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Counterfactual Feedback and Tennis

G. Beth Birky

G. Beth Birky

Candidate

Health, Exercise and Sports Sciences

Department

This dissertation is approved, and it is acceptable in quality and form for publication:

Approved by the Dissertation Committee:

Gloria Napper-Owen, Ed.D. , Chairperson

Glenn Hushman, Ph.D.

John Barnes, Ph.D.

Cathy Tingstrom, Ph.D.

COUNTERFACTUAL FEEDBACK AND TENNIS

by

G. BETH BIRKY

B.S. Physical Education, Eastern Mennonite University, 1989
M.S., Physical Education, Florida State University, 1996

DISSERTATION

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DEDICATION

This production is dedicated to my parents. My parents, who have initially taught me the value of education by their life example of being dedicated teachers, following with continual support through my educational foray, financial support in my undergrad, emotional support during my masterôs, and mental support during my doctorate. My mom and dad are the best examples of perseverance and dedication toward family, friends, and strangers alike.

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BY

G. Beth Birky

B.S. PHYSICAL EDUCATION, EASTERN MENNONITE UNIVERSITY, 1998

M.S. PHYSICAL EDUCATION, SPORTS ADMINISTRATION, FLORIDA STATE UNIVERSITY, 1996

Ph.D. PHYSICAL EDUCATION, SPORTS AND EXERCISE SCIENCE, UNIVERSITY OF NEW MEXICO, 2014

ABSTRACT

Physical education teachers must consider the most effective way to deliver instruction and feedback for maximum student learning. Counterfactual feedback assists in engaging visual (internal) and auditory augmented feedback in order to create an optimal learning environment, which will produce the highest skill level in the shortest time possible (Sigrist, et al, 2011). Counterfactual feedback promotes critical thinking as it applies to the performance of a skill. Critical thinking is linked to better decision-making, reasoning, problem-solving, and reflective judgment in individuals (Lodewyck, 2009). Counterfactual feedback relies on the teacher asking a directed question as feedback after a skill performance or after a series of practice attempts. The question should engage the studentôs critical thinking about the specifics of the skill. As the student considers the answer to the question, the feedback information gained from connecting the counterfactual feedback to the

intended behavior will allow the student to manipulate or adjust the next performance (Epstude & Roese, 2010). The choice to alter and evaluate the subsequent performance gives the student more control and autonomy which will increase intrinsic motivation to continue the activity.

The multiple case study methodology was used with beginning participants. Beginning tennis skills were taught to each of the participants in a one-on-one practice sessions, two times a week for eight weeks. Journal entries, in-depth interviews, researcher observations, and video recordings were used for primary data collection. Data was thoroughly analyzed by initially coding the within case studies, discovering the common themes permeating the responses by each participant. Secondly, commonalities were explored through cross-case analysis by comparing interview answers of the same questions posed to the participants.

Results indicated increased self-efficacy, improved critical thinking, and enhanced participantsô perception of their ability in tennis. These findings demonstrated the use of counterfactual feedback as a way to increase self-efficacy, critical thinking, and personal perceptions for beginning tennis players. Outcomes from this study will assist physical educators and coaches in acquiring another option for feedback delivery when teaching beginning tennis players.

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CHAPTER ONE

Physical Education as a content area strives to impact four different domains of learning. These domains include the psychomotor domain, the cognitive domain, the health-related fitness domain, and the affective domain. As physical education teachers implement the daily curriculum, their lesson plans indicate student-learning objectives that align all instructional activities and assessment for the dayôs lesson. Physical education teachers then determine the specific instructional activities to be taught within a lesson leading to student skill acquisition, knowledge growth, fitness enhancement, as well as development of beliefs and attitudes of the worth of regular physical activity. Throughout the planning cycle, teachers must also consider the most effective way to deliver instruction and dispense feedback for maximum student learning.

To assist the physical educator in planning for delivery of instruction, Mosston and Ashworth (1990) developed a Spectrum of Teaching Styles progressing from teacher-centered instruction to student-centered instruction. The Spectrum of Teaching Styles for physical education encourages the physical education teacher to choose the appropriate engagement of students in their learning based on outcomes intended for the daily lesson. The most direct, teacher-centered style of teaching, command style, requires the teacher to make nearly all decisions in the planning, delivery, and assessment stages of a lesson. The most indirect, student-centered style of teaching, learner-initiated, enables students to have maximum responsibility for planning, learning, and assessment of learning (Ashworth, 2010). Byra (2006) indicated students are more likely to learn specific content when direct, teacher-centered instruction is used. However, use of indirect, student-centered instruction

may lead to the development of cognitive objectives (Rink, 2012), inquiry skills (Byra, 2006) and more meaningful learning.

Dever and Karabenick (2011) correlated teaching styles and learner comprehension, as well as teaching styles and retention of information. Retention of information and application of knowledge is a goal for all physical education programs so individuals progress to becoming skillful, life-long movers. Because indirect teaching styles enhance inquiry skills of learners, these individuals are more successful in the utilization of critical thinking to transfer and apply cognitive concepts and principles from one movement situation to another. Critical thinking is linked to better decision-making, reasoning, problem-solving, and reflective judgment in individuals (Lodewyck, 2009). Developing critical thinking is significant in promoting studentsô application of concepts and skills learned in physical education class.

Critical Thinking

Critical thinking has been defined as the ability to assess a situation and apply the correct information available to support, adjust, or dispute an argument, behavior, or skill (Hughes, 2000; White, 2010). Rote memorization, content knowledge of details, and recall of basic facts are not higher-order thinking, but these skills can be improved as a result of increased critical thinking. Analysis, decision-making, understanding, and evaluation are just a few of the skills necessary for critical thinking to occur. Advantages of increased critical thinking skills can include intellectual self-respect, protection of one's own interests, reduced likeliness of being misled, and an increased ability to persuade others to our way of thinking (Hughes, 2000).

The development of critical thinking skills during regular instruction is a well-researched topic. Learning opportunities encouraging students to engage in critical thinking may be implemented in content lessons through immersion in all aspects of learning activities (Barnett & Francis, 2012). As teachers plan, instruct, provide feedback and evaluate attainment of learning outcomes, they may be mindful of the strategies used to engage students in critical thinking. The infusion of methodologies into learning opportunities engaging students in critical thinking, such as problem-based learning (PBL) and counterfactual questioning increases the probability of students developing critical thinking skills (Kowalczyk, 2011).

Feedback

Teacher feedback is the most common way research has described the process an instructor uses to deliver a response to students during instruction. Feedback in teaching is a well researched subject. Different dimensions of feedback, characteristics of feedback, and content of feedback are areas that have been examined multiple times with diverse methods (Nicaise, et al, 2006; Nicaise, et al, 2007; Silverman, 1994). Feedback frequency is one of the most common areas researched. Siedentop (1991) indicates a reasonable frequency in delivering feedback can be 30-60 statements during a 30 minute class. Statements can be specific, general, directional, relevant, and instructional depending on the context that is required.

How feedback relates to achievement in students is a controversial discussion. There is a contingent of believers that higher frequency of delivered feedback during instruction, particularly positive feedback, will produce greater student learning (Silverman, 1992). Due to this contention many PETE (Physical Education Teacher Education) programs began to

encourage students to practice delivering additional feedback when instructing and delivering at a higher rate. Silverman, Tyson, and Krampitz (1992) found a non-significant relationship between amount of feedback and achievement by students. Yerg (1981) reported a decrease in the final performance when an excess of feedback was provided to students during instruction. More recent research on feedback has shown that it is a significant benefit to learning under certain situations (Hamada, 2013; Huescar & Moreno-Murcia, 2012; Koka, 2010; Sigrist, et al, 2011).

Due to the difference in the learning process for motor skills as compared to classroom concepts, teaching complex motor skills requires distinct observations and decisions to be made by the instructor. Silverman, Tyson, and Krampitz (1992) warn against generalizing feedback research results from motor learning laboratories or from classroom situations to the development of movement skills. Organizational arrangements, experience, self-image, and complex social settings are just a few issues for instructors to take into consideration when contemplating motor skill instruction.

Assertions about feedback effects on long-term learning versus practice situations still need further research in order to establish a firm conclusion. Feedback is generally accepted as a preferred method to modify practice opportunities which allows more appropriate learning situations for individual students (Lee, Keh, & Magill, 1993). Simple or complex movement skill learning requires the instructor to be cognizant of the best ways to present new information to the student, as well as the diverse means of delivering feedback.

Counterfactual Thinking

Counterfactual thinking (CT), defined as mentally changing the outcome of a situation, is a cousin to critical thinking. Feedback questions, engaging the student in

counterfactual thinking, encourage the individual to consider what might have been, or what could have happened if different circumstances or situations had occurred (Dray & Uphill, 2009; Epstude & Roese, 2010; Kahneman & Tversky, 1982; Petrocelli, Percy, Sherman, & Tormala, 2011; Sanna, et al, 2003; Turman, 2005). CT requires the individual to interpret, to clarify, and to problem-solve while deciphering which modifications should be made when confronted with a similar situation or for improvement in subsequent performances. CT has been researched primarily as a way to reduce regret after a situation occurs, or as a way to deal with a negative situation dismissing or forgetting it happened. The use of CT as a method for providing feedback during instruction of physical skill development has not been researched.

Imagining alternatives to situations occurs in everyoneôs daily life. CT is used in physical activity situations most often when learning a new physical skill or developing new strategies for a game. Upward counterfactuals are thoughts that emphasize a positive future outcome to a situation. For example saying, ôIf I contact the tennis ball beside me then the ball will go over the net and into the courtô. Individuals who generate upward counterfactuals after a poor performance tend to modify behavior to improve future performances. (Epstude & Roese, 2010; Rye, Cahoon, Ali, & Daftary, 2008; Turman, 2005). Another positive effect from CT is greater motivation to train and improve skills in order to produce a superior performance. When combining counterfactual thinking as feedback during instruction of a skill, the individual may experience increased knowledge and critical understanding of the skill components necessary for improved execution (Sanna & Turley-Ames, 2000).

In most situations, CT encourages and enhances the enjoyment of playing the game, but it may hinder the individualôs skill improvement or perception of ability to perform the

skill. Encumbrances to skill progress have only been found when downward counterfactuals are used. Downward counterfactual represents a worse outcome than the actual occurrence. For example saying, ôIf I toss the ball high on the serve, then the wind will blow it and I will still not get it in the service boxô. However, the obstructions to skill development are no longer evident when the individual uses upward CT (Turman, 2005).

Individuals who dwell on "what might have been," allow the CT to become an obstacle for sound judgment. Learners may begin to doubt their capability, which could affect self-efficacy and ultimately increase pressure to perform. To keep individuals from using CT negatively, counterfactual feedback may be used to train those individuals to create positive, useful, and necessary thoughts as an evaluative tool to ensure the next performance is a success and intrinsic motivation is enhanced (Holland, Woodcock, Cumming, & Duda, 2010).

Counterfactual Feedback

Regardless of teaching style, curriculum, or objectives, each physical education professional relies on the use of feedback to instruct, enhance and expand the knowledge and abilities of students. Counterfactual feedback is an option that Physical Educators and coaches to use as a catalyst to assist students to improve the development of physical skills. Positive, negative, visual, auditory, augmented, instructional, concurrent, terminal, and technical are just a few of the other types of feedback researched in physical education (Coker, 2007; Nicaise, et al, 2007; Sigrist, et al, 2011; Viciana, Cervello, & Ramirez-Lechuga, 2007). Counterfactual feedback involves the encouragement of positive self-talk regarding skills being performed and critical thinking of the skill components necessary for improved performance. For example: if the student continues to hit the tennis forehand into

the net, the feedback would be, ñIF the face of your racquet is pointed up, THEN where is the ball going to go?" or ñIF you contact the ball early, THEN which direction on the court, will the ball go?ò Or any other IF/THEN statements and questions could be helpful for the individual to begin critically thinking about the skill concepts required for a positive outcome. When the student uses upward counterfactuals, a positive learning environment will be created and negative attitudes will be eliminated for the unskilled individual.

Research on feedback has focused on benefits to the participant and performance results. Positive general feedback, including statements such as ñGood Jobò, or ñWay to go;ò have been shown to increase intrinsic motivation when used in physical education classes (Koka & Hein, 2005). The more frequently positive feedback is used, the more likely it is for the student to experience a positive feeling toward the activity being performed, especially when reinforcement follows a perceived successful performance. Even after a mistake, students will tend to feel positive if encouragement and technical instruction are provided (Viciana, Cervello, & Ramirez-Lechuga, 2007). Counterfactual feedback attempts to incorporate positive feedback with critical thinking elements designed to allow the student to feel empowered and understand the basic elements necessary for successful performance of the skill. The integration of positive general feedback with technical instruction allows learners to produce their own positive self talk and cues that will assist them in skill development and prepare them for a time when there is not a coach or teacher around to do it for them. Feedback, such as, ñGreat job bending your knees on the serve - how was the result?ò encourages the student to picture what just happened and then adjust the focus to another part of the performance. Learners will gain confidence with each successive

execution and have a better understanding of the critical elements required for successful performance of the motor skill.

Counterfactual feedback facilitates the development of skill concepts, the understanding of activity benefits, and the improvement of critical thinking. Counterfactual feedback for a performance, such as in tennis, could take the form of a statement such as, ñIf the face of the racquet is toward the sky, then where will the ball go?ò or ñIf you bend your knees on your serve, then will you be able to jump higher?ò Directional questioning will trigger the individual to consider the immediate results of a swing, making it possible for them to envision the correct swing or movement and improve the performance. Involvement of visual (internal) and auditory feedback may create an optimal learning experience and increased skill acquisition in the shortest time possible (Sigrist, et al, 2011).

Counterfactual feedback assists unaccompanied student to become adept in the cues and techniques necessary for instruction and correction. Once the unaided person can apply the cues and feedback to advance their own performance, the individual should have the capacity to assist others. Counterfactual feedback focuses on intrinsic motivation to persevere with the activity and developing critical thinking in the individual for the specific skill being learned. Increasing intrinsic motivation for movement will allow perseverance in choosing to be active rather than sedentary. Feeling enjoyment when performing the activity will increase the likelihood of choosing the activity again. Developing critical thinking in skill concepts allocates control of development to the individual student rather than reliance on the instructor for specific feedback delivery (Huescar & Moreno-Murcia, 2012).

As Mitchell, Oslin, and Griffin (2006) summarized with the teaching games for understanding curriculum, a teacher can include questions in the lesson to check for

understanding and to encourage higher-order thought processes throughout the lesson. Counterfactual feedback also encourages individuals to adjust and question skill techniques needed for successful performance. Positive self-talk and corrective instruction will develop a positive outcome for the activity, inspiring the individual to return to the activity more often. Confidence, intrinsic motivation, and a preference for more difficult tasks originate with the ability to listen and picture the counterfactual feedback which one can produce when performing an activity.

Fostering the desire to choose activity over inactivity may result after finding success using counterfactual feedback. Confidence in knowing one can find results without depending on someone else may produce in a more intrinsically motivated individual for the activity. Nicaise, Bois, Fairclough, Amorose, and Cogerino (2007) found participants' positive feelings about an activity generated a greater likelihood of the individual choosing to do the activity again. This positive feeling can be enhanced by the use of counterfactual feedback. Once the individual experiences the ability of controlling the outcome and improving their skill, they will be more apt to pick the activity again.

Statement of the Problem

Physical educators realize feedback is an essential part of the teaching process. Most types of feedback, although very useful for skill development, do not promote critical thinking in students (Barnett & Francis, 2013; Kowalczyk, Hackworth, & Case-Smith, 2012). Development of critical thinking skills may be a catalyst to promote the individuals choice of activity and positive feelings in learning a physical skill, thereby guaranteeing the continued improvement and practice of the skill or sport. Counterfactual feedback could be one option in the promotion of critical thinking skills during skill instruction. Counterfactual feedback

has not been researched as a viable option for use as a feedback option when teaching physical skills.

Purpose of the Study

The purpose of this study was to discover whether counterfactual feedback improved the understanding of critical elements of tennis skills in beginning tennis players, allowing them to improve performance of beginning skills more rapidly. In spite of the surplus of useful feedback which physical educators use to encourage individuals to choose activities, it seems positive feelings toward physical activity are often missing in many individuals. Developing critical thinking skills during physical skill acquisition may encourage an individual to feel confident and understand the skill more fully in order to choose to continue learning or performing the skill on their own.

A secondary purpose was to identify whether counterfactual feedback questions promote critical thinking of tennis skill elements necessary for a successful performance. Describing and examining the specific feedback provided to individuals in order to develop critical thinking during tennis skill acquisition.

Research Questions

The research questions guiding this study were as follows:

- How does counterfactual feedback promote the studentôs perception of developing tennis skills?
- How does counterfactual feedback promote critical thinking and evaluation when performing tennis skills in beginning players?

Assumptions

The following assumptions guided the collection of analysis of qualitative data throughout this study:

- The use of interviews assumed the participants honestly and accurately communicated personal ideas to the researcher.
- The use of open-ended questions following each training session assumed the participants took their time, answering with self-confidence and composure.

Limitations

The following limitations were inherent in this study.

- Qualitative data were gathered from four beginning tennis players. Therefore, the results may only be generalized to these four individuals rather than to the population of beginning tennis players.
- Each of the participants was involved with other activities and family life outside of this research study. These other activities may have limited the amount of time the participant had to reflect on the feedback delivered during the practice session.
- Participants were asked to avoid discussion of the study with the other participants. The researcher did not attempt to control any discussion of the training or feedback given while participants were away from the practice sessions.

Delimitations

- Four beginning tennis players participated in this study.

- Practice sessions of one hour, twice a week for eight weeks were scheduled for the four participants.
- Tennis lessons were held outside at the same time of day for each of the two lessons across the eight week time period.
- Data were gathered through the use of interviews, journals, researcher observations, and video evaluations.
- The researcher provided the primary delivery method for the feedback.

Chapter 2

Literature Review

Schools should be a place where students learn and develop intellectually, socially, physically, and mentally. Effective instructors need to be flexible, adaptive, and proactive in developing new material to enhance the learning experience for each student. In 1993, Bandura reported the U.S. Education system was under attack for stifling creativity in youth, for smothering enthusiasm to learn, and for restraining individual thought processes. Inappropriately designed lesson plans, inadequate feedback, and lack of pedagogical knowledge may contribute to the repression of individuality in students. When using traditional approaches to education, teachers often fail to encourage the advancement of critical thinking, creativity, and evaluative processing, which are important to the educational experience. Students who engage in critical thinking are found to be highly employable in todayôs job market. Modern education should strive to cultivate critical thinking in all students, to assist them in lifelong success.

Research on effective teaching has not included the use of feedback as a means to develop critical thinking skills in students. Feedback research shows links to skill acquisition and retention of learning (Todorov, Shadmehr, & Bizzi, 1997). Counterfactual feedback involves the encouragement of positive self-talk regarding skills being performed and critical thinking of the skill components necessary for improved performance. Counterfactual feedback could increase critical thinking, could enhance teaching effectiveness, could be used in all teaching styles, could create intrinsic motivation for an active life, and could increase self-efficacy in students. Linking counterfactual feedback to critical thinking skills not only allows the instructor to have a new and efficient way of teaching a new skill to

students, but it will also increase the student's intrinsic motivation and self-efficacy for the skill being taught. When self-efficacy in a certain domain increases the individual will continue to perform the skill without being externally motivated (Alderman, 2008).

Physical educators and coaches are in a unique position to increase intrinsic motivation for exercise as well as develop critical thinking skills while educating individuals. Physical educators and coaches have the overall goal to establish a permanent habit and desire for activity sustaining a higher quality, active life for each individual. Developing basic movement patterns, cultivating intrinsic motivation for exercise, and teaching critical thinking techniques are all areas physical educators should emphasize to encourage students to choose an active lifestyle. In order to sustain or cause an active life, students require insight to choose movement or physical activity on a daily basis. Counterfactual feedback is one way for instructors to develop critical thinking which could increase intrinsic motivation, self-efficacy, volitional control, and perseverance in the student which could increase the rate of development and the selection to be active.

