 10 trials and videotaped on each. Form was measured by judges rating the form on five factors. It was found that college age students had higher performance and form scores than elementary students. Students who received 12 demonstrations received better form scores than the control group (Feltz, 1982).

Weiss (1983) studied verbal versus silent modeling in younger and older children. The subjects consisted of two groups, children between 4-5 years old and between 7-8 years old. They were asked to complete a six-part motor skill obstacle course. The following conditions existed: a.) silent model, verbal instruction group b.) silent model, no verbal self-instruction group c.) verbal model, verbal self-instruction group d.) verbal model, no verbal self-instruction group e.) no model, verbal self-instruction group f.) no model, no verbal self-instruction group. The verbal instruction group was instructed to verbalize the steps of the obstacle as they execute it. The no verbal instruction group was just asked to perform the task without verbalizing the steps. It was found that the 7-8

year old group performed significantly better than the 4-5 year old group. The older group executed the task equally well with a silent or a verbal model while the younger group only exhibited significantly better performance when exposed to a verbal model as opposed to a silent model (Weiss, 1983).

The effects of modeling combined with role-play practice on counseling skills were assessed (Froehle, Robinson, & Kurpius, 1983). It was found that the effects of video modeling and written modeling did not differ. Furthermore, role-play practice only made a difference in the written modeling group (Froehle et al., 1983).

Braver and Barnett (1976) examined the effects of modeling on cooperation in a children's game. It was found that modeling led to more cooperative behavior by children. Watching an opponent be cooperative leads to more cooperation (Braver & Barnett, 1976).

Rushton (1975) examined the effects of modeling on generous behavior in children aged 7 to 11 years. It was found that modeling had a significant effect on immediate donations of the subjects. The effects of modeling were still evident after eight weeks when the subjects were tested again. Modeling still had a significant effect on the donating behavior of the subjects (Rushton, 1975). The effects of modeling on generosity were also studied by Rushton and Littlefield (1979) and it was found that modeling resulted in an increase in generous behavior.

The effects of modeling in sport have been studied by various researchers. Dowrick and Dove (1980) studied the effects of self-modeling on swimming performance in children with spina bifida. Three children aged 10, 5, and 5, served as the subjects in this study. An observation stage was followed by a videotape session in which the three children were videotaped together swimming. The children were performing tasks within their realm of ability. This film was three-minutes long and was called Film X. Then three separate self-modeling films for each child which were two minutes long were produced. The performance in these films exceeded their performance during observation. For the next eight weeks, the children viewed their self-modeling tapes. The first child viewed the tape nine times. The second child saw it 15 times and the third child saw it 14 times. They were also shown Film X in between viewing the self-modeling tape. After each third viewing there was an observation session in which the child would

regularly practice. Two subsequent self-modeling films were made for Child 1 to see if additional self-modeling would occur. The three children increased their scores on the Water Confidence Behaviors Checklist. Child 1 increased during the first reapplication by 4 and the second by 5. The increases remained during follow-up (Dowrick & Dove, 1980).

Male intramural basketball players were participants in a study which examined the effects of self-modeling and goal-setting on self-efficacy and performance (Bradley, 1993). A positive group watched themselves making 12 free throw shots. A negative group watched a video of themselves missing twelve free throw shots. Then they were given a questionnaire to determine their self-efficacy and asked to shoot 30 free throws. They were given another questionnaire to evaluate commitment to the goals they had made. It was hypothesized that the positive self-modeling group would have a higher performance than the negative self-modeling group. On the first trial there was a difference, but it was not significant. On the second trial the performance difference did not reach significance. On the third trial, the difference in performance between the positive modeling and negative modeling was significant. This suggests that, over time, positive self-modeling has an effect on performance more than negative self-modeling does (Bradley, 1993).

Weiss and Klint (1987) examined modeling with verbal rehearsal in the realm of a physical education class. Specifically the children aged 5-6 and 8-9 were asked to complete a 6-part motor skill task. The subjects were placed into a verbal model group in which they viewed a model while verbalizing the skill. The verbal model plus rehearsal viewed the model and verbalized but were also asked to rehearse the task. The verbal rehearsal only group only rehearsed verbally after hearing a verbal explanation of the tasks. The control group only heard an explanation of the skills and when to perform them (Weiss & Klint, 1987). Fewer trials were needed by the verbal model plus rehearsal and the verbal rehearsal only than the verbal model and the control group. Thus the results of this study indicate the following, “From a practical viewpoint, it appears that a combination of modeling and provision for verbal rehearsal is maximally beneficial for motor learning and performance” (Weiss & Klint, 1987, p. 241).

Melody (1990) studied the effects of modeling on free-throw performance of 10 male and female Division I basketball players. The subjects watched a five minute videotape of themselves successfully performing a free-throw shot six times over two weeks. It was found that seven of the ten subjects were able to sustain or improve upon performance increases exhibited in the treatment phase. Furthermore, when eliminating one of the subjects as an outlier, the male subjects improved their free-throw percentage from 47% to 69%. The female subjects improved from 56% to 75% (Melody, 1990).

Scraba (1989) examined the effects of self-modeling with swimmers who had physical disabilities. Ten swimmers with disabilities were divided into one of two groups. One of the groups received only swimming instruction while the other group received swimming instruction and the viewing of a two minute self-modeling tape (viewed 3 days a week for 15 weeks). It was found that those students receiving self-modeling with instruction improved in performance in speed, power, and stroke-quality more than students who only received instruction (Scraba, 1989). Scraba indicates that self-modeling with instruction was the only method that produced improvements on stroke-quality for the breaststroke. He also indicates that self-modeling with instruction is an effective way to teach swimming skills (Scraba, 1989).

The effects of Visuo-Motor Behavior Rehearsal (VMBR) and modeling on racquetball performance were investigated (Gray, 1990). One group was given relaxation/imagery and another group was given behavior rehearsal and videotaped modeling. The latter group watched a videotape which was approximately 20 minutes long. This tape included progressive relaxation exercises followed by a model successful repeating the forehand and backhand shots. The groups were then tested on their performance on the forehand and backhand shots. It was found that a significant performance effect existed for the forehand shots with those students who used behavior rehearsal and videotaped modeling. “Performance results present qualified support for the efficacy of training in visuomotor behavior rehearsal combined with videotape modeling, with only this group exhibiting significantly better forehand performance than the group practicing relaxation/imagery" (Gray, 1990, p. 383).

LeJeune, Decker, and Sanchez (1994) studied the effects of observational learning on table tennis skills. Four different groups were formed: a control group which received

no practice, a physical practice group, a physical practice and observational learning group, a physical practice, mental practice, and observational learning group. Counterattack forehands and counterattack backhands were found to be improved qualitatively (form) and quantitatively (performance) in the group who received physical practice, mental practice, and observational learning (LeJeune et al., 1994).

Bouchard and Singer (1998) tested the effectiveness of modeling used with Singer's five-step serve strategy applied to the tennis serve. The five-step strategy involves readying, imaging, focusing, executing, and evaluating. Three groups were tested which were five-step strategy with videotaped modeling, audiotape five-step strategy with written transcripts and no strategy. The videotaped modeling group watched a video which was 11 minutes long of an instructor teaching using the strategy while performing serves. The audiotape condition listened to the strategy while reading the written transcript. The no strategy group watched an 11 minute videotape of John McEnroe and Ivan Lendl describing the serve. It was found that the group who received the five-step strategy with videotape modeling obtained the most points and had the least errors. They also continued to improve during the retention phase (Bouchard & Singer, 1998).

Fery and Morizot (2000) examined the tennis serve with respect to modeling. The participants either modeled from a kinesthetic or a visual image and had no mental practice or had mental practice. The group receiving mental practice was asked to "'represent yourself as accurately as possible actually performing the modeled movement and by using only the information provided during the modeling' " (Fery & Morizot, 2000, p. 715). On the form test, there was a main effect for type of mental activity and type of imagery. Mental practice had an effect on the performance (precision) of tennis serves evidencing the fact that modeling is effective when there is time to rehearse what is being modeled. It was also found that kinesthetic modeling is more effective than visual modeling for improving the speed and form of a tennis serve (Fery & Morizot, 2000).

Hall and Erffmeyer (1983) found an improvement in foul shot performance when modeling with visuo-motor behavior rehearsal (VMBR) was used. Ten intercollegiate female basketball players were randomly assigned to a VMBR condition or a progressive

relaxation and visual imagery condition with no modeling. The players did not practice their foul shots during the study. During the first week, both groups received 30-minute relaxation and visual imagery training sessions. In the second week, both groups practiced the relaxation and visual imagery for 20 minutes. The non-modeling group was then asked to continue practicing relaxing and visualizing excellent foul shot performance for 20 minutes. The modeling group watched a video of a model performing ten excellent consecutive foul shots for 20 minutes. The results showed that there was a significant improvement difference for the group who received modeling compared with the group that did not (Hall & Erffmeyer, 1983).