Teacher Effectiveness

Teacher effectiveness has been in the literature since the 1960's and is currently receiving significant attention in today's educational reform discussions. Seidentop in 1976, as well as Phillips and Carlisle in 1983, looked at characteristics of the most effective and the least effective teachers. Results showed that teachers having better classroom management, clearer learning outcomes, and delivery of more performance feedback were ranked as more effective. Effective teaching can result from a number of distinct characteristics including flexibility of directives, behavior management, time on task, and positive feedback (Dunkin, Precians, & Nettles, 1996). Early research on effective teaching focused on understanding the

difference in effectiveness based on presage versus process variables, drawing on flexibility of instruction, applying enthusiasm, investigating time on task and developing behavior management (Brophy & Everson, 1976; Cakmak, M., 2011; De Knop, 1986; Evertson, Brophy, & Crawford, 1975; Lydon & Chefffers, 1984; Phillips & Carlisle, 1983; Sankar & Raju, 2011; Wentzel, 2002; Yerg, 1981).

Yerg (1981) investigated the connection between teacher behavior or process on the development of motor skills. The Teacher Behavior Observation System (TBOS) was used to collect the frequency and nature of teaching behavior used during the instruction of a cartwheel to elementary students, grades three to six. TBOS defined three specific behaviors and one general behavior. Specific behaviors included: Task presentation, providing opportunity for practice, and providing feedback. The general behavior noted in the research was categorized under ñotherò, listing all behaviors not included in the other categories. Results were not conclusive on effectiveness of teachers due to behaviors other than time-on-task and previous ability. Students preferred teachers who provided guiding language and support during practice. An instructor having useful techniques to deliver feedback effectively which contains both encouragement and instructions increased teacher effectiveness.

Sankar and Raju (2011) found presage characteristics (gender, behavioral tendencies, learning styles, and race) were not a barrier to increase critical thinking skills as the pedagogy or instructional methodology were adapted for each group of students. Self-efficacy in content increased significantly while team-working skills and critical thinking were also increased through use of adjusted instructional methodology during the semester. Students favored more group work and case studies because the discussion and teamwork

needed to finish the projects increased critical thinking skills, as well as self-efficacy for the subject. Results proved that instructional methodologies were a more crucial than presage characteristics for the learning success of the student.

Teachers with a history of significant improvement in student development are often the same instructors found to be flexible with the type of instruction provided to students. Lydon and Cheffers (1984) found student skill development improved regardless of teacher-centered instruction or student-centered instruction. Students were given decision-making responsibilities without losing the advancement of skill acquisition. Likewise, self-concept of students increased regardless of the type of instruction provided, as long as instruction was provided. Allowing students to choose the learning area within the classroom enhances their ability to construct and complete the goals given for each section due to personal interest rather than teacher controlled choices.

Time on task (TOT), academic learning time (ALT), academic learning time in physical education (ALT-PE), and engaged time were investigated in teacher effectiveness research (Berliner, 1976; Locke, 1992; Philips & Carlisle, 1983; Siedentop, 1976; Thorpe & Godwin, 2006). The most effective teachers converted class time into essential learning time. Continuing to increase content time for physical education would be ideal; however, with the onset of standardized testing most "time" in school is dedicated to "essential subjects" such as reading and math. Effective teaching in physical education requires the instructor to use the time provided for instruction wisely. Pieron and Graham (1986) differentiated between learning time and engaged time. Engaged time was defined as the ratio between the practice of the task and the allocated time for practice. Separating engaged time from learning time assisted researchers to consider more thoroughly time-on-task rather than consolidating

instruction plus practice into learning time. Learning time includes both instruction and feedback used during the lesson, but separates actual performance of skill (engaged time) from the instructional time.

In 1986, De Knop found instructional time was not as crucial to the development of tennis skills as was the timing of the delivered specific feedback. According to student evaluations of teacher behavior, specific feedback was a significant desirable behavior demonstrated by effective teachers. Improved skill development was consistently seen in the groups where the instructor used more specific feedback. The less effective group also had a considerably different amount of time devoted to specific feedback than the more effective group. De Knop (1986) concluded that teachers were deemed effective due to the presentation of a number of time-related variables including: time-on-task, time spent on specific feedback and time spent on information delivery.

Measurement of teacher effectiveness has been evaluated through standardized testing, supervisory evaluations, and peer group reporting (Dunkin, et al. 1996). However, the most recent and prominent measure of teacher effectiveness in education today is student achievement. There is no research contradicting the idea that student achievement is not a part of teacher effectiveness, but most researchers and teachers agree student achievement should not be the only measure of an effective teacher. Is the criterion for effective teaching only the outcome or results provided by the student? Effective teaching should include the learner's feelings about instruction, class time management, and intentions to continue learning or advancement of skill as well as performance- based evaluations (De Knop, 1986; Mouratidis, Vansteenkiste, Lens, & Sideridisk, 2008; Phillips & Carlisle, 1983). As Brophy and Evertson (1976) posit that finding the right way to teach at the right time for the right

student will make every teacher effective in the right learning environment. Effective teachers realize all students do not learn in the same fashion. Wirz (2004) found when student learning styles and teaching styles are congruent, students retain and apply information more efficiently and develop a better attitude toward the subject being taught.

Teaching Styles

According to Ashworth (2010) a teaching style is a plan to deliver information, arrange practice opportunities, and convey feedback to a class or a student for optimal understanding and acquisition of concepts in a certain subject area. Matching the content of the lesson with a congruent teaching style will assist the instructor in providing proper symmetry and assistance to the student (Chatoupis, 2009). Teaching style and delivery has a direct influence on the retention of information and the preservation of the knowledge imparted to the student.

To assist the physical educator in planning for delivery of instruction, Mosston and Ashworth (1990) developed a Spectrum of Teaching Styles. The spectrum progresses from teacher-centered instruction to student-centered instruction. The Spectrum of Teaching Styles for physical education was developed to encourage the physical education teacher to choose the appropriate style based on the outcomes desired for the lesson. The most direct, teacher-centered style of teaching, command style, requires the teacher to make nearly all decisions in the planning, delivery, and assessment stages of a lesson. Jaakkola and Watt (2011) found instructors used the command and practice styles most often while the convergent discovery styles were used the least frequently. According to the teachers' perception using the practice and divergent styles, the students benefited more than when using the reciprocal or convergent discovery styles.

The most indirect, student-centered style of teaching, learner initiated, enables students to have maximum responsibility for planning, learning, and assessment of learning. Byra (2006) indicated students are more likely to learn specific content when direct, teacher-centered instruction is used. However, use of indirect, student-centered instruction may lead to the development of cognitive objectives, inquiry skills, more meaningful learning, and better student adjustment (Kandaghi & Farasat, 2011).

Mosston and Ashworth (1990) teaching styles F - H are focused on student-centered learning, which engages the student in a relationship with the subject matter in a more inclusive manner. Engaging the student in discovery can be difficult but will lead the student into critical thinking and detection of complex concepts on their own. Feedback is a key concept in guided discovery learning during the impact and post-impact sets. Providing guiding questions, waiting for the answers, allowing the learner to make the connections, adjusting the speed of delivery of the feedback, and acknowledging the achievement once accomplished are areas requiring preparation prior to the instruction. These styles are best used in a one-on-one situation as the timing in delivery of feedback is important. In a group situation the guiding questions from feedback may be answered by the same person and then only one student ends up "discovering" the answer while the others stay in a receiving role (Mosston & Ashworth, 1990). As the instructor becomes more adept at questioning, a group situation can be planned using a written form of discovery or computers to deliver the questions simultaneously to different individual students. The main objective is allowing the student to realize the purpose and recognize the new skill without providing the answer. Discovering the answer with guidance assists the student in developing self-efficacy and

better understanding the process of movement required for successful completion of the motor skill.

Devers and Karabenick (2011) correlated teaching styles and learner comprehension to parenting styles and achievement, using the same categories from parenting style research and applying them to teaching styles. Walker (2008) also used parenting style correlation by investigating achievement and motivation of students from three separate teaching styles, using the authoritarian, authoritative, and permissive styles of teaching in separate classrooms. Results were similar to parenting literature, the authoritative teaching style was found to be associated with high levels of achievement and motivation. Authoritative teaching style also predicted higher levels of interest in mathematics for Hispanic students (Devers & Karabenick, 2011). The authoritarian teaching style had the lowest levels of motivation and the permissive teaching style resulted in low levels of achievement. Although these styles give educators background and research for a classroom situation, teaching a physical activity or skill is a different entity and research in physical education has its own set of specific styles of teaching.

There is no research showing one perfect teaching style for increased achievement or production of movement by students, but certain styles seem to be more effective when it comes to physical development (Lee & Solmon, 1992; Lombardo & Cheffers, 1983; Wilkinson, Pennington, & Zanandrea, 2010). Retention of information and application of knowledge is an essential component for individuals to progress into skillful, life-long movers. Indirect-teaching styles enhance inquiry skills of learners. Therefore, individuals learning through the indirect or student-centered styles are more successful in the utilization of critical thinking for transfer and application of cognitive concepts and principles from one

movement situation to another. Critical thinking is also linked to better decision-making, reasoning, problem-solving, and reflective judgment in individuals (Lodewyck, 2009). The development of critical thinking is significant in promoting studentsô application of concepts and skills learned in physical education and other classes.

Critical Thinking

Critical or higher-order thinking has been defined as the ability to assess a situation and apply the correct information available to support, adjust, or dispute an argument, behavior, or skill (Hughes, 2000; White, 2010). Barnett and Francis (2012) describe critical or higher-order thinking skills separating foundational definitions into three separate categories. Dispositional, emergent and state perspectives may be explained by inherent characteristics, cognitive development, and behaviors or abilities respectively. Each type of critical thinking has a unique focus and goal associated with the instruction needed to develop this ability.

The dispositional perspective focuses on the possibility of critical thinking being an inherent trait. Thoughtfulness, concentration, and basic curiosity are characteristics which students who excel in critical thinking tend to exhibit naturally. Believing improved critical thinking necessitates innate qualities may discourage some teachers from attempting to teach critical thinking since innate qualities are seldom trainable. However, Angeli and Valanidez (2009) found students are capable of improving critical thinking skills with proper instruction.

The emergent view of critical thinking encompasses the views of Piaget (1969). Piaget believed thought processes develop as the individual is exposed to changes in environmental conditions and the encountering new situations. Developing thought processes

in an individual to develop critical thinking skills requires more than just the normal general education subject progressions which occur from high school to college or from college to professional situations (Halonen, 1995). Subject matter advancements do compel the individual to concentrate and manage thought processes which could develop improved critical thinking. However, unexpected escalation of the theme or focus demands extreme thoughtfulness, propelling the individual into advanced contemplation and complex reasoning about the situation.

Barnett and Francis (2011) name the last category of higher-order thinking skills, the state perspective. This foundational perspective posits cognitive processes as the product of critical thinking skills, opposed to critical thinking producing the cognitive thought process. The state perspective focus is on behaviors and abilities developed during instruction. Rote memorization, content knowledge of details, and recall of basic facts are not higher-order thinking, but these skills can be improved as a result of increased critical thinking. Angeli and Valanidez (2009) use a number of instructional techniques developed within the state perspective which showed promise of improving critical thinking skills. Analyzing, decision-making, understanding, and evaluating are just a few of the skills necessary for critical thinking to occur (Ennis, 1985). The state perspective is most closely related to the use of counterfactual thinking and therefore will be the concentration used for this research.

School administrators do not emphasize the teaching of critical thinking skills rather they focus on training behaviors and abilities which will lead to better standardized test scores. However, test scores could be improved by advancing the critical thinking skills of each student through specific classroom instruction. Research featuring how classroom instruction can produce critical thinking is substantial. Kowalczyk (2011) described how

critical thinking could be immersed throughout the planning of sessions, delivery of instruction, and assessment components of every lesson. In the planning stage, critical thinking can be integrated by using the problem-based learning (PBL) curriculum whereby, students solve a problem through the discovery of relevant information that enables them to explain the problem and elicit an appropriate action or skill adjustment. The teacher adjusts the curriculum around problems relevant to the learning objectives, most instructional methods that incorporate students as active participants in the learning process do not come without hard work. Critical thinking is no different. Critical thinking is a costly endeavor for a teacher to create; time, effort, energy, concentration, and determination must be engaged to foster a well-rounded individual (Valenzuela, Nieto, & Saiz, 2011).

Counterfactual Thinking

Critical thinking is a cousin to Counterfactual thinking (CT). Counterfactual thinking is defined as mentally changing the outcome of a situation which has already occurred. In using counterfactual thinking, a person imagines an alternate event that may result in a more desirable outcome. (Dray & Uphill, 2009; Epstude & Roese, 2010; Kahneman & Tversky, 1982; Petrocelli, Percy, Sherman, & Tormala, 2011; Sanna, et al, 2003; Turman, 2005). Counterfactual thought can result from positive or negative occurrences, most often resulting after a negative outcome. The same skills necessary for critical thinking are necessary for counterfactual thinking and are the same skills central in effective learning. When an individual is learning a behavior or skill, having the ability to interpret, clarify, and problem solve are critical factors for successful results.

Kahneman and Tversky (1982) were the first to introduce counterfactual thinking. CT is a thought using ñif onlyò or áfé .thenò statements after an experience. Thinking or saying

ñIf only,ò begins very early in life, typically by age two (Epstude & Roese, 2011). By age three, children are able to reason with counterfactual thoughts involved in the conversation by providing alternative endings to various scenarios (Guajardo & Turley-Ames, 2004). The function of counterfactual thinking is to control behavior, manage circumstances, and cope with situations.

Turman (2005) separated counterfactuals into ñupward or downward, additive or subtractive, and internal or externalò (p.118). Upward counterfactuals are those thoughts emphasizing a positive future outcome to a situation. Downward counterfactuals represent an outcome worse than the actual occurrence. Individuals who generate upward counterfactuals after a poor performance tend to modify subsequent behavior to ensure improved outcome occurs. This type of modification, or CT, is the preferred mode in which to train athletes following a performance or activity (Epstude & Roese, 2011; Rye, Cahoon, Ali, & Daftary, 2008; Turman, 2005).

Additive and subtractive counterfactuals are thoughts which either incorporate or condense elements into the incident allowing for a different conclusion. For example, using an additive CT, an individual would say, ñIf I had passed to the target, the setter would have been able to set to the hitter properly.ò For a subtractive CT, the person could say, ñIf I would not have moved to my position on defense, I could have passed the ball with more accuracy.ò Internal CTôs are those associated with oneôs own actions or behaviors while external CTs denote the focus on the behavior of others or the action of others. Internal CT has been linked to greater gains in intrinsic motivation to perform an action, but external CT seems to promote team disruption and negative self-efficacy toward the activity. Blaming

others for occurrences is not likely to produce intrinsic motivation for any event or activity (Turman, 2005).

In 2000, Sanna and Turley-Ames introduced counterfactual intensity to the body of research covering CT. CT intensity refers to the affective reaction a person experiences due to a specific counterfactual response (Johnson, 1990). Physical activity can bring out many emotions. CT intensity may be an area in need of consideration when connecting CT to physical activity. Another measure of CT is potency. CT potency is the likelihood the counterfactual thought will occur. If imagining what could have happened comes easily because what could have happened is similar to an actual outcome, then the CT is more likely to change the personôs response to the particular stimulus. On the other hand, if the CT potency is low, changing behavior, altering moods, adjusting blame, or feeling regret will continue following a similar situation (Petrocelli, Percy, Sherman, & Tormala, 2011).

Not only does CT occur automatically, spontaneously, and most often following undesirable events, but CT thoughts are often very similar (Petrocelli, Percy, Sherman, & Tormala, 2011). People will often choose the most common action or response to change the scenario. Most individuals, when considering CT, change the abnormal to the normal as opposed to changing a common occurrence to an unusual reality. The categories most commonly used when altering the outcome are space, time, cause and intent. These areas are frequently modified when one uses CT. In 2005, Byrne produced the term counterfactual imagination to define how one chooses an area to amend during the use of a counterfactual thought process. People can decide to either make an outcome better or worse. Whether creating an ñeven ifò scenario or an ñif onlyò scenario may depend on the personôs goal in that situation. When a game was lost, and the goal was to win, one may say, ñI would have

lost even ifé ò or possibly, ñI could have won if onlyé ò (pg. 12). Either scenario uses the imagination and prior experience to produce the counterfactual thought.

When considering what aspects of reality people change and imagining how things could have turned out differently, the individual engages in retroactive imagination. Previous experiences often dictate which aspect of the story the individual chooses to manipulate when recreating the scenario. However, examining the instances a person ignores in the story can be just as significant. Most people do not create unrealistic counterfactuals or sensational CT. CT generally do not adjust natural laws such as gravity, and force is rarely altered. There is no manufacturing of impossibilities, the individual preserves the familiar features of animals, cars, and humans. CT is most often conceived as a probable alternative to reality. People tend to believe an event could occur if the basic components are consistent with their belief system (Byrne, 2005).

Negative occurrences frequently produce negative emotions. CT has been known to help alleviate regret (a negative emotion) and adjust negative attitudes derived from these situations. Of all the emotions experienced after a negative incident, regret is the most common. Turman (2005) identified counterfactual regret used during coachesô half-time talks. CT regret messages can be used with upward or downward CT depending on the desired effect to the participant. Some coachesôused the regret messages as a precursor to poor player performance, while others used downward CT, suggesting a potential loss if the other team had performed better in an attempt to keep motivation levels high. Regardless of the message intent, frequently the individual experiences regret when the result of a performance is less than desirable. Regret does not occur as often after a failure to act (Kahneman & Tversky, 1982). For example, the player who gets hurt at the beginning of a

match may only regret the injury, not the loss of the match. At the same time, the participating team members may regret the loss of the match because their performance did not produce the desired result.

Motivation and counterfactual thinking can either hinder or help inspire an individual to participate in an activity which will be beneficial to them for years to come (Smallman & Roese, 2009). Action and participation stem from an individualôs belief and in the value placed on the activity or situation. Experiences producing competence and autonomy are essential to increase intrinsic motivation for an activity (Hagger & Chatzisarantis, 2007). Practical application of counterfactual thinking can aid in changing attitudes, increasing self-efficacy, reducing anxiety, changing satisfaction levels, altering blame or responsibility, and varying affective reactions. These results, thereby, would strengthen intrinsic motivation for the activity (Dray & Uphill, 2009; Petrocelli, Percy, Sherman, & Tormala, 2011). Training individuals in counterfactual thinking will enable the continual performance of the activity regardless of future performance outcomes or negative situations. On the other hand, improving intrinsic motivation will make the activity more enjoyable and increase volitional control, producing a lifetime of active living.

To further comprehend the relationship between sports, exercise, motivation, volitional control, and counterfactual thinking (CT), one must explore the contributing problems working against the individual becoming consistently active. Amotivation, fear of failure, burnout, and negative mood projection are just a few of the difficulties challenging the individual. ñAmotivationò is defined as a person with no motivation to perform an activity (Alderman, 2008). Amotivation for exercise can result from perceived lack of ability or because of disappointment in the outcome of a performance. Amotivation is usually a

product of a negative experience, a negative result, or when the activityôs value is not apparent (Hagger & Chatisarantis, 2007). Fear of failure refers to the person dismissing an activity because they have predetermined that failure will result. Many type A individuals must overcome this attitude. Understanding the learning curve necessary for proficiency in an activity often alleviates this belief (Sagar, 2009).

Burnout typically ensues preceding the initial excitement of beginning a new activity. Burnout transpires when the individual spends most waking moments concentrating on training in the activity. If results are disappointing after this extensive time commitment, burnout may occur. Negative mood projections occur when there is already an obstacle in oneôs life and an exercise or activity is introduced. Associating the activity with this negative episode could lead to a low sense of self-efficacy for that activity. This mismatch of negative mood with exercise would skew the perception the person has of exercise in general (Feltz, Short, & Sullivan, 2008).

Downward CT becomes an obstacle for sound judgment when negative self-talk is produced. The downward CT could convince the individual to mistakenly believe their talents will never be at a level to allow the participant to ever be successful in the activity. The negative belief will decrease intrinsic motivation to continue the activity and lower the level of self-efficacy. Negative self-talk and downward CT could also increase pressure to improve future performances. This pressure may blind the individual from recognizing any improvements, even an obvious increase in skill development. To eliminate the use of a downward CT, the instructor should train the student or participant to create positive, useful, and necessary thoughts which create evaluative tools for the individual and ensure their next performance is a success. Producing successful performances will encourage the increase of

intrinsic motivation and enhance volitional control (Holland, Woodcock, Cumming, & Duda, 2010).

CT is commonly used in sporting activities (Turman, 2005). Thoughts about ówhat might have beenô occur frequently in athletes, as they consider how specific results may be changed or avoided to have more positive results in subsequent performances. In most sport situations, CT does not interfere with the enjoyment of playing the game, but the thought may hinder an individualôs progress or subsequent attempt at the same activity.

One positive effect from CT is greater motivation to train harder and improve skills for perfecting the next performance. With a strategic review of the contest and an increase in self-confidence, the individual may be capable of competing at a desired level which is another positive outcome from the use of CT (Sanna & Turley-Ames, 2000).

Intrinsic Motivation and Volitional Control

Counterfactual thinking is a useful tool for promoting intrinsic motivation and establishing volitional control (Alderman, 2008). The relationship between intrinsic motivation, volitional control, and feedback has been researched as a part of the Self-Determination Theory (SDT) (Ryan & Deci, 2000). Volitional control is the ability to keep emotional stability and focus whilst learning complex tasks (Hagger & Chatzisarantis, 2007). Similar to increasing determination and perseverance, volitional control may support the continued learning of complex motor skills regardless of immediate success. Alderman (2008) encourages teachers and coaches to use motivation as a platform to develop independent learning and goal achievement. Intrinsic motivation is the engagement in an action due to enjoyment, not due to any coercion or learning. Fostering intrinsic motivation will give the studentôs resources to increase resiliency and purpose for performing the

activity. Mouratidis, Vansteenkiste, Lens, and Sideridis (2008) posit increased optimal motivation or high quality motivation predicted greater volitional control and intention to continue the activity, as well as satisfaction of performance in students during a physical task. An individual with optimal or high-quality motivation indicates the person will put forth considerable effort in performing an activity (Vansteenkiste, Lens, & Deci, 2006). Although intrinsic motivation and optimal motivation are not synonymous, each type of motivation has been shown to establish a difference in the competence and satisfaction of participants when performing an activity.

The link between motivation and feedback has been established in many studies. Koka and Hein (2003) found positive feedback had a positive effect on studentôs intrinsic motivation and competence. Delivery of encouraging feedback resulted in feelings of positive satisfaction by female soccer and hockey players (Allen & Howe, 1998; Price & Weiss, 2000). Evidence of the importance of feedback by teachers and coaches on the perception of competence and increased intrinsic motivation of students and participants is equally accessible in sport literature, as well as education literature (Amorose & Horn, 2000; Chelladurai & Saleh, 1980; Weinberg & Jackson, 1979; Whitehead & Corbin, 1991)

Creating intrinsic motivation in those individuals learning an exercise or movement will enable them to choose activity over idleness. Intrinsic motivation, as it pertains to sport and competition, is less clear. Sports can be played or participated in just for the sake of enjoyment, which is the definition of intrinsic motivation (Alderman, 2008). Many individuals play golf, tennis, soccer, or a simple game of catch without any coercion or incentives from external sources, in other words they are intrinsically motivated. However, once winning and losing (or competition) is introduced to the activity, then the players tend

to adjust their source of motivation. Competitive motivation often increases the fear of failure, pressure to win, ego involvement, fear of success, goal orientation and other controlling components (Feltz, Short, & Sullivan, 2008; Hagger & Chatisarantis, 2007; Sagar, 2009). Competition is often one catalyst in turning intrinsic motivation for activity into extrinsic motivation to perform successfully. Extrinsically motivated individuals often stay actively involved waiting for expected outcomes to occur. When the expected outcomes do not happen, then volitional control and intrinsic motivation for the activity are lost.

Volitional control keeps individuals on task by controlling feelings (Hagger & Chatzisarantis, 2007). When possessing volitional control, one would stay on task and self-regulate behavior to remain focused on the goal (Alderman, 2008). High volitional control can keep the individuals focus on one domain while still being able to deal with regular distractions occurring throughout the day. For example, if an individual has a high volitional control for a regular exercise program, regardless what happens during the day; long meetings, phone calls, unanswered emails, etc, the individual will still take time to perform their exercise routine. Individuals having a dual focus; performing other essential tasks while still keeping the importance of completing the exercise a priority, is a sign of high volitional control for that domain. Newman, Keller, and Just (2007) focused on two distinct and separate cognitive tasks, such as entering data into a spreadsheet while also singing along to a favorite song. Brain scans of their subjects showed while the brain was more efficient when the subjects were required to focus on two things. Applying this research to physical skill development and feedback, it follows an individual could perform and listen to feedback without any hindrance to feedback retention (Michou, Mouratidis, Lens, & Vansteenkiste, 2013).

Feedback Options for Effective Teaching

Discussing feedback options for teachers can be an extremely exhausting conversation. The generally accepted definition for feedback is ñthe information provided to students from some external source (Lee, Keh, Magill, 1993; p.228).ò Research in classroom instruction, physical education, sports performance, and motor learning all have distinguishing categories, descriptions, and results showing the importance of feedback used for instruction. This section will examine the feedback literature attempting to disseminate the crucial information necessary in teaching a complex motor skill to a novice student. Pedagogical feedback can be categorized into specific, general, directional, and instructional, to name a few (Nicaise, et al., 2007).

Siedentop (1991) posits regularly delivered feedback during instruction of motor skills produces greater student learning. However, Silverman joined with Tyson and Krampitz (1992) resulting in a non-significant relationship between amount of feedback and achievement of students. Other research in this area has been rife with unconvincing results between frequency of feedback and resulting performance (Brophy & Evertson, 1976; Lombardo, 1979). More recently produced research has more decisive research favoring the significant benefit feedback provides to students (Hamada, 2013; Koka, 2010; Sigrist, et al, 2011).

A practical way for physical educators to introduce counterfactual thinking concepts into a physical education class is through feedback. One characteristic of an effective teacher is delivery of frequent feedback (Dunkin, Precians, & Nettles, 1996). Delivering feedback in a timely matter is an important part of selecting the correct teaching style for movement and learning physical skills. In Mosston's styles of teaching, each style

has a unique way in which the instructor should impart feedback to the student. Thompson (2010) found styles A-C of Mosston's Spectrum did not allow the instructor to design a learning environment in which differentiation of feedback for each student was possible. Li and Kam (2011) introduced reciprocal feedback into a physical education classes in Hong Kong; both students and teachers experienced a positive result. Students found this reciprocal style to be active and comfortable, while the instructors found improvement in collaboration and communication.

Using feedback during motor skill instruction is essential in an effective learning process (Coker, 2007; Huescar & Moreno-Murcia, 2012; Koka & Hein, 2003; Lombardo, 1979; Sigrist, et al, 2011; Viciana, Cervello, & Ramirez-Lechuga, 2007). Positive, negative, visual, auditory, augmented, instructional, concurrent, terminal, and technical feedback have been researched in physical education (Coker, 2007; Sigrist, et al, 2011; Viciana, Cervello, & Ramirez-Lechuga, 2007).

Research on feedback has focused on benefits to the participant and performance results (Schmidt & Wulf, 1997). Counterfactual feedback is focused on the intrinsic motivation to persevere with the activity. The difference in purpose for this feedback is slight but extremely important. Increasing intrinsic motivation for movement will allow for volitional control and perseverance for an individual to frequently choose to perform one activity over another. Enjoyment of performing the activity itself will increase the likelihood of choosing the activity again.

Kalaitzi, Derri, Vasiliadou, and Kioumourtzoglou (2007) found physical educators, even with a short instructional session, can improve their delivery of feedback to increase acquisition of a physical skill as measured by three different feedback observational systems.

Intrinsic motivation for physical education is increased by the use of positive general feedback during instruction (Koka & Hein, 2005). Also, the more frequently positive feedback is used, the more likely the student will experience a positive feeling toward the activity being performed, especially when reinforcement follows a perceived successful performance. Even after a mistake, students will tend to feel positive if encouragement and some technical instruction are provided (Viciana, Cervello, & Ramirez-Lechuga, 2007), which is where counterfactual feedback will be most effective.

Physical educators encourage, reinforce, and promote activity in young children and adolescents. Counterfactual feedback may facilitate an individualôs own psyche to understand the benefits and results of performing one activity over another. The use of counterfactual feedback may challenge the person to think about the possible changes to be made in the long term by choosing to perform the activity now. Counterfactual feedback for a performance in tennis could take the form of a statement such as, ñIf the face of the racquet is toward the sky, then where will the ball go?ò or ñIf you bend your knees on your serve, will you be able to jump higher?ò Directional questioning will trigger an individual to consider the immediate results of a swing, making it possible for the individual to envision the correct swing or movement to enhance the performance. Counterfactual feedback assists in engaging the visual (internal) and auditory augmented feedback types to create an optimal learning environment which produces the highest skill level in the shortest time possible (Sigrist, et al, 2011).

Positive general feedback can be incorporated into counterfactual feedback to give the individual a picture of what occurred and adjust the focus to another part of the performance. An example would be, ñGreat job bending your knees on the serve. How was

the result?ò The individual will gain confidence with each successive execution because of the prompt to evaluate the performance and think critically of the outcome. The development of critical thinking during the activity allows the individual to evaluate the performance immediately, rather than wait for the instructor to watch each successive performance. Permitting the participant to have the control of evaluation and adjustment of the skill may inspire the individual to practice more often, thus quickly advancing the skill level. Using counterfactual feedback questioning allows the individual to produce his or her own positive self talk. This will enhance the participantôs experience when there is not a coach or teacher around to do it for them

As Mitchell, Oslin, and Griffin (2006) recommended with the teaching games for understanding curriculum, a teacher can incorporate questions into the lesson to check for understanding and to encourage higher-order thought processes to be in play during the lesson. Counterfactual feedback has the same result, by encouraging the individual to adjust and question the learned technique. Positive self-talk and corrective instruction will develop a positive outcome, inspiring the individual to return to the activity more often. Confidence, intrinsic motivation, and a preference for more difficult tasks will originate with the ability to listen and picture the counterfactual feedback required for improved performance of the activity.

Fostering the desire to choose activity over a sedentary life may result after finding success in the performance of a skill using counterfactual feedback. Confidence in accomplishing a successful result without someone else explaining everything could produce a more intrinsically-motivated individual who desires to maintain activity. Nicaise, et al (2007) found participants who have undergone depressive affect manipulation prefer to

engage in more solitary and inactive behaviors than those experiencing elative or positive statements. Positive feelings about an activity will generate a greater likelihood of the individual choosing to do the activity again. This positive feeling can be enhanced by the use of counterfactual feedback. Once the individual experiences the ability of controlling the outcome and improving the skill, the participant will be more apt to choose to perform the activity again. Using counterfactual feedback allows the student to increase self-efficacy, volitional control, intrinsic motivation, and critical thinking skills. In order to inspire individuals to be intrinsically motivated exercisers, developing critical thinking skills through use of counterfactual feedback during instruction may be the answer.

Reflective feedback and practice is another feedback option for practitioners to advance the studentôs critical thinking. Most of the research on reflective thinking concentrates on the development of the pre-service teacherôs reflective thinking to improve teaching skills; there is little mention of reflective feedback involved during the reflective process. There is no current research showing the advancement of critical thinking skills as a result of teaching or encouraging reflective thinking during an activity session to develop complex motor skills, but it has been shown to increase critical thinking in post teaching reflective sessions (Kinsella, 2007). Standal and Moe (2013) summarized current research done on reflective practice and feedback in physical education. Conclusions showed the absence of recent research on reflective feedback done in motor skill development.

Reflective practice relies on the individual performing the reflection on the context and the outcome of each situation occurring in the class or the performance. Although, counterfactual feedback is similar in this context, the difference is that counterfactual feedback simplifies the process and encourages the student to focus on the process rather

than the outcome of the skill being performed. Thinking reflectively requires the individual to reflect on prior knowledge, evaluate current data, and decide how to correlate information toward the goal of a better performance (Choy & Oo, 2011). Counterfactual feedback advances the individual to reflection more quickly by posing the statement or question to support the connection between what they know and what to change in order to complete a successful performance.

Schon's (1983, 1987) seminal work on reflective feedback focuses on education in medical pedagogy, specifically, nursing education. Critics scrutinized reflective practice studies, stating that all human action is reflective, but humans are not consistent in their engagement of practicing what they know will work (Greenwood, 1993). Kinsella (2007) claims reflective practice is more understandable as an "embodied mode of reflection" (pg. 396) useful in most human interaction professions. This interpretation asserts that reflection is a lived experience translated into action by the practitioner. For educational purposes this is a questionable definition of reflective practice. As reflective practice relates to motor skill acquisition, is a bit perplexing, although lived experiences turned into action is the point of learning a complex skill. Developing the reflective feedback to improve the individualôs performance regardless of the circumstances may be a little more difficult.

Reflective feedback focus in teacher education is admirable and research posits the validity of the practice. For physical educators to use reflective feedback as a practical option for beginning students learning complex motor skills has not been part of the current research. The differences between counterfactual feedback and reflective feedback are apparent, but more research is needed to solidify the most helpful feedback for motor skill acquisition.

Counterfactual Feedback. Counterfactual feedback is similar to reflective and augmented feedback. Counterfactual feedback relies on forming a question to lead the student into critical thinking about the concepts necessary for development of specific skills. Finding the ñif-thenò formula for questions or feedback is sometimes challenging, but focusing on the concepts rather than the specific skill performance may assist in forming the proper query and comments to support the participants.

The student may not always need to respond immediately to a question. Often consideration of the concept and additional practice is needed before the participant understands how the comment or question will affect the performance. The critical thinking process seldom transpires immediately, the individual should consider effects and outcomes prior to a response or subsequent to more skill attempts.

Counterfactual feedback is fluid; the answers received from the participant or student dictate the specificity of follow-up questions or comments necessary for continued pursuit of critical thinking elements focusing on concepts required for further performance proficiency. The only constraint on the use of counterfactual feedback is that the delivery should require the student to critically think about the basic skill or performance being attempted. Counterfactual feedback does not have a specific requirement for each question or comment. Specific wording is not essential for proper delivery; indicating a certified coach or physical educator would be able to adapt their feedback style to incorporate counterfactual feedback quite easily.

Specific samplings are found in Appendix E. These are only a small portion of the total feedback used during eight weeks of practice sessions with four participants.

Theoretical Perspectives

Self Determination Theory (SDT) was used as the theoretical framework guiding this research. Intrinsic motivation, self-efficacy, and critical thinking are all concepts identified within this framework, highlighting the focus of this study on autonomy, competence, and relatedness of individuals to the complex motor skill being learned. Social Cognitive Theory (SCT) is also closely related to SDT, however, SCT focuses more on motivation of the individual rather than the autonomy and competence being developed for advancing the performance and increasing the desire for continued participation in the activity (Bandura, 2004).

According to Self Determination Theory (SDT) the individualôs need for autonomy, competence, and relatedness will motivate them to put forth effort into mastering different behaviors. Due to the need for autonomy, competence, and relatedness, most individuals will work to gain a foothold regardless of what activity or accomplishment is being pursued. The SDT claims motivation plays a role in directing a personôs actions during an activity. Each piece of the SDT puzzle contributes to the overall behavior of the individual, exerting themselves throughout the activity to gain success (Ryan & Deci, 2000). Human beings in their healthy state are curious, active, and playful. The problem is many individuals are not in a healthy state. Choosing to be active and playful will help establish autonomy, competence, and relatedness; which, in turn, will foster intrinsic motivation to be active and playful rather than sedentary. By continuing to perform the activity, self-efficacy for that domain will increase, and the individual will improve their volitional control, encouraging them to persist with the activity.

Social Cognitive Theory (SCT) also posits a combination of factors contributing to the overall development of motivation for a specific activity. Focusing on sport and exercise, the SCT speculates that using positive feedback during initial instruction of an activity will increase the personôs belief (self-efficacy) and improve their effort to perform. Strengthened exertion could result in achieving the goal, which in turn fuels the individualôs intrinsic motivation and volitional control. Amplified intrinsic motivation creates another increase in resolve to continue performing the activity. The instructor or teacher should continue to provide positive feedback to reinforce the continual increase of motivation.

In each theory the explanation of how motivation is influenced varies, but each model has a recipe for how to foster intrinsic motivation in an individual. Increasing intrinsic motivation for exercise will allow volitional control to increase. Increasing both volitional control and intrinsic motivation permits the individual to find positive results from exercise, be it physical or mental (Feltz, Short, & Sullivan, 2008). Using a practical application of counterfactual feedback can influence the cultivation of a positive cycle of feedback to develop intrinsic motivation and volitional control for exercise and performance. Most researchers agree there is a continuum between intrinsic and extrinsic motivation; when one can keep an activity intrinsically motivating, the likelihood of the individual choosing to perform the activity again is exponentially higher. The reasoning and theory behind this concept requires a brief description of self-efficacy, self-determination, and goal orientation theory (Bandura, 1997; Feltz, Short, & Sullivan, 2008; Ryan & Deci, 2000).

Self-efficacy is defined as the belief an individual has in his or her ability to accomplish an activity, or the confidence the person has in their ability in a certain domain (Ryan & Deci, 2000). Individuals will choose to undertake activities in which there is a

reasonable chance to succeed. They set goals according to the belief in their capacity to execute an activity. As the personôs self-efficacy in the activity increases, the individual will choose to be active in more challenging tasks. The problem comes when individuals have an inflated efficacy judgment and set themselves up for failure by engaging in a task in which the challenge is too great. Once individuals fail, due to lack of experience or another reason, self-efficacy decreases, and they may decline to participate in the activity (Bandura, 1997). Depending on the self-efficacy level for the activity, the person may see the failure as an incentive to work harder and increase the chance of a successful performance. Individuals with high levels of self-efficacy prior to a challenge tend to put forth more effort after a close loss. People with low levels of self-efficacy will tend to give up, believing they will never be able to rise to the challenge (Feltz, Short, & Sullivan, 2008). The relationship between self-efficacy, goal setting, and motivation can be described as linear. The higher the self-efficacy and the more challenging the goal, the higher the level of increase will be in intrinsic motivation for the activity.

Goal-orientation theory research is clear. The goal should be specific, measurable, and realistic for the individual to believe the objective is achievable (Alderman, 2008). Since CT is goal-oriented, incorporating thoughts into action or performance is accomplished through content-specific and content-neutral pathways. Content-specific pathways are pathways using the CT connected to the intended behavior. The individual information gained from connecting the CT to the intended behavior will allow the student to manipulate or adjust the next performance (Epstude & Roese, 2010). Content-specific pathways require the individual to focus specific attention on the content of the CT; the connection to the performance needs to be positive and reliable to make it transferable for altering the next

performance. Allowing unrealistic or far-fetched thoughts to invade the CT can deter the adjustment for the subsequent performance. Content-specific pathways are the most direct approach to developing the strategy or specific action requirement for advancing the performance to the next level. The counterfactual feedback questions and statements used during this research focused on content-specific pathways. Research questions were developed following the direct approach and specific action requirements necessary for understanding the skill components.