Gray and Fernandez (1989) assessed the effectiveness of VMBR with videotaped modeling on the performance of continuous free throws, non-continuous free throws, and outside shots. Each player received a five day treatment which consisted of watching a video containing ten minutes of relaxation and a 20 minute modeling pattern of a silhouette of a female player successfully hitting three free throw shots and then a blank screen with imagery instructions and a repeat of both of those things. It was found that the players performed significantly better in the non-continuous free-throw shooting (Gray & Fernandez, 1989).

Weinberg, Grove, and Jackson (1992) examined the strategies used by Australian and American Tennis coaches to build the self-efficacy of players. It was found that both Australian and American coaches rank modeling by acting confident in the top five strategies for building the self-efficacy of players (Weinberg et al., 1992).

In a similar study Weinberg and Jackson (1990) studied the methods used by 222 high school and age group tennis coaches in the Southwest United States. It was found that acting confident, or modeling, was the third-ranked strategy for building confidence (Weinberg & Jackson, 1990).

Gould, Damarjian, and Medbery (1999) examined the mental skills training methods used by 20 United States Tennis Association (U.S.T.A.) junior tennis coaches. One of the factors discussed in teaching mental skills to players is through the use of modeling by the coach (Gould et al., 1999).

Starek and McCullagh (1999) studied the effects of self-modeling on the performance of beginning swimmers. A total of ten swimmers (8 women and 2 men) who

defined themselves as beginning swimmers were participants in the study and their performance was assessed using the Swimming Performance Checklist which was adapted for use by adult participants. Participants were either part of a self-modeling or a peer-modeling group. They each had five swimming lessons, the first two being the same. The first lesson was used to get a baseline of their swimming performance. The second session consisted of videotape feedback (VTFB) from the first lesson. During the third lesson, the self-modeling group watched three minutes of themselves swimming while the peer model watched a three-minute tape of a swimmer slightly better than they. The fourth lesson consisted of watching an update of the same tape from the previous lesson. The fifth lesson was the same for both groups and included no modeling. Modeling had an effect as both groups performed significantly better in the fourth lesson than they did in the third lesson. It was also found that the participants in the self-modeling group performed significantly better than the peer-modeling group (Starek & McCullagh, 1999).

Zetou, Tzetzis, Vernadakis, and Kioumourtzoglou (2002) compared the effects of modeling with verbal cues to self-modeling with verbal cues on the learning of setting and serving in volleyball. The modeling group watched a model on videotape while a teacher provided verbal cues about the important concepts of the skill. The self-modeling group watched a video of themselves and teachers provided error correction cues. Time was allotted for practice for each group between the modeling sessions. The modeling interventions occurred for 16 sessions, 8 for the set and 8 for the serve. Performance was evaluated in terms of a skills test as well as a form evaluation. The participants were pre-tested, post-tested and tested again one week later for retention. The modeling group had better scores on the set skill test at the post-test and the retention test. Likewise, the modeling group had significantly better scores at the post-test and the retention test on set form. For serve skill, it was found that there were no significant differences at post-test, but on the retention test, the modeling group did better than the self-modeling group. On serve form, the modeling group performed significantly better than the self-modeling group at post-test and retention test (Zetou et al., 2002).

Modeling in tennis has been studied extensively by John Yandell who has worked with top professionals such as John McEnroe and Gabriela Sabatini. In his book *Visual*

Tennis he discusses how one should model certain fundamentals of the tennis stroke rather than idiosyncrasies. "Teachers and players who study the strokes of champions often focus on idiosyncrasies rather than the underlying fundamentals. They end up copying things that are irrelevant or even detrimental to their tennis" (Yandell, 1999, p. 25). Richard Schonborn (1999) echoes Yandell's thoughts:

> Every person is an autonomous and incomparable unit composed of many physical and psychological factors, which together make up their special and unique individuality. In the course of their normal profession and daily life, a person can become successful, if allowed and enabled to develop, improve, perfect and make the most of their individuality, strengths, and particular abilities. (p. 71)

In conclusion, it has been shown that modeling can be an effective teaching method in various realms (Greeson, 1986; Possell et al., 1990; Feltz, 1982; Scraba, 1989) to improve performance. In addition, videotaped modeling has been used extensively by tennis experts such as John Yandell. However, the role that modeling can play in the teaching of tennis has not been widely researched in a scientific way.

Sport Confidence

Vealey defines sport confidence as "the belief or degree of certainty individuals possess about their ability to be successful in sport" (Vealey, 1986, p. 222). Vealey describes state sport confidence as affecting behavioral responses (performance) and behavioral responses then can lead to changes in trait sport confidence (Vealey, 1986). Harter (1978) also indicates that feelings of self-efficacy can be influenced by successful performance.

McCullagh and Weiss (2001) also indicate the importance of modeling on the confidence of athletes noting, "It is apparent that modeling can indeed have profound effects not only on performance but also on psychological variables (e.g., anxiety, fear, affect) that may impact physical activity patterns" (p. 212).

McCullagh and Weiss (2002) again note the important relationship between modeling, self-efficacy, and sport performance. "Thus, observational learning and self-efficacy go hand in hand. Observational learning is a key source of efficacy beliefs that, in turn, influence thoughts, emotions, and behaviors" (McCullagh & Weiss, 2002, p.

134). Therefore, it is important to study confidence because this can have a significant effect on one's performance in sport.

CHAPTER 3

Methodology

Participants

The players from two National Collegiate Athletic Association (NCAA) Division III women's varsity teams served as the participants for the study. As opposed to Division I, Division III offers no athletic scholarships. The philosophy of NCAA Division III is defined in the following way:

> Division III athletics features student-athletes who receive no financial aid related to their athletic ability and athletic departments are staffed and funded like any other department in the university. Division III athletics departments place special importance on the impact of athletics on the participants rather than on the spectators. The student-athlete's experience is of paramount concern. Division III athletics encourages participation by maximizing the number and variety of athletics opportunities available to students, placing primary emphasis on regional in-season and conference competition (http://www.ncaa.org/).

The participants were asked to participate on a volunteer basis. Permission to conduct the study was obtained first by the Virginia Polytechnic Institute and State University Institutional Review Board and then the Institutional Review Boards of each of the participating institutions. The informed consent form can be found in Appendix A. The participants ranged in age from 18 to 26 years. Three of the eighteen participants were left-handed.

The participants were randomly assigned to one of two groups. One of the participants in Group #1 took a leave of absence from the tennis team. This left 8 participants in Group #1 (with verbal cues) and 10 participants in Group #2 (without verbal cues).

Instrumentation

The instrumentation consisted of an on-court tennis skills test, a confidence measure, a qualitative questionnaire, and a follow-up interview question.

Tennis Skills Testing

Hewitt (1966) developed a test for measuring tennis stroke performance. This test contains measurements for the serve, forehand groundstroke, and backhand groundstroke (Hewitt, 1966). A seven foot restrainer rope is placed at the net. The goal is to hit the ball underneath the restraining line. If a ball is hit over the rope, the player's score for that hit is reduced by fifty percent. The court is divided into five sections with players earning more points for hitting the ball deeper into the court. The test is administered by an instructor who hits the player ten forehand and ten backhand drives. Any balls hit into the net are hit again.

This test was developed before the advent of topspin. Oscar Wegner (1992) explains this transformation:

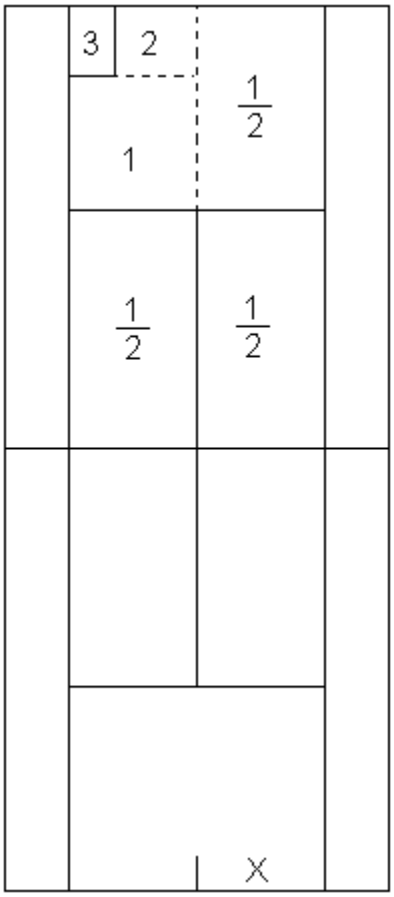
> In the last two decades professional tennis has taken a big jump technically with the acceptance and use of topspin among most players. Topspin is a forward roll, just as if the ball were rolling forward on the ground. It is created by brushing up on the ball while stroking. You lift the racket much higher than the intended line of flight of the ball (p. 15).

Therefore, the ball goes much higher than it would with a flat shot. "Applying topspin to groundstrokes permits the stroker to hit the ball harder while retaining control, since the ball crosses the net higher than the typical flat shot and drops sharply within the baseline" (Johnson, Xanthos, & Lebedeff, 2003, p. 61).