Content-neutral pathways are a general method of behavior change. Content-neutral pathways necessitate the prior establishment of intrinsic motivation for the performance. Having intrinsic motivation fortified will increase effort resulting in behavior change. Specific information is not a prerequisite for content-neutral pathways since effort can be attributed to contrast effects, assimilation effects, or mind-sets. For example, if the performer believes the negative result of a performance occurred due to illness the prior week, a behavior change would occur due to an increase in effort and not because of a specific action (Epstude & Roese, 2010).

Conclusion

It is necessary to combine the knowledge of CT with intrinsic motivation and feedback as a way to inspire youth and adults to participate in exercise. Many individuals would not attempt an activity or performance without some initial external motivator (Andersen & Hagger, 2010; Phillips, 2005). Extrinsically motivating individuals to perform or join an activity is often a catalyst for establishing intrinsic motivation for the same activity. Intrinsic motivation is doing something by choice and for the enjoyment of the activity itself without any outside incentive. It is not possible to force the transfer of

motivation from extrinsic to intrinsic. Instructing the individual to be aware of suggestions or tools like CT, may foster a transfer of motivation and cultivate incentives to propel the individual into an active lifestyle.

CT is a logical stepping stone in building intrinsic motivation for exercise, but instructors need to be cognizant of predetermining factors. Evaluation of the individual's developmental and physical capacity must be resolved prior to establishing a program that will nurture intrinsic motivation in the participant for the activity. The use of a comprehensive needs analysis tool is helpful prior to beginning instruction to better understand the individual or group (Holland, Woodcock, Cumming, & Duda, 2010). Teaching mental techniques and training strategies to individuals not developmentally prepared to perform or not equipped to envision the mental image can be detrimental to the building process. Training the individual in the CT process will cue the cognitive aspect of the strategies needed to succeed at the activity. Counterfactual feedback permits the individual to overcome shortcomings of performance by instigating intrinsic motivation for the activity. Increased intrinsic motivation creates the desire to improve and the confidence to understand the skill development necessary to advance the specific performance to the desired level.

Generating substitute outcomes to factual occurrences, or CTs, is a common and basic fundamental skill of all individuals (Rye, Cahoon, Ali, & Daftary, 2008). Controlling and learning to develop counterfactual thoughts in order to gain the most advantageous result in a competition or activity will motivate the individual to improving performance, reducing anxiety, increasing self-efficacy, and positively affecting the overall mood of the performer (Knowles, 2009). A teacherôs use of CT can allow the individual to feel in control and less

likely to use downward counterfactuals when evaluating a situation. When a discussion of negative events has to occur, the instructor should always attempt to use upward Counterfactual feedback. Upward Counterfactual feedback (how things can be better) operates as a preparatory function for the next contest and can improve the mood and self-efficacy of the individual if presented clearly and with enthusiasm. Attempting to use downward Counterfactual feedback (how things might have been worse) only distresses the individual and coping mechanisms initiate making the individualôs focus wander (Rye, Cahoon, Ali, & Daftary, 2008).

CT may follow a positive performance, but the overwhelming majority of counterfactual thoughts result subsequent to a mishap or negative result (Epstude & Roese, 2010). The negative outcome may act as a signal to the individual that the goal is not progressing to the desired result and the CT is a way of evaluating and coping with the occurrence. Counterfactual feedback can begin when the acknowledgement of a problem or other negative occurrence has been identified. Once the problem or negative incident has been specified and understood, counterfactual feedback is delivered. Following the presentation of counterfactual feedback, critical thought processes engage. This will result in improved intrinsic motivation which facilitates changed behavior in order to expedite the completion of the goal. When used appropriately by individuals, counterfactual feedback can increase the participantsôperceived volitional control of the situation. Amplified volitional control will continue to increase intrinsic motivation to attempt innovative ideas and improve effort to reach the previously set goal.

From the classroom to the playing field, individuals have wondered at one time or another ñwhat if.ò The connections formed between cognitive, emotional, and physical

performances or activities cannot be separated. As problems or negative situations arise, the activation of counterfactual feedback becomes automatic. Once counterfactual feedback is understood and applied to a situation, critical thinking and intrinsic motivation will assist the individual in clarifying and evaluating the adjustment of the skill required for a transformed outcome to the situation. When the desired result has been accomplished, self-efficacy will increase and transfer to other similar activities. Counterfactual feedback can influence behavior (or motivate) to correct and adjust requirements for enhanced development of a motor skill.

Counterfactual feedback can be a useful tool in many educational settings, specifically when learning a new skill. Counterfactual feedback is one method to increase intrinsic motivation and volitional control when learning a complex skill. Learning to manipulate counterfactual feedback allows the individual attempting a performance to expand critical thought processes assisting in the adjustment of the skill execution, increasing self-efficacy and the desire to perform the activity. Sports performances and motor skill development can become emotional. When one thinks about what might have been, feelings are triggered. Sentiment concerning abilities is another reason counterfactual feedback and intrinsic motivation is connected, especially in exercise and sports situations (Epstude & Roese, 2011).

Physical educators are in the unique position to develop counterfactual feedback skills. Physical education needs to move with the times; recent developments require additional focus on mental and physical abilities training resulting in healthier, more active adults. Using counterfactual feedback could be one way of increasing participation in activities and exercise on a consistent basis. By developing counterfactual feedback skills,

instructors may increase the critical thinking ability in students. Critical thinking assists the individual to transfer learning concepts from one area into other areas. Once a student develops counterfactual feedback skills for one domain, the transferability of the learned concepts may assist the individual in emerging with proficiency in other domains, be it cognitive, emotional, or physical.

Chapter 3

Methods

Current research on the use of feedback for motor skill acquisition has typically focused on traditional approaches. There has been limited research on delivery method of feedback, but research on impact of feedback on student learning in relation to motor skill development is positive. Counterfactual feedback can provide the student with the opportunity to analyze and evaluate their progress in the development of a motor skill. The current research study examined how this specific method of feedback delivery assisted with the increase of self-confidence, accelerated the skill acquisition, and improved the likelihood of continued participation when learning a new motor skill. Identifying an effective method of feedback delivery may provide instructors with options when teaching beginning tennis players in basic motor skill acquisition.

Effective instruction and increased motor ability can lead to the development of lifelong skills and involvement in physical activity (Ashworth, 1983; Chatoupis, 2009; Devers & Karabenick, 2011; Mosston & Ashworth, 1990). There is a continued need for instructors to have a variety of teaching and feedback methods which improve the acquisition of new motor skills. By allowing individuals to feel empowered within the learning process, students may continue to be active. This chapter describes the methods used for this study and delineates the processes employed for recruitment and selection of participants, data collection and data analysis.

Qualitative Research

Qualitative research is defined as an exploratory inquiry developing new perspectives on established topics and theories (Creswell, 2007; Patton, 2002). Using qualitative research

as a platform for this study was the appropriate avenue to explore and obtain data allowing the researcher to better understand results occurring from the use of counterfactual feedback. The current research followed qualitative research design methods which allow superior comprehension and identification of the impact occurring when delivering counterfactual feedback on beginning tennis players. Qualitative research permitted the participantsô reactions to the new feedback method to evolve and emerge as the study progressed. Finally, the qualitative research design provided the primary researcher with the opportunity to give meaning to the participantsôreactions to the feedback and allow more comprehensive insight into the advantages of using counterfactual feedback in teaching a new physical skill.

Phenomenology, grounded theory, qualitative inquiry, ethnography, historical and case study methods are commonly used when conducting qualitative research (Creswell, 2007). For the purpose of this study, the researcher used the case study method to examine participantsôreactions in relation to the use of counterfactual feedback during beginning tennis skill instruction. A qualitative case study is defined as an ñin-depth description and analysis of a bounded systemò (Merriam, 2009, p.43). An alternate method of describing the case study method is when a researcher takes a detailed collection of information from multiple sources such as: observations, interviews, questionnaires, and discussions to report on one case or bounded system (Creswell, 2007). A case or bounded system is a noun or an object allowing us to examine the functioning of, in this case, an innovative feedback method. Counterfactual feedback is the case (Stake, 2010).

In a collective case study, each participant is a separate entity to express opinions about the case. Separation of participants is essential in developing the most honest and forthright opinions concerning the subject matter being investigated. Case study research

demands in-depth data gathering and a defined period of time. For this study, data were collected through eight weeks, using three distinct methods: journal entries, video recordings (or direct observations with summary notes), and interviews. These qualitative methods of data collection were identified by Creswell (2007) to be effective in gathering extensively detailed information concerning the subject matter. This study obtained specific reactions from students concerning the delivery and specific wording of feedback delivered to the participant during instruction of beginning tennis skills.

This chapter lists the methods and process used within this study. The researcher identifies the methodology design, participant selection, data collection, and data analysis used in this research. Last, validity and reliability measures are described in detail near the end of the chapter.

Study Design

This study used Qualitative Collective Case Study methodology with four participants. The researcher chose the collective case study design because of the definition found in Smythe (2012) and Stake (2005). A collective case study examines multiple cases to find similarities and connections to the subject matter. This study began with four participants. Data was collected on each participant individually. Once case study data was collected, each study was analyzed for similarities and connections regarding the participantôs reactions to the counterfactual feedback delivered during instruction.

A collective case study design requires vast amounts of data collected through multiple techniques or means (Baxter & Jack, 2008), in order for the relevant themes to be developed as the results of multiple cases are combined (Smythe, 2012; Stake, 2010). The researcher must develop the situation in which the individual will react, without leading the

participant into the reaction. The conditions surrounding the participantôs performance are relevant to the resulting reactions. A collective case study method is ideal for this research due to the uncertain relationship between the feedback given and the reaction to the feedback by the participant.

Participants were four beginning tennis players between the ages of 18 - 40 years old. Data were gathered through the use of individual journal entries, interviews, direct observations, and researcherôs summary notes. The collective case study data was compiled throughout the eight weeks of data collection. Each set of data was analyzed using a holistic analysis of each case. All the specific data was included in the final reporting with detailed notes and the audio and electronic recording, as well as the specific coding pages were kept to ensure consistency in coding themes. A list of the specific skills covered and the order in which the skills were presented to each participant are in Appendix C.

The sections of this study including but not limited to purpose, design, participant selection, and confidentiality procedures were approved by the institutional review board of the sponsoring university. Human Research Compliance Main Campus Department (HRC) endorsed this study prior to beginning the recruitment of participants on May 24, 2013. Participant consent forms were approved (Appendix F). Prior to beginning the study, all privacy procedures were sanctioned by HRC. Specifically outlining the disposal of data and discarding of all identifying information to protect the privacy of participants once data was analyzed completely. Procedures were followed throughout the research and the study was officially closed on March 11, 2014.

Participant Selection

Sample size for a collective case study research is generally small compared to other research due to the amount of information required from each participant. Creswell (2007) recommends researching no more than four or five cases for a collective case study. The researcher is then able to collect comprehensive data from each case without an overwhelming amount of data to organize. For this research, the primary researcher posted an advertisement through a local newspaper ad, in a small eastern New Mexico community. Another advertisement was listed in the Monday Memo on the university website; the Monday memo was sent to all Faculty, Staff, and registered students, also including retired personnel.

The participants were a convenient sample chosen on a first come, first serve basis after responding to an advertisement of the research. Once four participants agreed to participate, signed consent forms, and agreed to the schedule, the primary researcher commenced data collection. Replacement of participants was not necessary in this case. All the participants were very considerate and reliable. One participant had to conclude one week early due to medical reasons and another due to family issues.

For the current research, there were four primary participants. Specifications for selection of the participants included age and experience with tennis skills. Patton (2002) states the power of purposeful convenience sampling is in the specifications required of each participant prior to selection, which will best enlighten the researcher about the subject under investigation. Due to the description and information required of the participants, the researcher chose adults over age 18. Gender was not a specific criterion for this study; interestingly the four participants ended up being two female and two male candidates.

Creswell (2007) posits each case or participant should have similar background experience in order for the phenomena being explored to result in fluent, expressive communication about the subject. None of the participants had experience playing tennis nor had any tennis instruction prior to volunteering for this study. The participants received free tennis lessons as part of the incentive to join the study.

Each participant met with the primary researcher for instruction two times per week for one hour during the eight-week sessions. Tennis skills taught included forehand, backhand, and serving. Scheduling the time and place for the lesson varied, as the primary researcher attempted to accommodate the schedules of each of the participants whenever possible. The participants provided informed consent, which included a clause on the requirements necessary for completing the study.

Data Collection

Data were gathered through the use of individual journal entries, required of each participant. Journal entries were completed at the end of each practice session. The questions provided to the participants pertained to the specific skill development of the week. See Appendix A for specific questions used.

The interviews were conducted at the conclusion of each week. Interview questions may be found in Appendix B. Researcher observations were coded after each practice session to highlight the specific counterfactual feedback phrases used during each meeting. The researcher made extensive, descriptive summary notes following each practice session concerning the flow and timing of the feedback given during the day, along with personal feelings and observations concerning the participantôs comments during the session.

Journal Entries or Participant Observations. Each participant was required to complete a journal entry for each practice session. These journal entries included observations, feelings, descriptions, or explanations of how the participant reacted to the provided feedback during the session. The journal entry was not limited to reactions to the feedback but also included inferences to the participantôs performance of the skill. The journals contained perceptions of possible future performance improvements. The primary researcher encouraged the participant to reflect at the end of each session and enter some specific feelings about the skill performance for the day and to interpret the level of motor competence they felt toward the specific skill practiced during the practice session.

There were a total of eight journal entries, one for each week of practice sessions. These journal entries were coded similarly to the coding used on the direct observation summaries. Journal entries were used by the researcher for insight into the daily reactions the participant had to the feedback, as well as clarifying the views of future performances the participant was expecting. Questions were given each week to participants, to assist in writing the journal entry. Specific information outlined by the questions contributed to the depth of information obtained during the study. Appendix A provides a list of the questions used by the participant to write a journal entry each week.

Interviews. Interviewing allowed participants to express their perception, describe their situation, and explain their view on the situation the researcher described (Stake, 2010). At the end of each practice session, participants were interviewed by the primary instructor for 15-20 minutes. Each interview session was conducted courtside in a comfortable, shaded, private environment, immediately following the final practice session for the week. The interview session was designed to enhance the observations and reveal more detail on the

opinions of the participant (see appendix B). These interviews permitted the researcher to understand which expectations were met and those not realized by each participant throughout the practice sessions.

Each interview session contributed vital information which the primary researcher utilized to make adjustments to the counterfactual feedback during the subsequent practice sessions. Providing better quality feedback during the remainder of the sessions gave more depth to the practice sessions and allowed the participants to improve skill performance more quickly. Interview session were videotaped and transcribed by the researcher. The researcher then transcribed each interview session by the following week in order to allow time for the participant to check their answers, so that information was not misinterpreted during the interview. Member check of information in transcription assists in research validity.

Direct Observation/ Summary Notes. Each practice session was directed and observed by the primary researcher. The primary researcher recorded each practice session via audio and video media. Following each session the primary researcher transcribed the interview and video recording to summarize the specific feedback wording used during the practice session.

Field notes on the primary researcherôs observations were written immediately following each practice session in order to accurately identify attitudes, feelings, and responses brought up by the participant. At the beginning of the next practice session, participants were asked to review the notes from the previous session to identify mistakes or miscommunications occurring during the recording or the interpretations of the conclusions drawn by the primary researcher in the written notes. Any revision to the notes were made immediately by the primary researcher.

Data Analysis

Data consisted of 16 hours of audio and video recorded observations per participant along with the primary researcherôs specific observations of each practice session, four participant journals, and 12 hours of audio-recorded interview sessions. Identifying emergent issues within each case and providing a fully descriptive summary of the case was where the analysis began. One way to begin a case study analysis is using ñwith-in case analysisò or ñembedded analysisò (Creswell, 2007; p.75). The investigator must bring all material together and develop a ñcase study databaseò (Merriam, 2009). The database will be useful for the researcher in two ways. One useful part of the database will allow the investigator to be able to locate the specific data necessary during the intensive analysis process. Secondly, the database will allow information to be edited; similar or identical information can be sorted, parts within each case are fitted together, and the information is organized by chronology or by themes or topics (Patton, 2002; Yin, 2008). The organization of the data is crucial in allowing the researcher to begin management of the data collected to begin forming the case study report.

During the current research, the primary researcher evaluated each practice session and coded the feedback given to the specific participant. A database was developed for each participant to assist in organizing the information gleaned throughout the practice sessions. The participant interviews were coded with theme words listed in a database following member check of the transcriptions of each interview session. The primary researcher developed the categories of this database after the collection of data was complete for that individual. The categories were emergent themes produced during examination of interview sessions, evaluation of journal entries, and analysis of summary notes.

Interview answers, journal entries, and direct observations data were compiled at the end of the data collection for each participant. Coding words and themes from the observations and journal entries meshed with the database themes. If different themes emerged while coding the journal entries and observations, the new themes were added to the existing database for that individual. Highlighting the most frequent themes was a function of the next phase of coding.

The next step for the analysis of a comparative case study was the ñcross-case analysisò (Merriam, 2009). Information gleaned from each of the case studies is compared and fit together into a culminating report bringing together the focus and themes of the case. This final step in combining all the information into a report led to categories, thus conceptualizing the data from all the cases making the conclusions stronger.

Findings were presented first by reporting on each case study separately, which allowed for specific themes and data of each individual case study to stand and be reported independently. A concluding report on the cross-case analysis includes the categories and themes common to all of the case studies. This cross-case analysis assisted in forming hypotheses or stories of how the themes relate to each other and to the main focus of the study itself (Corbin and Strauss, 2008).

Validity and Reliability

Validity is important for any research study. Merriam (2009) defined internal validity as the results of the study being based in reality. Qualitative studies have a unique way of ensuring validity. Creswell (2007) mentions triangulation, peer audits, and thick descriptions as good ways to establish validity in a qualitative study. Eisner (1991) mentions rather than validity, qualitative research needs to be credible. Structural corroboration (triangulation),

consensual validity (peer audit), and referential adequacy (thick description) are areas synonymous with more common validation practices in qualitative research. The most important part of validation is considering the real story, confirming with multiple sources concerning the narrative being revealed. From the participants to the readers, each person made sure the data are accurate and have been established through the study. In this study the current primary researcher used triangulation, peer audit, member checking and thick description for validity and reliability of the data collected.

Triangulation. Triangulation or structural corroboration is comprised of using three or more reflections of the data in order to corroborate the information being portrayed. Triangulation requires using multiple ways of collecting and selecting the information included in the thick description. In this study, weekly survey questions, journal entries, and interviews were used in order to establish triangulation. Triangulation was achieved in the current research by using the journal entries from participants, the primary researcherôs notes, and results from the interviews.

Peer Audit. Peer audit is an established validation tool which will only be useful if the peer is critical and honest about the interpretations of the researcher. Reviewing each of the conclusions and themes the researcher has established for validity will assist with the establishment of themes in each of the data sources. Insights from peers allows for better discussion and description of the themes evolving, especially if the peer reviewers are experts or have some expertise in the subject matter being investigated. The peer auditor will provide an assessment of the research once completed (Creswell, 2007). The peer auditor is similar to that of a fiscal auditor, and specific questions will be listed to which the auditor may respond after general comments concerning the research are recorded.

Peer audit was achieved in the current research by having a peer review each piece of information collected; the notes written by the primary investigator as well as the interview notes, the answers to the survey questionnaire, and the journal entries. The peer auditor was an expert in traditional feedback delivery and had basic knowledge of tennis skill requirements for beginners. The peer auditor examined the appropriateness of the feedback as it applies to the development of the participant.

Member Check. Merriam (2009) describes another common method of ensuring internal validity in a qualitative study as member checks or respondent validation. For correct member checking, the researcher must give each participant time to review and approve or change any interpreted information, profiles, or transcripts that will be used during summary and conclusion of the research. The member check process will allow for misinterpretations to be caught prior to the end of the study, allowing for more accurate data.

During the current research, member checking was a vital part of validity and triangulation. Each week prior to beginning the practice session, the participant had time to review all transcription notes made by the researcher and approve the information within the document. This member check allowed the participant a critical role in the validation of the researcher's interpretation of observations during the previous practice session.

Thick Description. According to Creswell (2007) one way of achieving external validity is using thick description of each participant, of all activities, and of summary conclusions during the qualitative research process. Thick or rich descriptions of the participantôs experiences and thoughts will allow the story to develop throughout the research process. Long quotations from interviews along with detailed descriptions of the researcher's observations will allow the themes and ideas to develop fully assisting in making conclusions

which are supportable by fact. Through the use of thick descriptions, readers are able to understand the conclusions drawn by the researcher. The possible transfer of deductions reached in this research to other times, settings, situations, and people are made more viable through thick descriptive writing (Merriam, 2009).

Chapter Four

Results

In this chapter, the opinions, comments, and attitudes of four individual beginning tennis players concerning counterfactual feedback given during tennis skill acquisition is reported and evaluated after eight weeks of one-on-one practice sessions. Data sources used for evaluation were participant journal entries, participant interviews, videotaped lessons, and researcher's observations. This chapter will describe the themes that developed in each case study separately.

The emergent themes found in this multiple case study are: a) perceptions of confidence in skill development, b) recognition of skill components necessary for success, c) best timing of feedback delivery and d) likelihood of continuing the activity in the future. Each of the themes illustrates more precisely how counterfactual feedback changed the thought process and critical thinking of the individual participant regarding tennis skill acquisition. Stake (2010) states three main techniques for reporting on case studies: biographical or chronological, researchers view, and major components highlighted. This chapter will use the biographical write-up of each case study combined with a description of each major theme, followed by the researcher's interpretation of how each case developed. Background information and full descriptions are provided for each case study to give the reader an overall view of the data discovered throughout the eight weeks of tennis lessons (Merriam, 2009). This chapter will then include comments on environmental issues affecting the participants and examples of counterfactual feedback statements used throughout the study. A short concluding summary will highlight the themes investigated and reexamine the completed inferences made by the study.

Participant Backgrounds

All participants were between the ages of 21 and 60. Four individuals participated in this research study, Trent, age 29, Sabrina, age 54, Oprah, age 25, Wade, age 21. Pseudonyms were assigned to each participant. The background of each participant is presented to assist in understanding the differences in the improvement and development of each individual during the practice sessions.

Trent. Trent was in his mid-twenties, was a graduate student at the local university, and was majoring in business. He also held a research assistant position at the university. Due to workload issues Trent was predominantly sedentary during the day, so in the evenings he enjoyed participating in diverse physical activities. After seeing a tennis tournament, Trent wished to play tennis, and he began watching YouTube videos for instruction on serving and forehand skills. He recognized the lack of consistency in techniques and was anxious to begin learning sessions after seeing the ads for this research.

In Trent's initial evaluation, his forehand was not consistent. A basic evaluation write up went as follows:

> I would rate Tim according to NTRP (see Appendix D) playing levels in between a 2.0 and a 2.5. He covers the court well regardless of where the ball is hit but has not developed any of the strokes for controlling the ball. He judges where the ball is going very well and will have no trouble adjusting his footwork to advance the skill once the basic strokes are developed. It was apparent that Trent had experience in playing other sports, specifically soccer, racquetball, basketball, and a variety of other sports. He had never had

experience playing tennis only watching and trying to imitate the pros on TV. (Researcher Journal/ preliminary evaluation 5/31)

Trent was born in Kazakhstan and had a good physical education background. With a variety of learned fundamental skills, his ability to transfer those skills and learn new skills efficiently was apparent. In questions about his history with sports skills, Trent expressed his view that his early years of physical education in school assisted in development of his current physical skills. He remembered having many opportunities to learn different movements and games as a child and continued to develop those skills as he matured. Trent was able to show the capacity to adapt and understand each skill component that was introduced to him in the preliminary evaluation session.

Trent's ability to adapt his skill proficiency quickly demonstrated that he continued to participate in many different areas of physical activity throughout his teenage years. Most of the chosen physical activities Trent participated in were chosen for the enjoyment of the game or for a social connection with friends. Trent became interested in tennis twelve months prior to our first meeting, when he was watching a tennis match on TV and he decided to try it. Trent had only begun learning the specific skills involved in playing tennis mainly through research of YouTube videos when he saw the advertisement for this study. He was excited to get personal assistance with learning the proper form and rules for tennis play.

Sabrina. Sabrina was a middle-aged woman with a desk job. Sabrina demonstrated physical limitations due to poor eyesight, and she was concerned that this problem would interfere with her being able to play tennis. I assured her that after the initial sessions we would evaluate the extent that her disability would affect her tennis skill development. I was

confident that we would be able to modify the tennis skills necessary for recreational play since there are few skills that could not be adapted for improved capacity.

Sabrina did not gain confidence in her physical abilities through her school physical education classes. Her recollections of class activities were of games in which she was not proficient and therefore was often ñpicked lastò or ñshown upò. However, the experiences occurred over 30 years ago. As a child, Sabrina participated in many activities outside of school. Sabrina remembered having tennis lessons as a young girl and having difficulty with the racquet. Most racquets, at that time, were wooden and quite heavy especially for younger players. Sabrina recalled using a two-handed backhand since she was not able to swing the backhand without two hands. She did not remember the forehand.

Sabrina had been involved in Zumba, yoga, and other exercise forms in the past couple of years but had not been able to sustain a regular exercise program. Sabrina had good memories of playing tennis as a child. She believed that improving her tennis skills would allow her to feel more confident and comfortable playing tennis with others, thus affording her a good consistent exercise routine. Her group of friends did not play, but she anticipated the she could convince them to go to the courts and play when her lessons were completed, thus allowing them to partake of the fun and exercise that tennis could provide.

Oprah. Oprah was a stay-at-home-mother of a six-month old. Oprah moved to the community a year ago from another country, so her conversational English was a bit weak, but she communicated well on paper. If given time, she was capable of answering the interview and journal questions. Oprah used walking as a means to stay healthy throughout her pregnancy. Her recovery from the birth was good, and she was released to exercise again

3-4 weeks after the birth. Oprah was ready to develop a new form of physical activity that she could share with her husband.

Oprah's background with physical activities and skills was apparent from the beginning evaluation. Oprah had good coordination and hand-eye contact skills which enhanced her learning of tennis. She remembered having good physical education experiences as a youngster. During her elementary years she recalled being encouraged to develop skills for a variety of activities. Oprah did not pursue sports outside of school, but she continued to have physical education as a teenager in school and enjoyed many physical activities with her friends. Her favorite activity was playing ping-pong. Since ping pong is a racquet sport, the possibility of skill transfer to tennis was probable. These early experiences and Oprah's penchant for continuing with physical activity during her pregnancy demonstrated her desire to discover behaviors for living an active life.

Oprah watched a few tennis tournaments and scrutinized certain tennis videos TV. Her goal was to imitate the skills necessary for playing tennis. She was interested in having a more structured environment in which to develop her tennis skills. When she saw the advertisement for this research, Oprah was confident in her capacity to learn the physical skills necessary to play tennis; she was anxious to become proficient at all the techniques necessary to become adept at tennis. She desired to become competent enough to have some consistent rallies with her husband. A varied background and desire to be active were both qualities that proved to be helpful in the development of Oprahôs tennis skills.

Wade. Wade was a young student in college, majoring in computer programming and engineering. Most of Wade's day was spent studying, reading research, or assisting professors with research projects. Wade was anxious to learn a new skill but his prior

experiences learning physical activities were limited to swimming and pick-up basketball games with friends. Having lived in New Mexico most of his life, Wade wanted to find a way to be active outside, and enjoy a social outlet with his friends. Tennis seemed to be an acceptable choice. Wade had watched very little tennis and did not know any of the physical skills required in playing tennis, he was eager to learn.

Wade did not remember much about his physical education classes during elementary school. He did recall playing kickball on the playground with his friends. In high school, Wade started swimming as a physical activity and continued whenever a pool was available. Wade was able to swim in his current location and expressed his enjoyment of becoming active again. Wade looked forward to having tennis as another activity option for him during the summer.

Wade had no recollection of physical education classes or of learning physical skills that facilitated his learning of tennis; therefore he was at a definite disadvantage. The lack of diverse physical experiences required Wade to be more determined and patient in developing the skills needed to play tennis. Footwork and movement did not seem to be a problem for Wade, but the contact and watching of the ball in order to strike it correctly required his total concentration. However, throughout the sessions, Wade kept his determination and belief that he could use tennis as an activity to connect with his father and brother.

With-in Case Analysis

Case 1: Trent

Perceptions and confidence of skill development. Trent commenced the first week of lessons with noticeable improvements in skill level with just two sessions. His comments

subsequent to this lesson illustrated the amount of progress being established with each session.

> I learnt that hitting the forehand with a straight arm gives my shot a lot more poweré .. learnt that the racquet should be flat and beside my body. é .I learnt how to use the power of my body and proper weight shifting techniquesé ... And to actually watch the ball before I hit it. (Journal, Week one, Ques. one)

Trentôs perception of his ability to perform a forehand tennis swing had progressed. Within the first hour of using counterfactual feedback, Trent had initiated development of critical thinking regarding the forehand skill in tennis.

> I felt a lot of difference after loosening the arm, I should be able to get more power on it, right?, or I should start on my back foot, é with my arm back,é hitting the sweet spoté on my side (Transcriptions, Trent #1).

Trentôs confidence was obvious by the comments produced throughout the sessions and within his journal entries. His comments indicated how the specific feedback made a difference in his skill level and his confidence to play tennis in differing circumstances. ñCommentsé gave me more confidence in my ability to play tennisò (Journal, Week 2, Ques.3). Trent also showed growing confidence in his ability to continue playing pursuant to the practice sessions. Trent still had a realistic view of his ability. His perception was not distorted as he continued to feel more comfortable with a simple drop rather than a distant toss. He illustrated this observation in his comment: ñdropping the ball was fine, when the

ball came in from farther away the timing was harder so I was not as confident in hittingò (Interview, Week 2, Quest. 2).

Continuing to employ counterfactual feedback and using varied equipment during week three, Trent was assured that progress was achieved.

> When we were playing with the foam balls I was swinging on both sides, and using the foam balls made me feel like I was making progress. The ball went right where you were thinking of hitting (Interview, Week 3, Ques. 2).

Trent established his favorite shot by the fourth week. After practicing, the forehand, the backhand, and the serve, his ability improved in all areas of play. The most notable change was in Trentôs preference to use his backhand, which emphasized and confirmed previous research conclusions regarding enjoyment of performance due to proficiency. ñI é improved greatly, I like the backhand. It is the most controlled and is better than the forehand.ò (Journal, Week 4, Ques. 2)

Trentôs perceptions and confidence in his playing ability continued to increase through weeks 6-8. ñé I imagine myself performing my adjusted shotò (Journal, Week 5, Ques.3). Trent realized that, when he reminded himself of the cues and visualized the motor skill prior to swinging the racquet, his confidence for a successful outcome increased. The attention to detail, exhibited by Trent, was an example of how useful counterfactual feedback could be to an individualôs perception of their ability. A reason to provide feedback is to advance the feeling of proficiency in oneôs performance so that when there is no coach around, the performer is confident that improvement may occur.

> I would love to play in a tournament and hopefully play a couple of games (Interview, Week 5, Ques. 4). This training was very helpful to me é ..Now I

know a lot of cues about proper shots and serveé é . I think my tennis skills improved greatly over the eight weeks (Journal, Week 7).

The previous comments led to the conclusion that Trentôs perception of his tennis skills improved over the course of the eight weeks. Although claiming the cause of the confidence is due entirely to counterfactual feedback is not possible, the improvement in tennis skills allowed Trentôs confidence to build enough for him to understand that he could continue to improve on his own. ñI'm pretty confident with forehand and backhand, with footwork - still semi-confident with the serve, moving around the court - love to play a game with someoneò (Interview, Week 8, Ques. 1).

Trent realized that as his knowledge of the skill components increased, his ability to adjust his performance was improved. Recognition of his capacity to improve and adjust his own play gave Trent the confidence to relax, which in turn allowed for more advanced skill development in performance. Trent comprehended the link between feedback and performance; therefore, he was able to progress unaided, giving him the desire to play more frequently to improve his skills.

Critical thinking and recognition of skill components for success. Trent was able to remember skill cues employed during the initial practice session as demonstrated in his responses during interviews and those contained in journal entries.

The feedback about the position of my feet é é made me critically think about my feet positioning (Journal, Week 3, Ques.2). The most helpful cue today was to move back arm back in the position prior to hitting a forehand. Having my arm ready to swing gave me extra time to think about how and where I'm going to hit my next shot. (Journal, Week 3, Ques. 3) ... controlling

the face of the racquet but having to hit it without any balance will make you hit up on the ball which will make the ball go up. (Interview, Week 3, Ques. 3)

Using the counterfactual feedback in addition to a slight change of equipment to develop the skill was a helpful advance. Although the use of foam balls changed the feel of the contact on the ball, the slow nature of the bounce allowed the beginning player additional time to consider the information provided prior to the performance. The adjustment in tempo permitted Trent to engage critical thinking developed, as illustrated in this comment given during the interviews in week three ñé é . Swing was the same but the contact with the ball was different. Hitting the ball, I don't think I see it roll but I feel it hit more solid; if your arm is straight then it should go flat.ò

Trent continued to improve performances by using critical thinking of each skill element. He repeatedly adjusted the swing when necessary according to the angles, positioning, and speed requirements. Trentôs deduction that consistency was key in maintaining a good performance is just one of the ways that counterfactual feedback helped him critically think about the game of tennis.

I think I need more practiceé .. (My) consistency sometimes it's good sometimes it's not, I could get one in but I would stick with the control serve rather than a hard hit (Interview, Week 4, Ques. 2). ...I like the backhand (it) is the most controlled é .(interview, Week 4, Ques. 4).

Trent demonstrated remarkable understanding of the cues and reasoning for each adjustment made during his initial skill performances. When asked about the skill components necessary for improvement, Trent was able to give concise answers.

For serving: ñkeeping the good angle to make sure it goes to the right square, reach for the ball and move forward when hitting the ballò (Interview, Week 4, Ques.1), ñfollowing through and reaching and keeping the hand straight, moving forward - trying to hit in the middle of the racquetò (Interview, Week 4, Ques.3). For ground strokes: ñwithout proper footwork you can't get a good shot, the ball won't go over the net , if you don't bend your knees you won't have as much power, that will help you be more efficient and save energy - they are important for direction of the shot, power of the shot. so it's the basis of your swingò (Interview, Week 5, Ques. 1). ñHitting a ball beside me, having my arm straight and contacting the ball on the middle of racquet. - Having my hand back before I hit it, contacting the ball on the middle of racquet, moving my body forwardò (Journal, Week 6, Ques. 2 &3). ñteaching aspect = have hand back, have a straight arm on contact, contact on the middle, have the ball on the side and try to move forward as you contact the ball, Backhand= having the ball right beside him to have the arm extended, trying to hit it in the middle of the racquet, and follow through (same as the forehand) and moving forwardò (Interview, Week 6, Ques. 4). ñcontacting the ball in the middle of the racquet, hitting the ball on the side - using proper footwork and position in order to have a good swing on both sides, watching the ball and follow through - for the forehand getting the arm back and getting ready for the shotò (Interview, Week 8, Ques. 4).

Trent commented as early as week 5, that he could apply the cues and feedback provided to him over the past weeks to adjust his game if required.

> Today, there was no problem with the forehand, usually the high balls are a problem but I was able to adjust ... to the power and control. I'll get more with control into the court but some of the power (ones) are the fun ones (to hit) even though they go out (Interview, Week 5, Ques. 2).

By week 8, Trent was secure in his ability to use the information acquired to improve his strokes when necessary.

> Some of them I remember ...using all the feedback for all of them - I try to do it before I hit - but when itôs a bad shot then I think about those comments to see what I have to work on for the next shot. For the good shots - I figure I did them right but for the bad ones I review the cues to see what went wrong (Interview, Week 8, Ques. 5).

Counterfactual feedback assisted Trent in remembering the cues for skill progression, along with permitting him to comprehend why the cues contributed to the improvement.

> é not controlling the face of the racquet but having to hit it without any balance will make you hit up on the ball which will make the ball go up. I need to have the face of the racquet perpendicular and then lift my elbow up to contact point and have a flat shoté (Interview, Week 3, Ques. 3). Keeping the good angle to make sure it goes to the right squareé (Interview, Week 4, Ques.1) Timing of when I hit the ball of the bounce. I now try to take it higher and it results in a more powerful and better directed shot. (Journal, Week 5, Ques. 2)

Students need to identify with the feedback in order for improvement to ensue. The individual must recognize why a technique works for skill progression to advance the

understanding of the concept, rather than just identifying the specific change needed in each specific skill. This recognition requires a thought process to happen during the feedback delivery. Counterfactual feedback permitted Trent to distinguish the concept required, as well as the proper technique needed, to perform each skill with proficiency.

Best timing in delivery of feedback. At the beginning of the sessions, Trentôs initial opinion was to have the feedback provided following a performance.

> I think receiving feedback after performance of the skill is the most effective for me because it helps me understand what I was doing right or wrong. So next time I perform a skill I know what I should work on (Journal, Week 1, Ques. 2).

Generally, this was an expected answer, especially from someone that had been playing sports and possessed a background which included skill development. If the individual had prior similar skill allowing for a decent performance, the student may not see the necessity of feedback until subsequent performances show inaccuracies. This is the case with Trent; he possessed mature motor skills, so performing the required skill initially was not difficult. However, when the desired result did not occur, then he was prepared for adjustments to the skill resulting in a better performance. ñThen I knew I had to adjust to improve my forehand, é .., not necessarily overnight just a couple of seconds in between feedback and performance, é . feedback helped to visualize it correctly,é ò(Interview, Week 1, Ques. 2).

Timing in delivery of feedback was important for two reasons: first, the individual has to recognize there is a problem to resolve, and second, the student should be equipped to listen to the feedback. Having these two components prior to delivery of feedback ensures a correct answer to the feedback question and retention of information for the next occasion

when the feedback is appropriate. Trent showed remarkable understanding and preservation of information when given feedback. Trentôs preference for feedback delivery was illustrated in these comments:

> For me the best time to give the feedback is after the performance on the shot, because I can take a few seconds to analyze the feedback and imagine myself performing my adjusted shot (Journal, Week 5, Ques. 3). There was a feedback during today's lesson that I remember well. It was given when I was hitting high balls on my backhand. The feedback was to lift my elbow higher and do a full swing (Journal, Week 6, Ques. 1).

Trent emphasized that for him, getting new feedback after a performance was helpful; however, his comments indicated that once he identified the feedback of a specific skill ï he reminded himself of the cues prior to his performance:

> If I remind myself of all of the cues, I run through the shot in my head before I hit it. Imagining a shot actually helps me (Journal, Week 6, Ques. 6). é I had to remind myself before we swung - using all the feedback for all of them - I try to do it before I hit - but when itôs a bad shot then I think about those comments to see what I have to work on for the next shot. é . (Interview, Week 8, Ques. 5).

Remembering cues and feedback prior to performance allows the individual more control over the skill development, so even if the skill goes awry, corrections can be performed without requiring assistance.

Likelihood of continuing the activity in the future. The recognition of improvement and assurance of continued progress assisted Trent in realizing the advantages

of continuing to improve his abilities. Even after the first practice session, although recognizing his limitations, Trent was willing to consider playing a match against someone: ñé . If I were to play a tennis match today my forehand would still be weak since I didn't have the correct basics before the lesson. I will use all of the new points that I learnt today. ..ò(Journal, Week 1, Ques.3).