Hensley (1991) described the AAHPERD test for groundstrokes similar to the one devised by Hewitt. The court is divided into 4 sections. Students can earn up to four points per hit for their placement. In addition, power zones are used. A student can score up to three additional points based on where the second bounce of the ball lands. This test involves hitting ten forehand and backhand drives. A score is found by adding the placement and power scores together for each of the trials.

A tennis skills test was designed using the principles described by Hewitt and Hensley. However, there was no restraining line. Furthermore, subjects received two separate scores for power and placement. A ball machine was used to feed the tennis balls for more consistency of the feeds. The two measures for assessing the forehand groundstroke were power and placement. Vic Braden defines what a great shot is. "And

by 'great' I meant someone who, while under stress, could place the ball near the intended target" (Braden & Bruns, 1998, p. 37). The U.S.T.A. suggests that all shots should be aimed six feet inside the baseline and six feet from the sideline (U.S.T.A., Woods, Hoctor, & Desmond, 1995). The following diagram illustrates how many points a player can receive for hitting a shot in the target area.



A ball machine fed three practice feeds. Then twenty forehand groundstrokes were fed. The player was required to hit the ball crosscourt into the target area. If a ball landed in the target area a total of three points was awarded. If it landed crosscourt deep in the court, but not in the target, two points were awarded. If a ball landed past the service line, but not to the back line, one point was awarded. If it landed crosscourt and shorter than the service line 1/2 point was awarded. A player received 1/2 point if the ball did not land in the crosscourt area, but still landed in the court. A ball that landed in the net or out will also received a score of zero. Therefore, a subject could score a total of 60 points on this test. In addition, a speed gun measured how fast each shot was moving

when the ball was hit. The speed gun operator knelt at the net directly in front of the participant to measure the speed of the forehand groundstroke. A speed score for each shot was taken, even if the ball went out or in the net. If a wild shot was hit, the speed gun did not record a score. These scores were not added to the total. The true scores were recorded and a mean score for the twenty shots was calculated.

Confidence Measures

Bandura (1977) identified four factors which enhance self-efficacy. These are performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. "People do not rely on experienced mastery as the sole source of information concerning their level of self-efficacy. Many expectations are derived from vicarious experience" (Bandura, 1977, p. 197). Bandura also explains that in order for modeling to be most effective a clear outcome must be present. "Modeled behavior with clear outcomes conveys more efficacy information than if the effects of the modeled actions remain ambiguous" (Bandura, 1977, p. 197).

The trait and state sport confidence inventories by Vealey (1986) will be reviewed for use in the current study. The validity of these scales has been tested using marathon runners. Before a race, 42 runners completed the inventories and also gave their predicted finishing times in the race. Thirty-five of them completed the race of which 25 were men and 10 were women. It was found that trait and state scores correlated significantly with predicted finishing times. Trait and state scores also correlated with actual finishing times (Gayton & Nickless, 1987). This research suggests that the use of the state and trait sport confidence scales will give a good prediction of how an athlete will do in a competition.

The modifiability of this measure was tested by Short and Vadocz (2002) who investigated the inventories with female figure skaters. The modified version removed the comparison element (when the subject is asked to compare their confidence level with the most confident athlete they know). The item-to-item correlations were low. The researchers suggested that the inventory should not be modified. "These findings show that the 'comparison' component of the state sport confidence inventory significantly altered the original questionnaire. Thus, researchers should be cautious about changing the instructions and the items by eliminating the comparison component" (Short & Vadocz, 2002, p. 1028).

The state sport confidence inventory was used to study the confidence of elite roller skaters. Researchers were interested in finding out what highly confident athletes are imaging. It was found that athletes who have a high level of confidence are imaging different things than those who have a low level of confidence (Moritz, Hall, Martin, & Vadocz, 1996). Specifically, those athletes with higher confidence imaged more mastery and emotional components of the skill.

The trait sport confidence inventory was used by Gold (1989) when female collegiate tennis players were used as subjects. The state sport confidence inventory and the trait sport confidence inventory were used by Savis (1996) who studied male collegiate tennis players. The inventories were modified slightly, but were not tested to assess whether they correlated to the original measures.

Feltz and Chase (1998) note that the TSCI and SSCI have been criticized for the comparison factor. "Further, the format of the TSCI and SSCI has been scrutinized because participants are instructed to rate their confidence in relation to the most confident athlete they know. This format is believed to produce unsystematic variance, depending upon whom the participants select as their standard of confidence" (Feltz & Chase, 1998, p. 74). They also indicated that these measures should not be used when a researcher is trying to measure confidence in a sport-specific situation (Feltz & Chase, 1998, p. 74). The TSCI and SSCI were modified to be tennis specific and were tested in a pilot study.

Pilot Study

Introduction

The purpose of the pilot study was to test the concurrent validity of a modified version of Vealey's Trait State Sport Confidence Inventory (TSCI) and State Sport Confidence Inventory (SSCI). These modified versions were called the Tennis Trait Sport Confidence Inventory (TTSCI) and the Tennis State Sport Confidence Inventory (TSSCI). These inventories were not named until after the participants completed the questionnaires, so that they would not know the purpose of the present study. The modified versions of these measures contain the same statements as the original measures but are reworded to be specific to tennis. Therefore, it was hypothesized that the TTSCI

would correlate with the original TSCI. Likewise the TSSCI would correlate with the original SSCI.

Participants

Fifteen female tennis players who compete at the 3.0 and 3.5 level served as the participants for the study. The definitions of these National Tennis Rating Program (NTRP) ratings are described below:

> 3.0: This player is fairly consistent when hitting medium paced shots, but is not comfortable with all strokes and lacks execution when trying for directional control, depth, or power. Most common doubles formation is one-up, one-back.
>
> 3.5: This player has achieved improved stroke dependability with directional control on moderate shots, but still lacks depth and variety. This player exhibits more aggressive net play, has improved court coverage, and is developing teamwork in doubles.
>
> http://www.midatlantic.usta.com/adultsseniors/custom.sps?iType=1524&icustompageid=3055

Materials

The TSCI and the SSCI were modified so that each statement directly refers to a competitive tennis situation, rather than to a general sports situation. The original version of the TSCI and SSCI are found in Appendix A. The modified versions, called the TTSCI and the TSSCI, are found in Appendix B.

Procedure

The players were given the inventories during three different sessions. These sessions were preceded by social, but competitive, play. The inventories were completed approximately one week prior to another similar competition. The participants were given the inventories and asked to read the instructions. They were told to complete the inventories to the best of their ability and were reminded that their responses would be kept confidential. They were given the inventories in the following order: TSCI, SSCI, TTSCI, TSSCI.

Results

The TTSCI correlated with the TSCI with a value of .837. These results are summarized in Table 2. The TSSCI correlated with the SSCI with a value of .946. These results are summarized in Table 3.

Discussion

The results indicate that the TTSCI and the TSSCI would be suitable to use in place of the original versions in a future study. It is interesting to note that the SSCI correlated more with its modified counterpart than did the TSCI. This could be due to the fact that when given statements assessing how confident they felt *right now*, the players thought about tennis with both inventories. However, when given a statement assessing how they feel *in general* they might have thought about other sports in which they participate. Even with this difference, the TSSCI and TTSCI are appropriate for use in future studies.

Qualitative Questionnaire

In order to assess what the participants are observing and attending to when they view the modeling video, the following questionnaire was developed.

1. What did you notice about the player's balance?

   _____

2. What did you notice about the player's posture?

   _____

3. What did you notice about the player's contact point?

   _____

4. What did you observe by watching the player?

   _____

To test the effectiveness of the qualitative questionnaire, it was given to four amateur tennis players after they watched the modeling videotape which did not contain verbal cues. There was much variety in the way they answered the questions. The answers to each of the four questions are listed below.

1. Participant #1 “very good footwork”
   Participant #2 “very well balanced; always came back to ready position with proper split step so she could move to shot; shot was under control and thus balanced”
   Participant #3 “She was balanced through her shots.”
   Participant #4 “She was constantly moving-anticipating control; good balance.”
2. Participant #1 “eyes watching the ball; head up; good footwork”
   Participant #2 “I thought it was proper-for example at point of contact because of proper footwork, she was in a good upright position, rather than say having to lean over to reach the ball”
   Participant #3 “Her posture was good.”
   Participant #4 “Good posture-hit into the ball-stepped into the ball. Head was kept down.”
3. Participant #1 “Ball around shoulder (little below) level contact in front”
   Participant #2 “Looked like something from the pros (a lot like Andy Roddick’s shot) low to high-caught ball on rise with a whip action and follow through across the chest (ending high)”
   Participant #3 “She met the ball out in front of her.”
   Participant #4 “Point of contact seemed to be the same.”
4. Participant #1 “Lots of topspin, moving back to position, split step, racquet up, good preparation, good consistency, follow through”
   Participant #2 “Great footwork, good power and control”

Participant #3 “I noticed her feet never stop moving and she kept her eyes on the ball.”

Participant #4 “Split step, follow-through, back to starting position, topspin, across court, down the line, how she gripped the ball, eyes on the ball at all times.”