By the second week, Trent was anxious to play as much as possible in order to advance his skills. ñYes, I will definitely try to play tennis as often as I can. Now that I'm learning proper shot techniques the game of tennis has become way more fun for me than before.ò (Journal, Week 2, Ques. 4). As Trent indicated, for him seeing progress in learning the activity became more enticing and fun. Once this allure of the game was present, even learning a new skill did not deter the enjoyment, and Trent now made concessions when deciding about playing: ñI think I need more practice, don't have stability, consistency sometimes it's good sometimes it's not, I could get one in but I would stick with the control serve rather than a hard hitò (Interview, Week 4, Ques. 2).

Knowledge led Trent to desire more activity, even attempting to recruit friends to play with him, especially those he recognized as having the basic skills required to grasp the concepts he had learned quickly: ñI'll try to convince my friend Michel to play tennis. He's a soccer player, and he's very athletic and fast. I believe he'd be a good tennis playerò (Journal, Week 5, Ques. 4). Trent continued to comment about the desire for continued play and for advancing his ability in complex situations. As Trent became more confident in his skills, he also that proficient play was a possibility: ñI would love to play in a tournament and hopefully play a couple of games (Interview, Week 5, Ques. 4). ñé - love to play a game

with someone. é as often as Donna (daughter, 3 months) lets meò (Interview, Week 8, Ques.7).

Case 2 – Sabrina

Perceptions and confidence of skill development. Sabrina had previous minor experience with tennis. However, the little tennis she played years ago had left Sabrinaôs confidence compromised, and tennis skills were non-existent now. As her experience stemmed from over 30 years ago, knowledge of most tennis skills was missing, and she had forgotten how to perform the tennis skills. Body composition, as well as additional physical ailments had Sabrina questioning the value of attempting tennis skill development at this stage in her life. This concern was expressed in the initial Journal Entry:

> é How confident am I in performance? I would rate myself only marginal because I currently donôt have much control over where the ball goes, but again, I know that takes practice. Also I am still working on seeing where the ball is. Wearing the correct glasses next time might help, particularly when it comes to depth perception and lack thereof (Journal, Week 1, Ques. 2).

One advantage of counterfactual feedback is developing a studentôs confidence in their ability. Sabrina seemed to understand this concept, as illustrated in her comment at the end of week one.

> é It was helpful to hear and I needed to hear it before, during, and after the performance in order to keep it fresh. Yes, it gave me confidence about being able to hit the ball correctly, then if I missed the ball I knew why I had missed it (Interview, Week 1, Ques. 2).

In Sabrinaôs case, physical limitations were preventing her from feeling confident in her capacity to improve her skill, ñé knowing on the backhand, confidence is mostly visual, when I can visually see the ball coming and I know where the ball is then I am okay swinging for the backhand sideò (Interview, Week 3, Ques. 2) This comment was encouraging in spite of Sabrina's visual limitations, she realized the discernment of skill components was necessary for improvement. When Sabrina could see the ball, she was confident in completing the skill successfully.

Counterfactual feedback assists the individuals in concentrating on the positive elements of performance and the reasons why the successful performance occurred. The positive concepts approach seemed to work well for Sabrina: ñThe feedback was definitely more helpful! é Helping me to focus on the positive and staying out of the negative side of my head was very helpfulò (Journal, Week 7). For a beginning player, such as Sabrina, to realize the positive aspects of her game allowed her to stay positive and continue building the confidence necessary to maintain a desire to play.

Some of Sabrinaôs comments indicated the importance of tone of voice and positive content when feedback is delivered.

> I remember all the positive feedback, specifically when you used an excited tone of voice (Interview, Week 1, Ques. 1). All of your positive feedback. If you think I can do it, then it makes me feel like I can do it (Journal, Week 2, Ques. 3). Positive tone of voice was most helpful, it helped me to know when I did well (Journal, Week 4, Ques. 1). No matter what, you kept the feedback positive. When I made mistakes, you pointed out how to correct it, but also found positive in what I did despite the missed ball. You helped me to

remember that I did have strengths and areas of improvement (Journal, Week 7).

The previous comments specify how counterfactual feedback, given in a positive manner, alters the studentôs perception of the improvement and ability.

Critical thinking and recognition of skill components for success. Sabrina was very eloquent throughout the entire study. She illustrated the positive impact that counterfactual feedback had on her tennis performance.

> é being prepared to swing with my racquet already back is good, but so was using the middle of the racquet after waiting for the ñrightò height and bounce. (Journal, Week 1, Ques.1). Remember to wait for the bounce é (Journal, Week 1, Ques.3). The feedback about ball position and body alignment to determine where the ball will go (Journal, Week 2, Ques. 1). Remembering where the ball is in relation to the rest of my body (Interview, Week 2, Ques. 1). Be aware of where the angle and tilt of the face of the racquet, so control of the face of the racquet, and where is it within the frame of my body before I swing. it doesn't matter what the racquet tilt is if you don't hit it in the right place on your body you are already behind (Interview, Week 2, Ques. 3). é . be aware of where you are hitting the ball in relation to position of the racquet and position of your body. Keep your eye on the ball and use the middle of the racquet with a slow relaxed swing. é Wait for the ball to be where you want it to be (Journal, Week 3, Ques. 1). é . swinging with the whole body, a low ball and I dip down and contact the ball going over seems effortless (Interview, Week 3, Ques.2). Slow down, pay attention and wait for the ball

to be in the correct position. Follow through! (Journal, Week 3, Ques. 3).

Forehand, wait for it, notice where it's hitting on the racquet as well as where the racquet,é try to get in position before the ball gets there, keeping your eye on the ballé .. backhand side: on both sides remember to point with your foot toward the direction you want to go and shift your body weight, try to line it up ahead of time, making sure to follow through, much better when I follow through (Interview, Week 3, Ques. 1).

At the beginning, Sabrina showed a great memory for cues provided for skill development. But many of the comments did not indicate understanding of the concepts needed for development. There was one exception:

Overall the feedback I remember keeping level on a high ball, not how hard you hit but the speed of the racquet will determine the consistency, and a slow swing in order to hit a short ball (Interview, Week 1, Ques. 1). After the first two weeks, most of the comments started to demonstrate some critical thinking illustrating Sabrinaôs understanding of the concepts in tennis and more than just the specific cues for the performance. For serving: Having a consistent ñtossò so that I can hit the ball at the optimum time (Journal, Week 4, Ques. 2). Timing, racquet position and body position along with the speed of your swing are crucial to a consistent game (Journal, Week 4, Ques. 4). follow through, pay attention to where the ball is so just let it go if it's not in the right place, making contact with the ball - and then adjust the contact after you see where the ball goes into the net or out then you can adjust (Interview, Week 4, Ques.4).

In Sabrinaôs case study the development of critical thinking was evident in the altered remarks. The early comments were rote memorization of the cues necessary to perform the skills correctly. Once the critical thinking and counterfactual feedback established functionality, the concepts necessary for successful skill performance were manifested in the adjusted language. Sabrina articulated the cue and explanation of why the prompt worked, rather than merely the cue itself.

> Predict the direction of the ball before hitting and waiting for the ball with the proper position for hitting, have right foot in position- when my right foot is in front of me, I need to hold the racquet behind me (Journal, Week 6, Ques. 4).
>
> Get the toss high enough and in front, watch where your body is faced and feet are pointed. Remember you don't have to kill it, speed doesn't necessarily mean better, be a little choosy with your toss, no need to just hit anything. It is contrary to our instinct that we don't have to hit it hard all the time (Interview, Week 4, Ques. 1).

Best timing in delivery of feedback. Individual students are often unique in the amount and type of feedback for successful improvement and skill development. In this case, Sabrina, annotated how the use of many feedback comments delivered at different times was most effective for her.

> I need lots of feedback and that is the way my brain works. I am constantly reviewing and analyzing what went wrong and trying to correct it (Journal, Week1, Ques. 2). Yes, it was helpful I understood it better and then could make adjustments and have a better application to the performance. It was

helpful to hear and I needed to hear it before, during, and after the performance in order to keep it fresh (Interview, Week 1, Ques. 2).

Due to Sabrinaôs analytical nature, her understanding of the feedback was immediate, but her attempt to physically modify the results of a skill transpired gradually. Sabrina explained her understanding of tennis success in this comment:

> Consistency is a bit of a problem, but I know I just need to practice (a lot!) é .I currently donôt have much control over where the ball goes, but again, I know that takes practice. Also I am still working on seeing where the ball is (Journal, Week 1, Ques. 2).

It seemed that Sabrinaôs comprehension of the concepts and the necessary requirements for improvement were clear during the practices. Some of the delay in physical response may have been due to age, or lack of consistent physical activity performed in recent years, or to vision problems with depth perception.

Likelihood of continuing the activity in the future. Sabrina showed that she continued to have a good attitude toward her ability to play tennis with others.

> I think so ï the only problem for me might be to find someone who is willing to play with me; especially in my novice state of play. It is a lot of fun and good exercise, so I do want to continue. (Journal, Week 2, Ques. 4).

Sabrinaôs initial excitement concerning the continuation of tennis play did not diminish but seemed to accelerate as we continued sessions. ñespecially if I was playing against someone who was also a beginneré . (Journal, Week 3, Ques. 4).

Sabrinaôs inability to physically change outcomes did not seem to affect her view on future performances for herself. Knowing the correct way to perform the skill encouraged

Sabrinaôs resolve to persist with practicing each skill, regardless of her seeming inability to immediately correct the skill. ñThis is fun é ò (Journal, Week 4, Ques. 4). Sabrinaôs ability to distinguish and comprehend what should occur for a successful performance cultivated the desire for continued learning of the skills regardless of the short term failure.

Case 3 – Oprah

Perceptions and confidence of skill development. Oprah had some noticeable experience with basic fundamental movements that allowed her to learn elements of the tennis skills quickly. She saw results almost immediately. Oprah had not played tennis before, but after the first week, saw an increased ability to adjust to the ball with considerable ease. ñWatching the ball is the hardest for me and to moving forward on the hit, confident on hitting the forehandò (Interview, Week 1, Ques. 3).

Oprahôs expression of confidence was articulated early. Confidence in physical ability was not unusual for someone with her background and familiarity with different sport experiences. ñThe specific part which I improved was thinking about aim before hittingò(Journal, Week 5, Ques. 2). Being able to adjust technique and consider consequences showed the assurance Oprah had in her tennis ability. Tennis serving is a distinct motion, different from other motions found in sports and often difficult for athletes with other sports experiences to master. Oprah was able to expertly adjust her swing and reach for the ball on the service motion, which allowed her to feel comfortably aim the ball right away. ñé . Serve, I'm comfortableé .. but I could just get the serve in the proper position when neededò (Interview, Week 5, Ques. 3).

Confidence when serving in tennis often translates to certainty in other areas of their tennis game. Oprah showed transformed belief in her other tennis strokes through other

remarks delivered during the last weeks of practice sessions. ñé ..last time was more productive, because I have better skillsò (Journal, Week 7). ñProbably use more placing the ball on the racquet, like hitting a short or longer ball é é ò (Interview, Week 8, Ques. 5). Oprahôs faith in her ability to accommodate and adjust while rallying with a partner, or to think about the modifications that needed to be made during a game, illustrated how far her ability to understand the concepts had developed.

Critical thinking and recognition of skill components for success. Each case study had different beginning comments which exemplified how counterfactual feedback statements were important in the beginning. Oprah was no different. She had many good statements demonstrating the importance of learning the concepts and cues to advance the performance to a proficient level.

> The most specific part of the forehand skill which was affected by the feedback was using my whole body to hit a forehand. Because when I tried to do forehand moving my body forward it helped to hit more powerfully and easy (Journal, Week 1, Ques. 1). I will useé arm straight, hit ball to the centre of racquet (Journal, Week 1, Ques. 3). Control my body, need to hit in the middle of the racquet, hit the ball on the top of the bounce, have to put my arm back before the ball comes, follow through in back (Interview, Week1, Ques. 1). Hit the ball in the middle of the racquet, hold my arms straight when I want to hit a high ball. When itôs low I need to bend my knees, I need to use my right foot when I want to use my right side or left side hit, when I hit on the right side reach the ball earlier for the left side I need to wait a little bit. When the fast swing is easier to hit on the right side, it depends on the speed

of the ball coming at me (Interview, Week 2, Ques. 1). For forehand- if the ball is low I have to use knees. For more powerful hit use the body. The best ballôs position is beside me. Before hit the ball I need to put my left foot in front of me. I have to hit the ball on the middle of the racquet. For backhand- - if the ball is low I have to use knees. For more powerful hit use the body. I have to hit the ball on the middle of the racquet. Before hit the ball I need to put my right foot in front of me. If I want to hit on the right site of the court I have to hit a little bit earlier then for the left side (Journal, Week 3, Ques. 1).

Oprah discovered early preparation (footwork and positioning) and contact assisted with successful execution for many skills in tennis.

é . I need to contact the ball earlier, it's easier for me to use the two hands and helps to control your power, not really location but more with the power (Interview, Week 3, Ques. 1). First time it's easier when I toss a little higher than needed so when I toss after that then have a little lower toss after I warm up. After hitting in the net? Then I have to change the height of the toss, and changing the racquet position to a different direction (Interview, Week 4, Ques. 3).

As Oprah understood the changes and concepts needed to improve her individual skills, her conversion into a tennis player continued. By the fourth week, Oprah was adept at verbalizing the concepts needed for playing a game of tennis and expressing the adjustments necessary to improve an individual skill following a poor performance. Oprah was aware of her comfort zones for each of the skills being practiced. The following remarks show the extent to which she can adjust the skill when needed.

é when I change my foot position, it helps to change the ball direction, it helps to have the right foot position itôs easier to hit; then when I have the wrong position I have to use other body parts to get it over (Interview, Week 5, Ques. 1). Sometimes I have trouble with when I want to reach the ball and if I have the wrong position and if I have to run too far and I can't get the two hands on the swingé (Interview, Week 5, Ques. 2). Usually thinking about hitting it late or early when you see ball coming to you and the direction I decide whether to swing early or late - for a backhand usually think not open face on the racquet as the forehand. High ball coming= I try to get my arms up high and turn my racquet to a lower face position (Interview, Week 5, Ques. 4). Predict the direction of the ball, probably wait before hitting or hit sooner, use my knees if ball is low (Journal, Week 6, Ques. 4).

The ability to teach a skill to another student can be used as an assessment of learned concepts. Oprah mentioned specific cues and feedback she would use to assist a friend to start playing tennis.

You should start in the right position, with foot position, and you have to wait for the ball and watch the ball all the way to your racquet, your racquet should be behind you and ready - hitting to the left side you have to swing earlier and for the right side you have to wait. Correct position? In front step your left foot in front and right foot behind - when you swing and hit the ball you need to push off your right foot. Backhand? Same but it will be different for the feet and for waiting on the ball (Interview, Week 8, Ques. 2). Try to change sometimes change the racquet position or the face of the racquet or sometimes

use my knees if it's low or sometimes wait longer before I hit it (Interview, Week 8, Ques. 4).

It is apparent by Oprahôs statements that critical thinking occurred throughout the eight weeks of practice sessions for tennis skill improvement.

Best timing in delivery of feedback. Oprah considered the feedback and applied it effectively, and she preferred to have it before performing the skill or during the skill. She favored recognizing the resulting problem and immediately correcting or adjusting it as the skill developed to better understand the predicament and the resulting solution.

> The best time for receiving feedback is prior and during performance, because when I receive feedback prior it helps me to think about my actions before. Feedback during performance helps me correct my actions and provides an opportunity to do the right hit (Journal, Week 1, Ques. 2).

Preferring to have feedback early, showed that Oprah was very reflective in how she learned a physical skill. She preferred receiving feedback early and performing many specific skill sequences in order to master the skill. These tendencies indicated a preference for specificity when learning a new skill and supported her partiality for detailed information.

Although the language barrier did get in the way several times during the discussion of these questions, Oprah was able to communicate her pleasure and opinion about the usefulness of this feedback.

> Yes, helpful é . don't spend a lot of energy when I'm hitting the ball (Interview, Week 1, Ques. 2). Because it's usual for me to hold my racquet when the face of the racquet face is pointed up, so the best cue was to explain about the racquet face being pointed up and that is where the ball would

> go(Interview, Week 3, Ques. 3). The most helpful (changed) part of the backhand skill was using my 2 arms. It helps to do my hit more powerful and directly (Journal, Week 2, Ques. 1).

Oprahôs comments emphasized the changes most beneficial in correctly performing the skill. Once the researcher understood Oprahôs preference of knowing the skill components early, the feedback was given to her prior to performance on each occasion.

Likelihood of continuing the activity in the future. Counterfactual feedback was ideal for Oprahôs situation and her personality. When asked if she would like to continue to play tennis in the future, she responded: ñYes, I doò (Journal, Week 2, Ques. 4). Oprah may continue to improve her skills and discover more enjoyment. One difficulty in continuing tennis play is locating others to compete against. ñI do not have friends of the appropriate age for this game at this time, but my husband and I will playò (Journal, Week 5, Ques. 4). As Oprahôs confidence increased through the weeks of practice, it altered her notion of playing in a regular tennis match.

> It will be more comfortable if I play against someone who plays better than I do - because of the speed of the return, it's easier to judge the ball if it comes back faster. It helps to learn more to be able to copy what they are doing (Interview, Week 8, Ques. 1).

A studentôs positive perception of skill improvement without constant feedback is another characteristic of counterfactual feedback. In Oprahôs case, her secure position for continued development of her skills was revealed in her statement: ñimprove the skills on your own? Yes, I have the tools to keep working on the skills on my ownò (Interview, Week 8, Ques. 6). Although Oprahôs English skills were not as fluent as those other participants,

counterfactual feedback still seemed to assist her performance through increased knowledge of tennis components, improved overall tennis skills, and enhanced confidence in tennis acumen.

Case 4 – Wade

Perceptions and confidence of skill development. Wade was the slowest of the participants to show confidence in his tennis skill ability. He was least experienced of the participants, and Wade only had a few other sports experiences from which to draw. Wadeôs background was mainly in swimming or recreational basketball. He had participated in some racquetball with a friend, but Wade was the most novice athlete of the participants and the truest beginning tennis player. The researcher was unsure whether Wadeôs perceptions of his abilities would change throughout the case study with the use of counterfactual feedback. However, after one session of practice, with the use of counterfactual feedback, Wade was able to voice confidence in his improvement. ñé I at least feel like I'll have a chance to keep the ball going with my improved forehand swing, which is a significant improvementò (Journal, Week 1, Ques. 2). Wade continued to voice increased confidence after the first week of practice sessions were completed:

> Suggestions would allow me to adjust my forehand and then helps me to improve your performance, and helps me feel more confident in playing not just the skill, position of the ball where it's going to be will vary widely, I'm more able to adjust to where the ball is so it will allow me to be more confident in playing tennis overall (Interview, Week 1, Ques. 2).

Wade understood the feedback goal and reiterated the intent when it was helpful for his improved skill development. ñé . Not really one thing, but learning the conceptsò

(Interview, Week 2, Ques.1). Wade had excellent recall and deliberated when answering the questions posed to him during the practice sessions. He analytically compared the performance result with the feedback provided. Wade scrutinized the situation in order to better comprehend the sequence and results of each performance. Wadeôs prolonged deliberation and examination of concepts for tennis skill acquisition may result from the everyday habit of considering all possibilities with programming a computer, since that is his job during the day.

Wade remarked on his increased confidence after performing a more difficult skill. ñTossing from farther actually builds confidence even though itôs harder skill but getting better at the more difficult and then when you succeed it feels more like you will be able to play.ò (Interview, Week 2, Ques.2). Wadeôs statement given in the third week illustrated increased confidence concerning his tennis match play. ñI won't be able to hold my own against someone who has been playing for a few months, but it is definitely improvingò (Journal, Week 3, Ques. 4).

As Wade continued to build his confidence in his ability to play tennis, he discerned other qualities that tennis cultivates for individuals:ñEnjoyment, challenge, exertionò (Journal, Week 4, Ques. 4). The concept that tennis is about more than just a specific way to hit a ball is a factor not anticipated as a result of counterfactual feedback. Wade continued to voice confidence in his ability to improve. ñé probably wouldn't be able to hold my own yet but I'm definitely improving. é ò (Interview, Week 5, Ques. 3). ñé No consistent problem with anything so no specific statement that made a difference todayò (Interview, Week 6, Ques. 4).