It was suggested that the qualitative questionnaire would be an effective measure of what the participants are viewing when they watch the model. However, the last item on the questionnaire will become question #1. This will ensure that the participants are not prompted by the other three questions. The final questionnaire can be found in Appendix D. The participants were asked a follow-up question in an interview format to be certain that all responses from the participants were obtained. The interview question can be found in Appendix E.

Procedure

The participants were pre-tested using the tennis skills test to assess their performance on their forehand groundstrokes. They were also given the TSSCI and the TTSCI to assess their confidence levels with regard to their forehand groundstroke.

The participants were randomly assigned to one of two groups. Both groups viewed a modeling videotape which contained a female professional tennis player hitting approximately seven minutes of forehand groundstrokes. The tape contained the same 56-second video clip looped seven times. Group One’s videotape did not contain verbal audio, but only contained the video portion with no verbal cues. Group Two’s videotape contained verbal cues designed to direct the participants’ attention on specific information in the video clip. These cues are listed below:

- Notice the balance of the player—she is completely on-balance when she strikes the ball
- Notice her posture—she is stable from her head to her waist
- Notice her contact point- contact point is consistently in the same place which is slightly in front of the balanced body, in front of the center of gravity

The modeling videotape was constructed using I-Movie. I-Movie easily enables the tape to be put in slow motion and repeated. Both groups viewed their respective modeling videotapes for six sessions. The participants from one of the colleges completed their study in two weeks. The participants from the other college completed their study over a 17-day period, due to weather constraints. The participants from both colleges viewed the tape for six sessions.

Following the viewing of the modeling videotape both groups were post-tested using the qualitative questionnaire, qualitative interview question, tennis skills test, the TSSCI, and the TTSCI.

Data Analysis

To assess the qualitative portion of the study, responses to the questionnaire were analyzed by categorizing the responses and using frequency counts. Trends on responses to the questions were analyzed.

The participants' scores on the TSSCI, the TTSCI, the power meaure, and the performance measure were explained using descriptive statistics.

Limitations of the Design

A limitation of the study is that it did not assess whether or not improvements will be maintained over time. Likewise, it did not test whether confidence levels and performance improvements can be maintained in a competitive match situation. The qualitative portion of the study depends on the accuracy of recall of the athletes. Since this occurred after a two-week period, it is possible that the long-term memory of the athletes might present a limitation. In addition, the study was in a real world setting as opposed to a controlled environment. Therefore, it was impossible to control for some extraneous variables.

CHAPTER 4

Results

The data analysis is divided into three sections. The first will describe the results to the qualitative questionnaire. The responses to the qualitative questionnaire in their entirety can be found in Appendix F. The second section will explain the results to interview question. The responses to the interview question can be found in Appendix G. The third section explains the quantitative analyses.

Qualitative Questionnaire

In order to analyze the qualitative data, percentages of relevant answers to questions 2, 3, and 4 on the questionnaire were calculated. The cued group (Group #1) had more relevant responses than the non-cued group (Group #2) did. The following chart summarizes those data.

	Group 1	Group 2
Question #2	62.5%	0%
Question #3	50%	20%
Question #4	100%	60%

For question 2, the relevant response was defined as “balanced while striking (or hitting) the ball.” For question 3, the relevant response was defined as “stable or straight from head to waist" (also accepted responses which identified posture in terms of bending at the knees and not the back). For question 4, the relevant response was defined as “contact is in front of the body; slightly in front of the center of gravity” or “contact is out in front.”

Themes were examined within each group for question 2, question 3, and question 4. Being balanced while striking the ball was a theme for Group 1 for question 2. For Group 2, eight out of ten participants mentioned that the model was well-balanced or had good balance. None of the participants mentioned that the player had good balance “while striking the ball.”

For question 2, Group 2 seemed to understand that the player was balanced, but did not interpret this in terms of being balanced *while* striking the ball. Some examples of this lack of understanding are: “She always faced back toward the center of the court, getting her balance back that way after a shot” and “she had good balance, yet jumped

after she hit the ball" and "she seemed well-balanced before and after she hit" and "I noticed that the player was balanced, but then her feet came off the ground when she hit with a full body turn." These four statements indicate that these participants do not understand or are unable to articulate the fact that the player is on balance while she strikes the ball.

For question 3, four out of eight participants in Group 1 mentioned that the model was stable (or had good posture) from her head to her waist (or torso). One participant mentioned that the player was "balanced from (her) head to (her) torso." The remaining three participants talked about the model's posture being straight. For Group 2, none of the participants mentioned that her posture was stable from her head to her waist. However, five out of ten participants noted the model's posture in relation to her body with statement such as "bent her knees and kept her eyes on the ball" and 'the player stood up straight and then bent her knees when hitting the ball, rotating her hips." Two of the participants noted that the model was ready for the shot. Two of the participants noted that the player leaned. They stated "she would lean over and then jump" and "leans into the shot-it was a full body experience not just her arms." The remaining participant discussed posture in terms of "not slouching." Two of the participants in Group 2 answered this question in terms of power with the following statements. "She leaned into the shot-it was a full body experience, not just her arms" and "The player stood up straight and then bent her knees when hitting the ball, rotating her hips." While these participants did address posture, they also provided extraneous information by describing how the player obtained power. Addressing ready position is also extraneous information.

For question 4, Group 1 noted that the contact point was slightly in front of the body or slightly in front of the center of gravity. For Group 2, six participants noted that the contact point was "out in front" or "in front of the body." Three participants noted the contact point in terms of the height of the ball with statements such as "she hit it at the top of the ball to get topspin" (incorrect), "she took the ball on the rise" and "the contact point of the ball was when it had reached its peak."

Secondly themes were assessed for question 1 across both groups. One theme that emerged was "footwork." This was evident in responses such as "very consistent in

footwork", "retreats to the middle after hitting the ball", and "moved her feet well." Seven of the eighteen participants mentioned footwork in their response to question 1.

Four out of eight participants in Group 1 mentioned the concepts of balance, posture, and contact point. Five out of ten participants in Group 2 mentioned power of the shot. This was evident by statements such as "she had a lot of power" and "she had very strong shots."

Interview Question

For Group 1, eight out of eight participants had a response to the question. Four out of eight participants mentioned footwork. Two participants noted the follow-through.

For Group 2, six out of ten participants did not have a response to the interview question. The remaining four answers yielded no particular theme. The responses included "She had a lot of power; her shoes squeaked" and "her feet came off the ground on every shot; she came back to the middle on every shot" "it helped with my hitting; I had the chance to think about everything and then put it to use; she did everything that my coach tells us" and "she seemed consistent; she bounced back toward court at an angle toward the ball."

Quantitative Results

Due to an insufficient number of subjects, inferential statistics were not run. Instead descriptive statistics are provided. The results reveal that the means are similar for power, state confidence, and trait confidence. Group 2 had a slightly higher mean for performance. Descriptive statistics are included in the following table.

Table 1

Descriptive Statistics

	Group	Mean	Standard Deviation	N
Performance	1*	13.8125	3.03477	8
	2**	16.1500	4.78452	10
	Total	15.1111	4.16412	18
Power	1	41.5788	9.99959	8
	2	41.6390	7.45556	10
	Total	41.6122	8.40248	18
Trait Confidence	1	5.7988	1.87487	8
	2	5.7380	1.49005	10
	Total	5.7650	1.61981	18
State Confidence	1	5.5350	2.14326	8
	2	5.8910	1.38889	10
	Total	5.7328	1.71634	18

*Cued

**Non-cued

CHAPTER 5

Discussion

The purpose of the present study was to investigate the use of videotaped modeling of a tennis skill with and without verbal cues. Supplementary investigation examined the skill performance and confidence levels of the participants.

Summary of Results

The following results were found in the study:

1. The group that received videotaped modeling with verbal cues (Group 1) observed different concepts than the group that received videotaped modeling without verbal cues (Group 2).
2. The use of videotaped modeling with verbal cues did not improve the performance of collegiate tennis players more than the use of videotaped modeling without verbal cues.
3. The use of videotaped modeling with verbal cues did not improve the confidence of collegiate tennis players more than the use of videotaped modeling without verbal cues.

Qualitative Summary

The results of the present study indicate that the when verbal cues are used in conjunction with videotaped modeling, the players receiving verbal cues observe different concepts than the players who do not receive verbal cues. Players who viewed the modeling videotape without verbal cues responded to a qualitative questionnaire with a variety of responses.

Group 2 did not articulate the concepts of balance, posture, and contact point in the same way that Group 1 did. With regard to balance, Group 2 articulated that the player was balanced, but did not appear to understand that the player was balanced while she hit the ball. On the other hand, Group 1 was able to articulate that the player was balanced while she hit the ball. Group 1 also articulated that the player had good posture or was stable from her head to her waist. The three participants who did not articulate this were very close by answering “it is straight and strong”, “it was straight up and down”, and “straight, slightly forward, balanced.” None of the participants in Group 2 mentioned that the player was stable from her head to her waist. However, 50% of the participants

did mention posture in terms of the body of the player, noting such things as the player bent her knees and not her back. Two participants talked about the player "leaning" into the shot and two participants discussed power in answer to this question.

Everyone in Group 1 articulated the concept of contact point while only 60% of the participants in Group 2 did so. Three participants in Group 2 noted contact point in terms of the ball, rather than in terms of the body of the player and one participant

Themes emerged for both groups on the open-ended question of "what did you notice by observing the player?" A theme for Group 1 was balance, posture, and contact point with 50% of the participants mentioning these themes. For Group 2, a predominant theme was power with 50% of the participants answering in terms of power. A theme present across both groups was footwork.

The responses of Group 2 indicate that they are not always attending to the key concepts of balance, posture, and contact point. In some cases, their responses are incorrect. For example, a participant stated, "she hit it at the top of the ball to get topspin." In many cases, they are correct but are irrelevant to the concept being addressed or they are incomplete. An example of this is when a participant mentioned, "she leaned into the shot-it was a full body experience, not just her arms" (in response to question 3). The participants in Group 2 seemed to best understand the concept of contact point, while are lacking in an understanding of balance and posture. It is important to note the lack of understanding of balance. Frank Early notes how essential balance is. "It is also possible to compensate for certain inadequacies of stroke production. For example, timing may compensate for a lack of speed, or stamina may compensate for a lack of strength. Nothing, however, can compensate for a lack of balance" (Early, 1995, p. 17). Early goes on to discuss the connection between balance and posture. "Keeping your head, shoulder, and hips in a vertical line will help ensure that you are getting down for low balls by flexing your knees; it will also help ensure that you are moving your feet for wide balls instead of simply reaching for them" (Early, 1995, p. 18). Furthermore, contact point could be a concept that is taught more by coaches and instructors than are the concepts of balance and posture.

It is interesting to note that footwork was a dominant theme across both groups. Footwork is an essential concept and is closely related to the concepts of balance,

posture, and contact point. However, footwork was not a concept used in the verbal cues because it is something that it not universal and can vary from player to player.

The responses of the participants in Group 2 confirm John Yandell's thought on players copying the idiosyncrasies of a model's stroke. "Teachers and players who study the strokes of champions often focus on idiosyncrasies rather than the underlying fundamentals. They end up copying things that are irrelevant or even detrimental to their tennis" (Yandell, 1999, p. 25). The participants in Group 2 are not responding in ways that are necessarily detrimental to their game, but are at times mentioning things that are irrelevant. For example, "I noticed that the player was balanced, but then her feet came off the ground when she hit with a full body turn" (in response to question 2) and "she was in a ready position and hit the forehand with an open stance" (in response to question 3) and "she hit it at the top of the ball to get topspin" (in response to question 4).

In conclusion, the results of the qualitative analysis revealed that Group 1 reported seeing different concepts than Group 2 with regard to balance, posture and contact point. In some cases the players were correct with their responses. In most cases, they were incomplete or gave extraneous information. In some cases, they were incorrect with their responses.

Confidence, Power, and Performance

Forehand and Yoder (1973) studied the performance of retarded children on a matching objects test. It was found that the modeling plus verbal condition resulted in fewer errors than the modeling only and no modeling conditions (Forehand & Yoder, 1973). Weiss (1983) found that younger children do better when exposed to a verbal model while older children do equally well when exposed to a verbal or silent model. Weiss and Klint (1987) found improved performance when there was time for verbal rehearsal. Zetou, Tzetzis, Vernadakis, & Kioumourtzoglou (2002) compared the effects of modeling with verbal cues to self-modeling with verbal cues on the learning of setting and serving in volleyball. The modeling group watched a model on videotape while a teacher provided verbal cues about the important concepts of the skill. It was found that the modeling group performed significantly better than the self-modeling group on set skill and set form and serve skill and serve form at the retention test (Zetou et al., 2002).

The means suggest that subjects in Group 1 were unable to implement the verbal cues in the context of this study. This study showed that Group 1 could articulate the concepts of balance, posture, and contact point. However, the present study did not test whether the participants completely understood those concepts enough to be able to implement them. It could be that they (Group 1) were lacking the knowledge necessary to put the concepts into use.

It is possible that simply viewing the model is enough to improve confidence, power, and performance and that the verbal cues do not add anything to this learning. It is possible that the mere novelty of an intervention aided their confidence and performance equally. One participant in Group 2 noted this in her response to the interview question. "It helped with my hitting. I had the chance to think about everything and then put it into use. She did everything that coach tells us." Perhaps the videotape should be viewed for more than six sessions in order to note a significant difference between the two groups.

In addition, the skill level of the players might have affected the degree to which modeling was an effective method of improving their performances. Rothstein and Arnold (1976) note that beginners benefit from verbal cues. "Generally, provided that time is sufficient, intermediates and advanced beginners gain more from videotaped replay than beginners when verbal cues are not provided. Beginners tend to benefit more from videotape replay when verbal cues are added" (Rothstein & Arnold, 1976, p. 40).

Another possibility is that the participants in Group 2 were aided by watching the model perform, with correct form, the skills they needed to improve. For example, participants in Group 2 said "she always faced back toward the center of the court getting her balance back that way after she hit the ball" and "she took small, quick steps and was very balanced. She had the same stance at every hit" in response to the question on balance. In response to the question on posture, some examples are "she was in ready position and hit the forehand with an open stance" and "she leaned into the shot-it was a full body experience, not just her arms" and "the player stood up straight and then bent her knees when hitting the ball, rotating her hips." For the question on contact point some responses included "she took the ball on the rise" and "the contact point of the ball was when it had reached its peak." Because they were not cued, they seemed to personalize the modeling videotape to those things which they might need to improve. Perhaps they

were able to implement these changes as much as Group 1 participants were able to implement the concepts of balance, posture, and contact point. A more noticeable difference between the groups might exist if the participants viewed the model for more than six sessions.

Conclusions

The present study found that the use of videotaped modeling with verbal cues leads to the participants reporting observing different concepts compared with the use of videotaped modeling without verbal cues. This study shows that when tennis coaches use videotaped modeling as a teaching tool, they should give specific verbal cues to assist the players in what concepts to which they should attend, but that this might not lead to more of an improvement in confidence and performance.

Recommendations for Future Research

This exploratory study has shown that videotaped modeling can be a useful teaching tool for collegiate tennis coaches. The present study tested whether the participants could articulate the concepts, not whether they understood them or could implement them. Future research should extend the qualitative questionnaire and interview question to assess if the participants understand how to implement the concepts included in the verbal cues.

References

Adams, J. A. (1990). The changing face of motor learning. *Human Movement Science, 9,* 209-220.

Bandura, A., Ross, D., & Ross, S. A. (1963). Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology, 66,* 3-11.

Bandura, A., Blanchard, E. B., & Ritter, B. (1969). Relative efficacy of desensitization and modeling approaches for inducing behavioral, affective, and attitudinal changes. *Journal of Personality and Social Psychology, 13,* 173-199.

Bandura, A., & Kupers, C. J. (1969). Transmission of patterns of self-reinforcement through modeling. *Journal of Abnormal and Social Psychology, 69,* 1-9.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 2,* 191-215.

Bandura, A. (1986). *Social Foundations of Thought and Action.* Prentice-Hall: Englewood Cliffs, NJ.

Bouchard, L., J. & Singer, R.N. (1998). Effects of the five-step strategy with videotape modeling on performance of the tennis serve. *Perceptual and Motor Skills, 86,* 739-746.

Braden, V. & Bruns, B. (1998). *Tennis 2000: Strokes, Strategy, and Psychology for a Lifetime.* Little Brown and Company: Boston, MA.

Bradley, R. D. (1993). The use of goal-setting and positive self-modeling to enhance self-efficacy and performance for the basketball free-throw shot (Doctoral Dissertation, University of Maryland, 1993). *Dissertation Abstracts International, 54,* 1723.

Braver, S. L., & Barnett, B. (1976). Effects of modeling on cooperation in a prisoner's dilemma game. *Journal of Personality and Social Psychology, 33,* 161-169.

Bray, M.A., & Kehle, T.J. (1998). Self-modeling as an intervention for stuttering. *School Psychology Review, 27*, 587-598.

Bray, M.A., & Kehle, T. J. (2001). Long-term follow-up of self-modeling as an intervention for stuttering. *School Psychology Review, 30,* 135-141.

Carroll, W. R., & Bandura, A. (1985). Role of timing of visual monitoring and motor rehearsal in observational learning of action patterns. *Journal of Motor Behavior, 17*, 269-281.

Carroll, W. R., & Bandura, A. (1987). Translating cognition into action: The role of visual guidance in observational learning. *Journal of Motor Behavior, 19,* 385-398.

Carroll, W. R., & Bandura, A. (1990). Representational guidance of action production in observational learning: A causal analysis. *Journal of Motor Behavior, 22*, 85-97.

Donahue, M., & Bryan, T. (1983). Conversational skills and modeling in learning disabled boys. *Applied Psycholinguistics, 4,* 251-278.