Wade improved in tennis skill level as well as in understanding the complex concepts of the game. Although he felt incapable of playing an experienced tennis player, his comments continued to show increased confidence in his ability to improve his skills.

Critical thinking and recognition of skill components for success. Wade was a true beginning tennis player with very little transferable sports experiences from which to draw. His beginning status did not deter him from accepting how counterfactual feedback phrases were enhancing successful improvements in his skill development. Wadeôs ability to enumerate the skill components after a practice session confirmed his comprehension of the procedures necessary for successful execution.

> é the arm should "follow through" during the swing (Journal, Week 1, Ques. 1). é trying not to hit the ball prematurely, before it reaches my side, adjusted height of the swing depending on if I changed by bending my knees, so the swing was adjusted when you bend your knees, depends on the ball - if that ball is lower to the ground, then I have to bend my knees and the center of mass would have to be lower in order to get the ball over the net (Interview, Week 1, Ques. 1).

Wade seemed to grasp the intricacies of positioning the racquet and body alignment prior to contacting the ball very quickly. Many of Wadeôs statements showed his appreciation for the element of body and racquet position for the performance to be a success.

> é . where the ball is related to my body and where the racquet is, and also my side run (sliding) - largely a matter of practice, as I continue playing, getting used to how the ball bounces, how fast itôs moving and how fast it will be for me to get to it and the arc of the ball? Summer I played racquetball so having

> to adjust to the different in the bounces, May have helped a little because the behavior of the balls are different é doesn't make it any easier to predict where the ball is going (Interview, Week 1, Ques. 3).

Wade seemed to appreciate the complexity of tennis, realizing that having the skill performance does not guarantee a successful attempt on every contact. He appreciated the number of uncontrollable variables contributing to a successful result.

Wade improved his understanding of the intricate concepts in tennis throughout the next couple of weeks of practice. Constant adjustments and technical elements were obvious in many of Wadeôs statements. His physical ability and progress to become a tennis player was not as apparent as his comprehension of the concepts necessary to advance his tennis game

> The direction you twist your hand during a backhand swing is the opposite to the direction you twist your hand during a forehand swing (Journal, Week 2, Ques.1). é moving your body into the swing will make the swing easier and will reduce the strength demand on your arm (Journal, Week 2, Ques.2). é adjusting the height of the racket when hitting a high ball. é making sure to hold the racket at the ready position behind me (Journal, Week 3, Ques.1). The relationship between the arc and height of the ball when hit, and the angle of the face of my racket relative to the ground (Journal, Week 3, Ques.2). Position of the ball relative to where I was on the court, é and the angle of the racquet at the point where you strike the ball, and the direction that you step toward. for forehand hits cross court, on the backhand it needs to be in front of you for it to hit cross court, the opposite for the forehand, so the same concept.

> The ball relative to where you are and the racquet face will determine which way the ball flies (Interview, Week 3, Ques. 1). Being more conscious of where the ball is relative to where I am and how that effects the direction the face of the racket is facing when the racket makes contact with the ball (Journal, Week 4, Ques. 1).

The geometric qualities in tennis are sometimes confusing to those attempting certain skills, but for Wade these concepts seemed to make sense. Clarity in one area, allowed for more discernment of skill execution needed for success.

Power is often a misunderstood concept for many beginning tennis players. When watching professionals, it seems they hit with as much power as possible on every contact. The beginner is often confused into believing that power is the proper way to hit every ball. Unfortunately, although hitting with power is enjoyable, there is much more involved in proper contact than just power. Wadeôs perception of power necessary for execution of a tennis swing was very realistic and quite exceptional for a beginning player.

> é generally the forehand doesn't require as much power as the backhand. for the forehand is a more natural swing than the backhand is. é initially it was easier to do forehand but now both are very even (Interview, Week 3, Ques. 1). The service motion is another area that many beginners do not comprehend right away. When throwing the ball into the air, remove your fingers from the ball instead of allowing the ball to spin off of them. Try to make sure the height, direction, and spin of the ball are consistent, with the ball's maximum height approximately one half of a racket above the top of

your racket when your racket arm is fully extended upward (Journal, Week 4, Ques. 3).

Wade was aware of the technique required for serving, albeit the actual physical performance of serving did not consistently match the knowledge he had.

Wade expressed his discoveries during the practice sessions eloquently, emphasizing the specifics of how to successfully perform the tennis swings:

> I think the swings and I, didn't know before this, I didn't know what to do but didn't take into account the factors that go in it, knowing the face of the racquet when it contacts the ball, where the ball is when I contact it according to body position, the details of the swing and the follow through so it goes on a straight line or up in the air. The details would help me to know what I'm doing wrong, and positioning the ball relative to where I am. I hadn't considered where the ball is when I make contact with it (Interview, Week 4, Ques. 4). Predict the direction of the ball before hitting and waiting the ball the proper position for hitting, have right food position- when my right foot is in front of me, to hold the racquet behind me (Journal, Week 6, Ques. 5). Where the ball is relative to me, where to move and how close to get to the ball - I know what distance from the ball I should be so that I have my arms extended so that you can make use of your arm positioning and can't put a lot into the swing if you don't have that extension. It's more using your wrists (Interview, Week 6, Ques. 3). The main one is where was the ball and where was the face of the racquet facing when I contacted it so that

I can adjust it for the next one and make sure the face is pointed where I wanted the ball to go (Interview, Week 8, Ques. 5).

Positioning of the ball was accentuated during many of Wadeôs written responses concerning tennis skill development. It is well-known that the symbiotic relationship between ball position and body position resulting in a successful performance is one that most beginners do not grasp. Foot positioning prior to ball contact is another challenging concept for beginning tennis players to comprehend. Wade showed his discernment of the importance of a stable foot position when performing his swing:

...It seems to make a difference, need to be in a stable position, it makes it easier to control your swing if your feet are planted before the actual swing happens. é ..It does make more of a difference in control, and also the power so that I can put my feet into the swing (Interview, Week 5, Ques. 1). For the positioning of my feet, the distance between the racket and the ball, controlling the power of the swing, following through with my swing (Journal, Week 6, Ques. 1).

While many advanced tennis players do not appreciate the connection and importance of foot work on the correct execution of the swing, Wade seemed to understand this concept earlier than many players.

Best timing in delivery of feedback. Wade preferred to receive feedback after the performance. He was convinced that receiving the feedback after performing allowed him to adjust his technique and be more successful on the subsequent performances:

After. During this time, the instructor would point out errors in my technique and make suggestions about what to change. I at least feel like I'll have a

chance to keep the ball going with my improved forehand swing, which is a significant improvement (Journal, Week 1, Ques. 2).

Wade acknowledged that his perception of his improvement may be skewed, but the statement showed that perception and execution were separate issues when learning a new physical skill.

Wade applied the counterfactual feedback provided during the practice sessions. Wade recognized that feedback was helpful, and his progression in skill level throughout the eight weeks could be associated to the feedback: ñsuggestions would allow me to adjust my forehand and then helps me to improve your performanceé ò For Wade, the positive feedback seemed to be just as motivating as the counterfactual feedback, as illustrated in this comment: ñAcknowledging when I did something right, and encouraging me to investigate what aspect of my swing was incorrect when I did something wrong and figuring out how to correct itò (Journal, Week 2, Ques. 3).

Wade could analytically express how counterfactual feedback should theoretically perform on beginning tennis players. The description Wade provided demonstrated the level of comprehension he retained concerning the counterfactual feedback method.

> This method seemed to involve letting the student perform the skill, then encouraging the student to analyze the details of how he/she performed the skill, how those details affected the performance, and determining what adjustments should be made to improve the performance of the skill. I thought it was very effective (Journal, Week 7).

Understanding the structure of counterfactual feedback is not essential for the participant, but it was encouraging to hear that the student recognized the benefit and appreciated the technique.

Likelihood of continuing the activity in the future. During the practice sessions, the researcher emphasized the possibility of playing on their own, and encouraged the students to see all the opportunities available for participation. This concept of choosing to play, did not translate very effectively as is shown by the comments Wade completed concerning the continuation of his tennis participation: ñI might. I am undecided at this point. ñThe problem is that I don't know anyone else who plays tennisò (Interview, Week 2, Ques. 4). Wade identified some qualities of tennis that would entice him to continue performing the activity in the future. ñEnjoyment, challenge, exertionò (Journal, Week 4, Ques. 4).

Although Wade experienced ñenjoymentò in the activity, the perception of his ability to play tennis was realistic. ñI won't be able to hold my own against someone who has been playing for a few months, but it is definitely improvingò (Journal, Week 3, Ques. 4). Wadeôs concept of his serving prowess was understandable since he only spent one and a half weeks on the skill: ñeventually I will do it but the person might get impatient since it takes longer for me to get the toss correct and to swingò (Interview, Week 4, Ques. 2). Wade still identified the problem with continued participation with not having a partner, even though for most of the sessions he performed skills on his own:

> I don't know many people outside of my family. I might try to convince my father or brother (Journal, Week 5, Ques. 4). é probably wouldn't be able to hold my own yet (in a tennis tournament) but I'm definitely improving. I think

> I want to continue to improve and play if I can. Don't know if I would invite someone to play yet, it's possible if I had someone in mind but I don't know anyone that would want to play (Interview, Week 5, Ques. 3).

Wade's comments indicated the desire to continue improving and the comprehension that attaining increased ability is not impossible.

Cross Case Analysis

In a multiple case study, a single case is important because it belongs to the collection of cases. The more cases and the greater variation there is across the cases lends to the more convincing interpretations of data collected. Multiple case studies also enhance the external validity of a qualitative case study and the generalizability of the findings depending on the distinctiveness of each case. Merriam (2009) recommends performing one case at a time due to the large quantity of data needed to be collected for each case. This study was done in a collective manner which assisted in building abstractions across the cases and general explanations affecting each individual case. The multiple case study design used for this research provided the primary researcher with the opportunity to give meaning to the participantsô reactions to the feedback and allow more comprehensive insight into the advantages of using counterfactual feedback in teaching a new physical skill. The following were external factors found to affect each case study similarly.

Adult Learners. The assertion that adult learners are better able to remember complex concepts due to learned previous complicated information was quite apparent. From the first week all participants were able to separate out the concepts necessary for their successful performance of each skill. In week one, each participant required differing skill concept emphasis, since individuals tend to be proficient at different parts of the skill. Putting

an emphasis on the areas that were needed for proper improvement necessitated accenting a different part of the skill. Overall, each participant was able to recall the components of the skill that had been specified for them directly following the session. All participants were also able to remember the particular phrases after the fifth week of practice.

> There was so much it is hard to pick just one. I think being prepared to swing with my racquet already back is good, but so was using the middle of the racquet after waiting for the ñrightò height and bounce (Journal, Week 1, Ques. 1). Making sure that the face of the racket is facing downward when contacting the ball, meaning that I had to wait a little longer after the toss before swinging (Journal, Week 6, Ques. 3).

None of the participants had trouble remembering the cues given to them during the practice sessions for each skill. Developing the autonomy to correct a faulty tennis swing was one of the goals of counterfactual feedback, from this evidence obtained across all cases, it seems that self-sufficiency is possible.

Physical Limitations. Physical limitations do not necessarily inhibit the production of self-efficacy for the activity. One of the participants was battling macular degeneration in one eye, leaving her with very little vision on the left side. Limited physical improvement was seen for this participant throughout the eight week sessions. Regardless of this limitation her self-efficacy for tennis continued to improve throughout the practice opportunities. The researcherôs summary notes showed consistency in performance of actual physical skill had not increased for this participant but her perception of her ability to play tennis and confidence continued to improve.

> Some more practice I'll be able to feel like I can do it from the back. I have the tools that I can correct myself while practicing (Journal, Week 4, Ques. 2).
>
> The feedback was definitely helpful! I found positive in what I did despite the missed ball. Helping me to focus on the positive and staying out of the negative side of my head was very helpful (Journal, Week 7).

In this case, finding a way for a physically disabled individual to feel increased self-efficacy for movement was produced through using counterfactual feedback during practice sessions.

Environmental. Timing of the study was not ideal. The middle of summer tended to produce extreme heat as well as excessive temperature fluctuation. The temperature fluctuation was a bit problematic for consistency of schedule in the practice sessions. The participants accommodated and adapted to the heat, wind, or rain chance with no perceptible interruption of concentration. Most of the participants had lived in this community long enough to be able to alter attire and expectations for an outside performance without undue stress.

The researcher communicated with each participant regularly throughout the day prior to the practice time assuring the participant was comfortable with the conditions before each session. Rain storms often develop quickly in the summer, and there were a number of days that adjustments were needed after starting the session. The participants did not comment on the heat or the rain interruptions in their journal or interviews. Interruptions in training did not lead to consistent development of skill, so it was worth noting in this research the possibility of the weather affecting the learning process.

Heat was only an issue on two occasions. When drinking water was gone for the participant, it was decided to cut the session short. The second time the participant decided to change the time to allow the heat to dissipate. Rain storms came a few times and adjustments on time schedules were made. The participants were very tolerant and calm about the changes. Alterations to the scheduling changes did not seem to strain the students in any way.

During the third and fourth weeks of practice sessions, the sun became a factor for two of the participants. Changing the schedule to meet at noon to alleviate the heat factor for one of the participants was helpful, but it accentuated the problematic angle of the sun when tossing the ball up for a serve. As the participants were not aware this would be a problem, they were not wearing a hat, which may have provided some relief. A consensus reached to work on another skill until a cloudy day. Watching the contact point on the racquet for a serve is very important, so not being able to view the contact point for a beginner may impede progress.

One participant expressed concern with the noise around the courts. ñ- I don't play as well when traffic goes by, I get distractedò (Journal, Week 2, Ques. 2). The courts were in a very quiet part of the campus, but there was some traffic around the perimeter, as well as some trees planted strategically to provide shade. Birds enjoyed the tree cover and often in the evening became quite loud. Only one participant was affected by the noise, the other students did not seem to have a problem with the noises around the practice session area. The only adjustment made for this eventuality was to change the meeting time for the individual in order to have a quieter environment allowing for better concentration.

Motor Skill Experience. Experience with motor skill development prior to the study and consistent practice during the study appeared to create progress and improved

development of tennis skills in participants. This study was not investigating a measurable skill development as an outcome; therefore, the additional practice of tennis skills outside of scheduled practice sessions was not a limitation of the study. The researcherôs knowledge of added practice outside of the scheduled sessions for some of the participants did not affect the results of this study.

From the researcherôs observations and summary notes, there was obvious differential in the beginning motor development of each of the case study participants. Two of the individual case study participants had considerably more advanced hand-eye, and foot-eye coordination than the other case study individuals. Variability in traits across cases lends itself to more enhanced interpretations of the study (Yin, 2008).

> Her ability to distinguish where the ball is going to be so that she can hit it, is not good. Her macular degeneration comes into effect a lot on this side and she was missing quite a few balls at this distance (Sabrina, Researcher Observation, #3). It seems when the ball comes at him from the left side he has a harder time adjusting his footing so (Wade, Researcher Observation #3). Demonstrating the footwork for down the line and cross court hits was a success as he was able to adjust his footwork right away (Trent, Researcher Observation #2). I only had to have her look at the face of the racquet once to show her why the ball was going so high up in the air and she adjusted (Oprah, Researcher Observation #1).

Measurement of actual skill improvement was not done for this study. Regardless of the diversity in skill levels of participants at the beginning of the study, specific changes in skill improvement were not measured. Only testimonials of developed confidence in ability

were recorded for evaluation. The researcher did observe rapid development in confidence concerning their tennis skills from each of the participants.

Confidence Development. Noticeable differences in previous motor skill development from certain participants may have contributed to the quicker advancement of skills in those individuals. Motor learning research posits transfer of motor skill is possible, however, research showing confidence increases in athletes who are more proficient does lead this researcher to question the progressive advancement of confidence from the participants with analytic tendencies but less motor skill proficiency (Alderman, 2008; Feltz, Short, & Sullivan, 2008). Nevertheless, comments show increased confidence of tennis skills was evident from all the participants, regardless of their beginning motor abilities. In fact, one of the participants with the least amount of prior motor skill proficiency commented on week two about the confidence being developed.

> Tossing from farther actually builds confidence even though its harder skill but getting better at the more difficult and then when you succeed it feels more like you will be able to play. If you would play would you more confident in forehand or backhand? Equally now but last week I would have said the forehand (Journal, Week 2, Ques. 2). I think my backhand has improved a lot over last 3 practice sessions. If I hit it slowly I think I can get the ball into the court most of times. I don't know how my backhand will be in a real tennis match when balls will coming at me at a much higher speeds, but at lower speeds I'm pretty confident in my backhand (Journal, Week 3, Ques. 4). The specific part which I improved was thinking about aim before hitting (Journal, Week 5, Ques. 2). Improvements have been to hit directly to my aim,

to reach short and long balls, hit the ball which behind me (Journal, Week 6, Ques. 3).

Due to the presence of improved confidence in both those adept at a higher skill level and those lacking proficiency, the researcher can deduce that in this situation counterfactual feedback was a beneficial technique in developing confidence for beginning tennis players regardless of prior motor skill proficiency and experience.

Summary

Counterfactual feedback proved to be a beneficial way to develop confidence in beginning tennis players. Comments by the participants of this study confirmed the increased understanding of tennis concepts during the eight-week practice sessions. Students were able to verbalize the cues and concepts necessary for continued successful performance of tennis skills. The additional advantage of increased fun the individual perceived during practice strengthened the appeal and desire for continuing to play tennis. The participants increased confidence and understanding of concepts establishes that counterfactual feedback is one way that beginning tennis players can learn to enjoy this activity and develop habits that could be sustained for a lifetime.

Chapter 5

Discussion

Research on feedback, critical thinking, and instruction in a learning environment is satiated with conclusions about best practices, best development, and best instructional methods for retention and performance. This study is diverse in its concentration on two areas. One area of focus looks at how counterfactual feedback assists the beginning student to increase critical thinking when learning complex motor skills. A second area of focus looks at the individualôs perception of confidence to continue improving their skill. Self Determination Theory used as a framework promotes autonomy for the student and motivation for continued performance. For multiple case studies, such as this study, Merriam (2009) stresses the importance of reporting the comparison answers to the same questions given to the participants as a reliable way to disseminate and detail the information collected.

Validity was established in this study by the same questions given to each participant, and by similar delivery of feedback from the same instructor for each individual. Participantôs responses were recorded through the individual journal entries and from interviews done by the researcher following the practice sessions. Cross-case analysis was then used to compare answers given. Scrutiny of transcriptions and examination of given feedback was performed by the researcher and an outside expert to discover similarities and consistency of feedback delivery between participants.

During this study counterfactual feedback created certain differences and illustrated specific similarities to preceding investigations of feedback on learning concepts, critical thinking, and perceived confidence obtained by the students during instruction. All four participants experienced improved skill performance, noticeable critical analysis of tennis

concepts, evident progress of personal confidence in their tennis ability, and manifested specific knowledge of cues needed for continual improvement of tennis skills. These results are consistent with seminal pieces of literature from educational research showing that complex physical skill acquisition and retention of learning is linked directly to specific instruction, feedback, and positive encouragement (Lydon & Cheffers, 1984; Todorov, Shadmehr, & Bizzi, 1997; Viciana, Cervello, & Ramirez-Lechuga, 2007). The use of counterfactual feedback resulted in motivation, confidence, and skill improvement in each of the different participants, regardless of previous experience and learning style preferences with a minimal amount of training.