Dowrick, P. W. (1999). A review of self-modeling and related interventions. *Applied and Preventive Psychology, 8,* 23-39.

Dowrick, P.W., & Dove, C. (1980). The use of self-modeling to improve the swimming performance of spina bifida children. *Journal of Applied Behavior Analysis, 13,* 51-56.

Dowrick, P.W., & Raeburn, J. M. (1995). Self-modeling: Rapid skill training for children with physical disabilities. *Journal of Developmental and Physical Disabilities, 7,* 25-37.

Early, F. (1995).Tennis strokes that win: Breakthrough techniques for mastering the game. Contemporary Books: Chicago, IL.

Espin, C.A., & Deno, S.L. (1989). The effects of modeling and prompting feedback strategies on sight word reading of students labeled learning disabled. *Education and Treatment of Children, 12*, 219-231.

Feltz, D. L. (1982). The effects of age and number of demonstrations on modeling of form and performance. *Research Quarterly for Exercise and Sport, 53,* 291-296.

Feltz, D.L, & Chase, M.A. (1998). The measurement of self-efficacy and confidence in sport. In J.L. Duda (Ed.), *Advances in Sport and Exercise Psychology Measurement* (pp. 65-80). Morgantown, WV: Fitness Information Technology.

Fery, Y.A., & Morizot, P. (2000). Kinesthetic and visual image in modeling closed motor skills: The example of the tennis serve. *Perceptual and Motor Skills, 90,* 707-722.

Forehand, R., & Yoder, P. (1973). The effects of modeling and verbal cues on learning of retardates. *Journal of Clinical Psychology, 29,* 184-186.

Froehle, T.C., Robinson, S. E., & Kurpius, D. J. (1983). Enhancing the effects of modeling through role-play practice. *Counselor Education and Supervision, 22,* 197-206.

Gayton, W. F. & Nickless, C. J. (1987). An investigation of the validity of the trait and state sport-confidence inventories in predicting marathon performance. *Perceptual and Motor Skills, 65,* 481-482.

General characteristics of NTRP playing levels – abbreviated. Retrieved on October 31, 2003 from http://www.midatlantic.usta.com/adultsseniors/custom.sps?iType=1524&icustompageid=3055

Gold, G. L. (1989). Achievement Orientation, self-confidence, and attributions of female collegiate tennis players: a case study (Doctoral Dissertation, University of North Carolina Greensboro, 1989). *Dissertation Abstracts International, 51,* 1546.

Gould, D., Damarjian, N., & Medbery, R. (1999). An examination of mental skills training in junior tennis coaches. *The Sport Psychologist, 13,* 127-143.

Gray, S. W. (1990). Effect of visuomotor rehearsal with videotaped modeling on racquetball performance of beginning players. *Perceptual and Motor Skills, 70,* 379-385.

Gray, S. W., & Fernandez, S. J. (1989). Effects of visuo-motor behavior rehearsal with videotaped modeling on basketball shooting performance. *Psychology: A Journal of Human Behavior, 26,* 41-47.

Greeson, L.E. (1986). Modeling and mental imagery use by multiply handicapped and learning disabled preschool children. *Psychology in the Schools, 23,* 82-87.

Groppel, J. (1992). *High Tech Tennis*. Leisure Press: Champaign, IL.

Hall, E. G., & Erffmeyer, E. S. (1983). The effect of visuo-motor behavior rehearsal with videotaped modeling on free throw accuracy of intercollegiate female basketball players. *Journal of Sport Psychology, 5,* 343-346.

Harter, S. (1978). Effectance motivation reconsidered. *Human Development, 21,* 34-64.

Henley, P.T. (2001). Effects of modeling and tempo patterns as practice techniques on the performance of high school instrumentalists. *Journal of Research in Music Education, 49,* 169-180.

Hensley, L. (Ed.). (1989). *Tennis for boys and girls skills test manual.* Reston, VA: American Alliance for Health, Physical Education, Recreation, and Dance.

Hewitt, J.E. (1966). Hewitt's tennis achievement test. *The Research Quarterly, 37,* 231-240.

Hewitt, M.P. (2001). The effects of modeling, self-evaluation, self-listening on junior high instrumentalists' music performance and practice attitude. *Journal of Research in Music Education, 49,* 307-322.

Ironsmith. M., & Whitehurst, G.J. (1978). How children learn to listen: The effects of modeling feedback styles of children's performance in referential communication. *Developmental Psychology, 14,* 546-554.

Johnson, J.D., Xanthos, P.J., & Lebedeff, A. V. (2003). *Tennis*. McGraw Hill: Boston, MA.

Kriese, C. (1997). *Coaching tennis*. Master's Press: Indianapolis, IN.

Knapczyk, D. (1991). Effects of modeling in prompting generalization of student question asking and question answering. *Learning Disabilities Research and Practice, 6,* 75-82.

LeJeune, M., Decker, C., & Sanchez, X. (1994). Mental rehearsal in table tennis performance. *Perceptual and Motor Skills, 79*, 627-641.

Maderino, M.A., & Bzdek, V. M. (1984). Effects of modeling and information on reactions to pain: A childbirth-preparation analogue. *Nursing Research, 33,* 9-14.

Magill, R. A. (1993). Modeling and verbal feedback influences on skill learning. *International Journal of Sport Psychology, 24,* 358-369.

Martin, J. J. & Gill, D. L. (1991). The relationships among competitive orientation, sport-confidence, self-efficacy, anxiety, and performance. *Journal of Sport and Exercise Psychology, 13,* 149-159.

Martin, J. J. & Gill, D. L. (1995). Competitive orientation, self-efficacy, and goal importance in Filipino marathoners. *International Journal of Sport Psychology, 26,* 348-358.

McGuire, D., & Thelen, M.H. (1983). Modeling, assertion training, and the breadth of the target assertive behavior. *Behavior Therapy, 14,* 275-285.

McCullagh, P. & Weiss, M.R. (2001). Modeling: Considerations for motor skill performance and psychological responses. In R. N. Singer, H.A. Hausenblas & C.M. Janelle (Eds.), *Handbook for sport psychology* (pp. 205-238). New York: Wiley & Sons.

McCullagh, P. & Weiss, M.R. (2002). Observational learning: The forgotten psychological method in sport psychology. In J. L. Van Raalte & B.W. Brewer (Eds.), *Exploring sport and exercise psychology* (p. 131-149). Washington, D. C.: American Psychological Association.

Melody, D. W. (1990). The influence of self-modeling on free-throw shooting (Doctoral Dissertation, University of Connecticut, 1990). *Dissertation Abstracts International, 52,* 478.

Moritz, S. E., Hall, C. R., Martin, K. A., & Vadocz, E. (1996). What are confident athletes imaging? An examination of image content. *The Sport Psychologist, 10,* 171-179.

Possell, L. E., Kehle, T.J., Mcloughlin, C.S., & Bray, M.A. (1999). Self-modeling as an intervention to reduce disruptive classroom behavior. *Cognitive and Behavioral Practice, 6,* 99-105.

Reamer, R.B., Brady, M.P., & Hawkins, J. (1998). The effects of video self-modeling on parent's interactions with children with developmental disabilities. *Education and Training in Mental Retardation, 33,* 131-143.

Riolo, L. (1997). Effects of modeling errors on the acquisition and retention of sterile hand washing task. *Perceptual and Motor Skills, 84,* 19-26.

Rothstein, A.L. & Arnold, R.K. (1976). Bridging the Gap: Application of research on videotape feedback and bowling. *Motor Skills: Theory Into Practice, 1,* 35-62.

Rushton, J.P. (1975). Generosity in children: Immediate and long-term effects of modeling, preaching, and moral judgment. *Journal of Personality and Social Psychology, 31,* 459-466.

Rushton, J. P., & Littlefield, C. (1979). The effects of age, amount of modeling, and a success experience on seven-to eleven-year-old children's generosity. *Journal of Moral Education, 9*, 55-56.

Savis, J.C. (1996). State Self-confidence, mood states, and sleep perceptions of collegiate tennis players: Toward theory development (Doctoral Dissertation, University of Virginia, 1995). *Dissertation Abstracts International, 56*, 3514.

Schonborn, R. (1999). *Advanced Techniques for Competitive Tennis*. Meyer & Meyer Sport: Verlag, Aachen.

Scraba, P.J. (1989) Self-modeling for teaching swimming to persons with physical disabilities (Doctoral Dissertation, University of Connecticut, 1989). *Dissertation Abstracts International, 50,* 2830.

Shaw, D. W., & Thoresen, C.E. (1974). Effects of modeling and desensitization in reducing dentist phobia. *Journal of Counseling Psychology, 21,* 415-420.

Short, S. E. & Vadocz, E. A. (2002). Testing the modifiability of the state sport confidence inventory. *Perceptual and Motor Skills, 94,* 1025-1028.

Silby, C. J. (1995). Differences in sport-confidence among elite athletes (Doctoral Dissertation, University of Virginia, 1994). *Dissertation Abstracts International, 55,* 3145.

Starek, J., & McCullagh, P. (1999). The effect of self-modeling on the performance of beginning swimmers. *The Sport Psychologist, 13,* 269-287.

United States Tennis Association (1995). Woods, R. Hoctor, M., Desmond, R., *Coaching Tennis Successfully.* Human Kinetics: Champaign, IL.

Vealey, R.S. (1986). Conceptualization of sport-confidence and competitive orientation: Preliminary investigation and instrument development. *Journal of Sport Psychology, 8,* 221-246.

Vealey, R.S. (1988). Sport-confidence and competitive orientation: An addendum on scoring procedures and gender differences. *Journal of Sport and Exercise Psychology, 10,* 471-478.

Vealey, R. S. (1994). Current status and prominent issues in sport psychology interventions. *Medicine and Science in Sports and Exercise, 26,* 495-502.

Vealey, R. S., Hayashi, S.W., Garner-Holman, M. & P. Giacobbi (1998). Sources of sport-confidence: Conceptualization and Instrument Development. *Journal of Sport and Exercise Psychology, 20,* 54-80.

Walter, G. A. (1975). Acted versus natural models got performance-oriented behavior change in task groups. *Journal of Applied Psychology, 60,* 303-307.

Wegner, O. (1992). *You can play tennis in 2 hours.* Thomas Nelson Publishers: Nashville, TN.

Weinberg, R ,Grove, R. , & Jackson, A. (1992). Strategies for building self-efficacy in tennis players: A comparative analysis of Australian and American coaches. *The Sport Psychologist, 6,* 3-13.

Weinberg, R., & Jackson, A. (1990). Building self-efficacy in tennis players: A coach's perspective. *Applied Sport Psychology, 2*, 164-174.

Weiss, M. R. (1983). Modeling and motor performance: A developmental perspective. *Research Quarterly for Exercise and Sport, 54,* 190-197.

Weiss, M.R., & Klint, K.A. (1987). Show and tell in the gymnasium. *Research Quarterly for Exercise and Sport, 58,* 234-241.

What's the difference between Divisions I, II and III? retrieved from http://www.ncaa.org/ on February 19, 2004.

Yandell, J. (1999). *Visual tennis*. Human Kinetics: Champaign, IL.

Zetou, E., Tzetzis, G., Vernadakis, N., E. Kioumourtzoglou (2002). Modeling in learning two volleyball skills. *Perceptual and Motor Skills, 94,* 1131-1142.

Appendix A

Informed Consent

Title of Project Videotaped Modeling

Investigator Amy Rowland

Faculty Advisor Dr. Richard Stratton

Purpose of this Research

The purpose of this research is to investigate the use of videotaped modeling of a tennis skill with and without verbal cues. Supplementary investigation will examine the skill performance and confidence levels of the participants. There will be approximately thirty subjects from three collegiate varsity tennis teams.

Procedures

The study will begin with an on-court tennis skills pre-test. You will be asked to hit three forehand groundstrokes for practice fed to you by a ball machine followed by twenty forehand groundstrokes. You will be asked to hit these twenty forehands to a crosscourt target zone. You will be awarded points based on where your shot lands. The power of your shot will be tested using a speed gun. You will then be given two confidence inventories which require you to rate your agreement with thirteen statements.

The actual modeling intervention will take place during six sessions over two weeks. During each session, you will watch a modeling videotape which will last approximately seven minutes. Following the six sessions, you will be post-tested on the tennis skills test and the confidence measures. You will also be given a questionnaire which contains four questions. Following the questionnaire, you will be asked to meet with the researcher for a brief interview to clarify your responses on the questionnaire. The entire study will take two weeks. The pre-test will take approximately twenty minutes. The modeling sessions will last seven minutes. The post-test will take approximately twenty-five minutes.

Risks

There are minimal risks associated with this study. The on-court testing has the most potential for injury, although it is no more harmful than a regular tennis practice. These risks include ankle sprains from possible falls, elbow or shoulder dislocation, general muscle strain in the shoulder and arm area. The researcher is certified in first aid and CPR. In addition a certified athletic trainer will be on-call should an injury occur. Neither the researcher nor Virginia Polytechnic Institute and State University shall be financially responsible for medical treatment should an injury occur during the on-court testing.

Benefits
Although benefits cannot be guaranteed, it is possible that this study might help to explain the role modeling can play in the teaching/coaching of female collegiate tennis players.

Extent of Confidentiality
At the beginning of the study, you will be assigned a number. This number will identify you for the pre-test and the post-test. This will ensure your participation remains confidential.

Freedom to Withdraw
You are free to withdraw from this study at any time. You are also free to not answer any question that you do not wish to answer. Participation in, non-participation, or withdrawal from this study will in no way affect your status on the tennis team.

Subject's Responsibilities
The subjects are responsible for stretching prior to the on-court testing.

Subject's Permission
I have read and understand the Informed Consent and conditions of the project. I have had all of my questions answer. I hereby acknowledge the above and give my voluntary consent.

_____ _____

Subject Signature Date

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Amy Rowland *Investigator*	434-947-8540 arowland@rmwc.edu
Dr. Richard Stratton *Faculty Advisor*	540-231-5617 rstratto@vt.edu
Human Subjects Committee Chair at R-MWC, SBC, or LC	Phone Number E-Mail
Dr. David M. Moore *Departmental Reviewer/Dept. Head*	540-231-4991 moored@vt.edu

This Informed Consent form is valid 3/15/04 to 5/15/04.

Appendix B

Trait Sport Confidence Inventory

Think about how self-confident you are when you compete in sport.

Answer the questions below based on how confident you *generally feel* when you compete in your sport. Compare your self-confidence to the *most self-confident athlete* you know.

Please answer as you *really* feel, not how you would like to feel. Your answers will be kept completely confidential.

When you compete, how confident do you *generally feel*? (circle number)

1. Compare your confidence *in your ability to execute the skills necessary to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

2. Compare your confidence *in your ability to make critical decisions during competition* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

3. Compare your confidence *in your ability to perform under pressure* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

4. Compare your confidence *in your ability to execute successful strategy* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

5. Compare your confidence *in your ability to concentrate well enough to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

6. Compare your *confidence in your ability to adapt to different game situations and still be successful* to the confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

7. Compare your confidence *in your ability to achieve your competitive goals* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

8. Compare your confidence *in your ability to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

9. Compare your confidence *in your ability to consistently be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

10. Compare your confidence *in your ability to think and respond successfully during competition* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

11. Compare your confidence *in your ability to meet the challenge of competition* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

12. Compare your confidence *in your ability to be successful even when the odds are against you* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

13. Compare your confidence *in your ability to bounce back from performing poorly and be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

State Sport Confidence Inventory

Think about how confident you feel *right now* about performing successfully in the upcoming competition.

Answer the questions below based on how confident you feel *right now* about competing in the upcoming contest. Compare your self-confidence to the *most self-confident athlete* you know.

Please answer as you *really* feel, not how you would like to feel. Your answers will be kept completely confidential.

How confident are you *right now* about competing in the upcoming contest? (circle number)

1. Compare the confidence you feel right now *in your ability to execute the skills necessary to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

2. Compare the confidence you feel right *now in your ability to make critical decisions during competition* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

3. Compare the confidence you feel right now *in your ability to perform under pressure* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

4. Compare the confidence you feel right now *in your ability to execute successful strategy* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

5. Compare the confidence you feel right now in your ability *to concentrate well enough to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

6. Compare the confidence you feel right now *in your ability to adapt to different competitive situations and still be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

7. Compare the confidence you feel right now *in your ability to achieve your competitive goals* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

8. Compare the confidence you feel right now *in your ability to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

9. Compare the confidence you feel right now *in your ability to think and respond successfully during competition* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

10. Compare the confidence you feel right now *in your ability to meet the challenge of competition* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

11. Compare the confidence you feel right now *in your ability to be successful based on your preparation for this event* to the most confident athlete you know

Low			Medium				High	
1	2	3	4	5	6	7	8	9

12. Compare the confidence you feel right now *in your ability to perform consistently enough to be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

13. Compare the confidence you feel right now *in your ability to bounce back from performing poorly and be successful* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

Appendix C

Tennis Trait Sport Confidence Inventory

Think about how self-confident you are when you compete in tennis.

Answer the questions below based on how confident you *generally feel* when you compete in tennis. Compare your self-confidence to the *most self-confident tennis player* you know. Please answer as you *really* feel, not how you would like to feel. Your answers will be kept completely confidential.

When you compete, how confident do you *generally feel*? (circle number)

1. Compare your confidence *in your ability to execute the skills necessary to be successful in tennis* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

2. Compare your confidence *in your ability to make critical decisions during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

3. Compare your confidence *in your ability to perform under pressure during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

4. Compare your confidence *in your ability to execute successful strategy during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

5. Compare your confidence *in your ability to concentrate well enough to be successful in a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

6. Compare your confidence *in your ability to adapt to different game situations in tennis and still be successful* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

7. Compare your confidence *in your ability to achieve your competitive goals* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

8. Compare your confidence *in your ability to be successful in tennis* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

9. Compare your confidence *in your ability to consistently be successful* in tennis to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

10. Compare your confidence *in your ability to think and respond successfully during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

11. Compare your *confidence in your ability to meet the challenge of a tennis competition* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

12. Compare your confidence *in your ability to be successful even when the odds are against you* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

13. Compare your confidence *in your ability to bounce back from performing poorly and be successful* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

Tennis State Sport Confidence Inventory

Think about how confident you feel *right now* about performing successfully in the upcoming match.

Answer the questions below based on how confident you feel *right now* about competing in the upcoming contest. Compare your self-confidence to the *most self-confident tennis player* you know.

Please answer as you *really* feel, not how you would like to feel. Your answers will be kept completely confidential.

How confident are you *right now* about competing in the upcoming contest? (circle number)

1. Compare the confidence you feel right now *in your ability to execute the skills necessary to be successful in te*nnis to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

2. Compare the confidence you feel right now *in your ability to make critical decisions during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

3. Compare the confidence you feel right now *in your ability to perform under pressure during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

4. Compare the confidence you feel right now *in your ability to execute successful strategy in a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

5. Compare the confidence you feel right now *in your ability to concentrate well enough to be successful in a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

6. Compare the confidence you feel right now *in your ability to adapt to different competitive situations in tennis and still be successful* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

7. Compare the confidence you feel right now *in your ability to achieve your competitive goals* to the most confident athlete you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

8. Compare the confidence you feel right now *in your ability to be successful in tennis* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

9. Compare the confidence you feel right now *in your ability to think and respond successfully during a tennis match* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

10. Compare the confidence you feel right now *in your ability to meet the challenge of a tennis competition* to the most confident tennis player you know.

Low			Medium				High	
1	2	3	4	5	6	7	8	9

11. Compare the confidence you feel right now *in your ability to be successful based on your preparation for this event* to the most confident tennis player you know

Low			Medium				High	
1	2	3	4	5	6	7	8	9

12. Compare the confidence you feel right now *in your ability to perform consistently enough to be successful* to the most confident tennis player you know.

Low			Medium				High	

1 2 3 4 5 6 7 8 9

13. Compare the confidence you feel right now *in your ability to bounce back from performing poorly and be successful* to the most confident tennis player you know.

Low Medium High
1 2 3 4 5 6 7 8 9

Appendix D

Follow-Up Questionnaire

1. What did you observe by watching the player?

   _____

2. What did you notice about the player's balance?

   _____

3. What did you notice about the player's posture?

   _____

4. What did you notice about the player's contact point?

   _____

Appendix E

Follow-Up Interview Question

1. Is there anything else that you observed by watching the modeling videotape?

Appendix F

Group #1

Question #1

- The player hit off her back foot instead of stepping in
- Her balance, contact point, and posture
- Her footwork and her posture and where she hit the ball
- Balance of player when hitting the ball posture (stood straight) from head to waist consistently hitting the ball slightly in front of the player, in front of her center of gravity
- She is balanced, centered, and able to make solid contact with the ball and move laterally because of her posture. Her strokes and posture are consistent.
- Hitting a forehand, balance, contact point, and posture
- Very consistent in footwork, stroke, balance, going back to the middle
- Her balanced body, completely on posture when she strikes the ball, contact point slightly in front of her body, split steps, retreats to the middle of the court after hitting the ball, follows through over her shoulder

Question #2

- Balanced from head to torso; always balanced when striking the ball
- She was on balance
- It was perfect, able to move back and forth without stumbling
- She was on balance every time she hit the ball
- She is balanced completely through her torso
- She was balanced while striking the ball
- On balance at all times even when hitting the ball
- Completely on balance when she strikes the ball

Question #3

- Balanced from head to torso
- The player's posture was stable from her head to her waist
- It was straight up and down; good posture
- She had a straight posture from head to waist
- It is straight and strong
- She is perfectly straight from head to waist
- Straight, slightly forward, balanced
- On posture from her head to her waist

Question #4

- Always slightly in front of the center of gravity
- Contact point was out in front, at the center of gravity of the player as well as her center of balance
- It was in front of the balanced body, slightly in front of the center of gravity
- Same spot in relation to body every time; consistently in front of the player (slightly), in front of the center of gravity
- It's slightly in front of the balanced body
- Slightly in front of her center of gravity
- Slightly forward of her body around her upper thigh
- Slightly in front of her balanced body, in front of her center of gravity

Group #2

Question #1

- Her consistency with footwork and her stroke
- That she moved her feet to the ball and returned to the middle after every shot
- She moved her feet, took the ball on the rise, and leaned into the ball
- She seemed very good and consistency but looked like she had a bit of an open stance when she hit
- That she had a lot of power and was consistent; she also went diagonal to the ball and moved her feet well
- She hit forehands with a loop swing, had good body rotation; she hit the ball really hard
- She had a lot of power and was able to hit the ball with a lot of control
- She hit very strong shots, but they weren't always low to high and you could hear that they didn't always make it over the net
- I observed the player hitting forehands and I really noticed how much she rotated her body through the shots
- Hits ball with confidence; hits ball hard

Question #2

- Solid, always on her toes though
- She was well-balanced and stepped in to hit the ball instead of leaning backwards
- She had good balance and wasn't falling all over the place
- She always faced back toward the center of the court, getting her balance back that way after hitting a shot
- She had good balance, yet jumped after she hit the ball
- She seemed well-balanced before and after she hit
- She took small, quick steps, and was very balanced. She had the same stance at every hit.

- It was very good. Lots of use of the split-step to regain balance if it was ever lost.
- I noticed that the player was balanced, but then her feet came off the ground when she hit with a full body turn.
- Well-balanced

Question #3

- Upright and leans into the ball
- She bent her knees and not her back to get low balls
- She had very nice form and was not slouching
- She had good posture, bent her knees and kept her eyes on the ball.
- She had good posture, and when she hit the ball she would lean over and then jump
- She was in a ready position and hit the forehand with an open stance
- She was upright. She bent at her knees and not at her back.
- She leaned into the shot-it was a full body experience not just her arms
- The player stood up straight and then bent her knees when hitting the ball, rotating her hips
- Good posture; ready for each ball

Question #4

- She hits the ball out in front her body
- She hit it at the top of the ball to get topspin
- She took the ball on the rise
- It seemed to be just in front of her; just about the right spot
- The contact point was always out in front and in the center of the racquet
- It was out in front and about thigh height
- The player's contact point was to her forehand side and just in front of her body
- It was very consistent
- The contact point of the ball was when it had reached its peak.
- In front of the body; correct mechanically.

Appendix G

Group #1 Interview Question

- Footwork and everything; I could hear and see it (footwork)
- Sounds; technique the way she was hitting; balance, posture, contact point; footwork and getting to the ball
- Looked like she moved to side and hit off of back foot instead of stepping in; hit off of wrong foot on last shot; moving feet, shuffling, split-step
- Follow-through; consistent; only forehands; looked down the line or maybe crosscourt
- She looked like she had been practicing a long time because of the amount of sweat; the courts were really good; she followed the ball; she always looked to see the ball; everything was done perfectly
- Her power is not all in her arm; she used her body as well;
- She had a red hat, blue shirt etc.; there was a house in the background; I noticed the slow-mo effect
- She used the split-step; she retreated to the middle of the court every time; she followed through over her shoulder and used the side shuffle

Group #2

- She had a lot of power; her shoes squeaked
- No, I don't think so
- Her feet came off the ground on every shot; she came back to the middle on every shot
- No, everything is on the sheet
- No, nothing else
- It helped with my hitting; I had the chance to think about everything and then put it to use; she did everything that coach tells us
- I don't think so
- No

- No
- She seemed consistent; she bounced back toward court at an angle toward the ball

Table 2

Correlations

		TRAIT	TENNISTR
TRAIT	Pearson Correlation	1	.837(**)
	Sig. (2-tailed)	.	.000
	N	14	14
TENNISTR	Pearson Correlation	.837(**)	1
	Sig. (2-tailed)	.000	.
	N	14	15

** Correlation is significant at the 0.01 level (2-tailed).

Table 3

Correlations

		STATE	TENNISST
STATE	Pearson Correlation	1	.946(**)
	Sig. (2-tailed)	.	.000
	N	15	15
TENNISST	Pearson Correlation	.946(**)	1
	Sig. (2-tailed)	.000	.
	N	15	15

** Correlation is significant at the 0.01 level (2-tailed).

Curriculum Vitae

Amy L. Rowland was born in Kettering, Ohio on August 14, 1975. She graduated from Centerville High School in 1993. She received the Bachelor of Arts degree in Psychology from Kenyon College (Ohio) in 1997. She received the Master of Science degree in Exercise and Sport Studies from Smith College in 1999. She is currently completing the requirements for the degree of Doctor in Philosophy in Curriculum and Instruction with a concentration in Health Promotion from Virginia Polytechnic Institute and State University. She has accepted a position at John Jay College of Criminal Justice (New York) as Instructor of Physical Education.