The current research, similar to DeKnopôs findings in 1986, supports the notion that time-on-task, specific feedback given, and time spent on information delivery are crucial to skill development in beginning learners. Counterfactual feedback combines informational delivery and specific feedback to each participant. Although all of the participants in this study improved in skill performance, there was no measure of skill improvement taken for this study. Although no specific measure of improvement was taken, researcher's observation notes highlighted a noticeable increase in the participantôs ability to adjust their swing performance when rallying with a partner across the net. The ability to rally and adjust to the oncoming ball is important in allowing the individual to feel successful and confident in their ability for intrinsic motivation to play tennis.

Retention of learning is improved with specific feedback (Todorov, Shadmehr, & Bizzi, 1997). The current research confirms this finding as counterfactual feedback questions were very specific to the skill being performed. The four participants displayed acquisition

and retention of knowledge from answers given at the end of the eight weeks about the skills learned in the beginning of the eight weeks.

Critical thinking is a central theme for counterfactual feedbackôs usefulness. During this research all participants demonstrated understanding of complex concepts after each session, which exhibited their enhanced critical thinking process. Regardless of experience with racquet sport concepts prior to participation in the research sessions, all participants were able to verbally assign importance to the cues identified as necessary for improvement of each skill reviewed in the practice sessions. The ability to learn and display improvement not only confirmed critical thinking but also illustrated perceived confidence in oneôs ability to adjust performance and advance as a player. Counterfactual feedback could be part of the proper instruction that Angeli and Valanidez (2009) found could result in improved critical thinking skills.

During weekly interviews, the participants were encouraged to reflect on the specific problem-solving techniques they would use to assist in better skill performance. Each individual showed remarkable ability to reflect on their performance and problem solve what needed to be done to improve for the next practice session. While reflection of past performance is one way to show learning and critical thinking, the participants were also able to prove decision making abilities during the practice session itself, by adjusting the skill in the course of the practice. For instance, participants were able to contact a ball thrown from a variety of distances, or varied heights, as well as balls arriving from differing angles and speeds. These results confirm research done by Lodewyck (2009) which posits that critical thinking is linked to decision making, reasoning, problem-solving, and reflective judgment.

Individuals often drop-out or quit an activity when negative feelings occur due to mistakes in performance. While Viciana, Cervell, and Ramirez-Lechuga (2007) found that technical instruction assisted in alleviating a negative sentiment following mistakes, counterfactual feedback seemed to give the participants continued desire to attempt each skill again. Research tells us that a studentôs confidence will increase with successful skill performance; and many students shy away from advancing to a more difficult skill due to fear of failure preferring to stay within their ócomfort zoneôof skill performance (Mouratidis, Lens, & Sideridis, 2010; Simons, Dewitte, & Lens, 2003). Counterfactual feedback combines specific feedback, encouragement, and technical instruction throughout the questions asked of the participants, which supports the individual performance. Once the participant understood the technical components of the skill and recognized the adjustments required for a successful performance, they were able to feel in control of the environment and continued performing at a high level. Consequently, the student is able to prolong the positive mood and increase the intrinsic motivation to perform the skill again.

During this study each of the four participants indicated increased confidence in their ability to play tennis, demonstrated improved knowledge of the basic concepts of tennis, and recognized improved performance of their personal skills. All participants were enthusiastic about continuing to play tennis, and encouraging comments about the advantages they seemed to perceive in the feedback system that was used to help them get to where they are. Each had realized how much had been accomplished within a short time and was ready to continue their improvements made by continuing to play with friends. Some commented a desire to teach a friend in order to have someone to play with them on a regular basis. In the following section each theme will be compared according to findings for all participants.

Perceptions and confidence of skill development

Increasing the perception of confidence an athlete possesses in their ability to perform is not always a straightforward concept. Perceptions and confidence are wrapped up in different packages for each individual. Each package can contain past experiences, previous comments from others, and prior sensitivities developed through years of disappointments or embarrassments. This study attempted to discover a solution to assist individuals in strengthening positive perceptions of their own abilities regarding tennis skills within a short time frame. Leading the participants to feel more assured when being invited by a friend to play tennis or when taking initiative to invite someone to play. Confidence may also allow the individual to participate rather than refuse due to ineptness. Commentary gathered during this study serves as proof that altering perceptions of skill acuity is a possibility for individuals even in a brief training period.

The nature of this study inhibits the production of blanket concluding statements concerning counterfactual feedback and the effect on individual skill perception changes. Past research has shown that feedback alone is not the sole cause of perception adjustment in a participant. However, each of the participants in this study demonstrated increased positive perception of their tennis ability, regardless of their beginning capability. From this information, one could conclude that counterfactual feedback should be one element to consider when attempting improved confidence for beginning tennis players.

Critical thinking and recognition of skill components for success

The recognition of skill components necessary for success became apparent to the researcher early-on during the data collection phase of the study. Comments made by participants throughout the practice sessions exhibited comprehension of tennis concepts

developing rapidly. The participants answered specific questions concerning skill development following the sessions and during the practices the students began adjusting their skill performances without prompting from the instructor. Participants chose various skill components to focus on for skill improvement to occur. Each individual concentrated on a different aspect of the tennis skill. One focused on the angle of the racquet on contact, and adjustments were made as needed. Another student concentrated on the position of the arm prior to contacting the ball and then better preparation for contact was discussed.

Drills and repetitive execution of skills are the mainstays of many physical education programs. Critical thinking and recognition are traditionally not used in everyday classes. Because of this tradition, physical educators require immense patience when teaching beginning skills to individuals. Repeating information to a student is helpful at the beginning stages of learning a physical skill. The dichotomy comes when the instructor directs the student to practice unaided. Many students rely heavily on the information and feedback continually supplied by the coach. While the athlete tends to listen to instructions and not consider the justification the coach has for each drill. Once the coach instructs athletes to practice on their own, there is no conscious thought process to adjust the skill themselves. When the skill does not produce the desired result, the student quickly becomes irritated and either gives up or appeals to the instructor for help or suggestions.

Due to the nature of counterfactual feedback, the student becomes aware of the concepts rather than just the skill components that are being practiced. Understanding the reasons for each step of the development process allows the individual to ponder the process and identify the cause of the poor performances. Once the individual can determine the cause, they are capable of making adjustments without input from the coach or instructor.

During this study, each of the participants started at a different level of skill proficiency, and although all were beginners, some were more equipped to advance rapidly. Proficiency in skill execution was not required to understand the concepts needed for adapting the skill during implementation. Some study participants played outside of the regular sessions and remarked on their ability to modify the tennis skills during play.

Adjusting the performance when it is gone awry is a true test of critical thinking process when developing a new skill. The participants in this study continued to show comprehension of the tennis concepts throughout the sessions. Counterfactual feedback, delivered in a timely manner, during the beginning stages of learning tennis skills, assisted the participants in identifying the components necessary to advance their proficiency level in tennis.

Best timing in delivery of feedback

During the practice sessions there was no noticeable change in skill acquisition due to the timing in the delivery of feedback. The researcher did not notice a particular predilection in any of the participantsô reactions during the sessions to the time when feedback was given. According to the comments made by the participants, each preferred a unique time when they believed that feedback would be most effective. The participants reasoning for choosing their special time had merit, but when it was delivered similarly to each individual, all appeared to utilize the feedback appropriately.

Delivery of counterfactual feedback was comparable for each participant. Regardless of the preference stated by the individual participants in journal and interview notes, the instructor did not alter the timing of delivery of the feedback. Since delivery of feedback was similar for each individual, the researcher can conclude that for these participants the timing

of counterfactual feedback neglected to assist in the learning of tennis concepts. Neither did the timing of delivery detract from the participant being able to remember the important concepts dispensed during the practice session. While many individuals claim to have a preference of receiving feedback during the acquisition phase of skill development, this study did not find that timing of delivery made a difference in the amount of information the individual recalled concerning the concepts of tennis skills. The only difference noted was in the connection of the specific component feedback to the proper overall skill.

The lack evidence to support better retention of concepts due to differences in timing when delivering feedback may be due to the age of the participants in this study. Adults are able to connect the concepts to the proper source and relate the feedback comment to the correct skill involved. Timing of delivery may be more crucial for younger beginning players who do not yet have the acumen to link the comment to the appropriate skill.

Likelihood of continuing the activity in the future

Learning a new skill requires determination and consistency of execution. Understanding the concepts of a new skill will allow the individual to feel more confident about performing the skill on demand. All of the participants in this study, according to observations from the researcher, improved their skill level and showed signs of developing confidence in the concepts needed to continue to play the sport. Throughout this study the participants answered favorably to questions concerning the continuation of participation in tennis activities following the completion of the practice sessions. However, the researcher understood that the participants saw tennis as a companion sport, meaning that two people were needed to play it. During the practice sessions, the activities were split between those needing two people to participate and those that could be done unaccompanied with just a

backboard. The split activities were the researcherôs way of encouraging the students to understand that, although playing a game of tennis required more than one person, solo tennis activities could be beneficial to advancing tennis performance as well.

Commentary made by the participants and observations made by the researcher support the improved likelihood of participants continuing to choose this activity for a future exercise option. All participants understood and reiterated the concepts learned prior to finishing the study. The researcher was confident that each of the individuals could continue to advance their confidence and skill levels without continual planned lessons. Using counterfactual feedback with the participants appeared to encourage the ófun factorôof participation which in turn may promote the continued participation in tennis.

Feedback and skill learning

The themes that evolved in this research focused on best timing of feedback delivery, perceptions of confidence in skill development, recognition of skill components necessary for success, and the likelihood of continuing the activity in the future. The findings outlined some essential points that physical educators and coaches should observe of when teaching beginning physical skills to individuals.

Seminal research in feedback affirms that individuals enjoy the skills in which they perceive themselves proficient (Alderman, 2008; Feltz, Short, & Sullivan, 2008). Feedback is important in the learning process. Timing in the delivery of feedback does not seem to be as important as conveying feedback to the learner. Motor skills are acquired through performance, any feedback be it counterfactual, specific, augmented or other assist in increasing the learning progression. Counterfactual feedback could, as shown in this research, be a viable option and simple way to improve development of complex motor

skills. Stagnation in progress of a skill is often the culprit for frustration to beginning learners. Counterfactual feedback allows the individual to discover tactics that will navigate them toward success and away from annoyance.

Combining specific, instructional, and encouraging feedback into a question format, as counterfactual feedback does, supports the studentôs learning procedure. This research illustrates how using the correct language during the practice sessions of beginning athletes allows the individual to understand the concepts quicker; thereby, boosting the studentôs perception of confidence when performing the complex skill. Complex concepts in games can often take individuals years to comprehend. Requiring the individual learner to critically think about the skills needed and incorporating them into the game concepts early in the learning process allows the individual to understand how the skills and concepts fit together within the whole game. This development of insight may have been delayed due to the participantôs lack of previous proficiency in the basic elements such as footwork or hand-eye coordination. Required basic physical elements need to be established prior to complex concepts of a skill being learned.

Common traditional practice often includes skill repetition without extensive feedback given to the performer. Counterfactual feedback encourages the notion that variety of movement exploration during initial learning will encourage the participant to realize the best solution to movement problems without continued repetition, thereby, grasping the correct development and concepts prior to becoming bored with performing the skill. Recognition of the skill factors necessary for success is crucial for the learner to increase their performance confidence. Physical educators and coaches can have the initial information for the skill presented to the student prior to beginning a practice session. For

older beginning players in this research, understanding the skill components seemed to be more important than repetition of the skill during the sessions. The participants were able to recognize the components of the skill necessary for a successful performance.

Time constraints in regular physical education classes have the teacher moving through drills quickly and fitting in the feedback when they can. This research indicates a slower development of drills and more emphasis on the thought process may engage the student in a more cerebral process prior and subsequent to the feedback being delivered. Although, this research was a one-on-one teaching situation, the time allotted per week was small. Improvement was more noticeable from the participants after a slower pace of drill, giving them time to consider the result of the performed skill, than when the participants performed numerous repetitions without time to consider the outcome. Critical thinking of concepts requires time that often is more essential than getting additional practice of the same skill.

Many individual intend to continue participation in a complex skill. Frustration and forgetfulness of how to perform the skills are culprits in many deciding to give up the activity. This research increased participant confidence and knowledge of the concepts needed for success, which alleviated the frustration in a beginning player. The participants gained knowledge of fundamental elements needed for improvement of the skill, securing the possibility for continued performance of the activity.

Conclusions

This study extended the literature of Counterfactual feedback by: (a) showing the usefulness of counterfactual feedback for the development of beginning tennis skills in adult participants, (b) broadening the research base concerning feedback for physical education

professionals, coaches, and physical skill trainers in developing critical thinking in students when learning physically challenging skills, (c) extending the use of counterfactual feedback as a viable option for use in physical education settings.

Theoretical frameworks in research are established through examination of fundamental principles, concepts, and beliefs concerning the subject matter. SDT was used as a framework centering on the independent perceptions, increased motivation to improve self-efficacy for tennis, and increase critical thinking by the individual. Educational research has explored the connection between feedback and critical thinking in beginning students. This research proffers on the existing knowledge while offering additional choices for superior development. Increasing the participantôs critical thinking during practice sessions permits them to form a functional efficient schema which can enhance the experience of learning a new physical skill. Counterfactual feedback was a relatively effortless system that seemed to increase critical thinking for students in this study. Subsequently this research showed increased confidence and maximum understanding of concepts for developing tennis proficiency in the participants in as little as eight weeks time.

Physically challenging lifetime activities are often overlooked due to the amount of time necessary for unskilled individuals to develop the proficiency needed for continued performance. Extending the research on the connection between feedback and critical thinking will allow others in the field to use more efficient ways to encourage beginning students to engage in a lifetime activity.

The use of counterfactual feedback during skill acquisition developed critical thinking for the activity in this research and supported the studentôs desire to continue advancing their skill proficiency. Although in this study, counterfactual feedback was used on a one to one

basis, setting up scenarios which would work in a physical education class setting is not difficult. The same questions used to ask one person can be used to ask a class. Students could then be encouraged to practice the concepts and report back about problems or successes that they encounter.

Physical educators look for new ways to give confidence, to persuade, and to promote activity for all individuals. The current research demonstrated how counterfactual feedback was instrumental in assisting four individuals to discover a lifetime activity in which continued performance was a viable option. Improvements and understanding of the concepts were grasped quickly and confidence increased for each of the participants. Development of physical skills can be frustrating to beginning performers but increasing confidence and understanding through counterfactual feedback can hearten even the most prolific naysayers. Continued research is needed to investigate the consequences and problems with using counterfactual feedback in a physical education class setting.

Implications for Future Research

Weaknesses for this study were consistent with other qualitative research design studies. Generalization limitations, bias of results, and treatment partiality are just a few of the potential predispositions that are inherent in qualitative research and specifically addressed for the current research in this section. There are specific ways to address these preconceptions and flaws within qualitative research studies.

Specifically for the current study, due to the small participant pool, generalization of conclusions to other populations and to the general public is not possible. For this research to have practical implications, the researcher concentrated concluding remarks of results on how outcomes could be helpful for current beginning physical education class settings. The

recording of ñhow people interpret their experiencesò(Merriam, 2009, p.5), which is a staple of qualitative research, providing a few general guidelines for possible feedback options to be used by professionals in teaching beginning students complex skills.

The potential of bias is a concern in any research study. Qualitative research has unique difficulty with partiality due to the limited number of individuals involved in the collection and analysis of results. This research required consistent performance of feedback delivery during the practice sessions. Having one instructor during all of the sessions was helpful in having consistency of feedback technique and verbalization. An outside expert reviewed the transcripts and compared the feedback delivery to ensure uniformity.

The elucidation of outcomes in qualitative research may be biased due to the experience and history of the primary researcher. Interpretation of results is the sole decision of the primary researcher. Therefore initial reviewing of possible bias from the researcher bears consideration understanding the history and prejudice that may seep into the conclusions established during the composition. Qualitative research emphasizes experience of individuals and attempting to understand the meaning of each occurrence (Merriam, 2009). In order to do this appropriately, the researcher needs to have some experience themselves for the interpretation to be functional for a viable review of concepts examined. These weaknesses only emphasize the importance of further research needed for development of feedback options in teaching complex motor skills to beginning participants.

Further counterfactual feedback research with younger participants, would be beneficial. Exploration of younger students could use the same questions used for this study. Reactions and information from younger participants may focus on different concepts and cues. Subjects in the control stage of development often only see the basic cues necessary for

success for each skill. Control level individuals are not focused on the overall concepts needed in the game. Since counterfactual feedback attempts to deliver both the critical thinking and the specific feedback to the individual in one question, it may be too complicated for a younger audience to comprehend.

Future research could also concentrate on investigating if skill improvement is effected by counterfactual feedback. The current research was focused more on perceptions than on results. An interesting examination of skill improvement would be an area that could set counterfactual feedback above other types of feedback if improvement is accelerated by the use of counterfactual feedback. Quantifiable measurement would need to be explored and if possible other types of feedback should be used simultaneously. Skill development is another measure of how feedback is valuable for learning motor skills.

Another research implication could be to measure the perceptions and concepts received by a group of students during a regular physical education setting. Counterfactual feedback delivered to a group would have different responses from each individual student. Although, this is not ineffectual for the overall learning process, it would be interesting to see if all participantsô perception of the feedback is similar. This study could offer insights into the difference that counterfactual feedback has on the critical thinking of motor skill development.

List of Appendices

Appendix A

Journal Questions

Week 1

1. Which specific part of the forehand skill was most affected by the feedback received this week? (critical thinking)
2. What do you believe was the best time for you to receive feedback most effectively, prior, during or after performance of the skill? (perception)
3. How do you feel about your ability to perform a forehand during a tennis match? (perception)
4. What was one of the cues you will use to adjust your skill, if needed, during a performance? (skill content)

Week 2

1. Which feedback was the most helpful in your sessions this week? (perception)
2. Which cues do you remember that will allow you to perform a backhand swing during a tennis match? (skill content)
3. What comments assisted you in feeling more confident in your ability to play tennis this week? (critical thinking)
4. Do you believe at this point you will choose to play tennis for a long time? (perception)

Week 3

1. Please specify what feedback you remember during this week's practice sessions? for forehand? for backhand? (critical thinking)

2. What feedback led you to critically think about the skill performance you displayed during the practice session? (perception)
3. Which cues where most helpful and allowed you to improve your next performance of that skill? (skill content)
4. How do you feel about your ability to perform a backhand during a tennis match?

Week 4

1. Specifically which feedback statement assisted you the most in feeling confident about your tennis ability this week? (perception)
2. Which part of your serve will you need to work the most on to get consistent? (critical thinking)
3. If you were teaching your friend to serve, what cues would you use to assist them in learning this skill? (skill content)
4. We are half way through your lessons, what specific words come to mind when you think about playing tennis now?

Week 5

1. Why do you think that the forehand skill is the generally the easiest for participants to master and feel comfortable with? (critical thinking)
2. Which specific part of the forehand skill improved this week? (skill content)
3. What do you believe was the most effective time to give the feedback, for best performance adjustments to be made? (perception)
4. Which of your friends will you try to convince to play tennis with you?

Week 6

1. Try to remember some of the feedback from this week and specifically when was feedback delivered to you that helped you perform the backhand swing better? (critical thinking)
2. Which backhand skill concept have you been able to perform best during the practices this week? (skill content)
3. How does reminding yourself of the backhand cues that were given to your earlier help you to perform better? (perception)
4. When your backhand does not go where you want it to go during play, what feedback comes into your head?

Week 7

1. What feedback led you to consider one aspect of the serving performance during the practice session? (skill content)
2. Which feedback statements allowed you to use the feedback for your next performance of the serve? (critical thinking)
3. How do you feel about your ability to perform a serve during a tennis match? (perception)
4. What cues do you remember for the forehand/ backhand/ serve or volley skills we have gone through in weeks past?

Week 8

1. We have now concluded the practice sessions, which feedback statements have you been able to use to assist in your performances? (critical thinking)
2. Have you started to incorporate some of the cues when you have a performance that is not satisfactory to help you make it better? for the forehand? for the backhand? for the serve? (skill content)
3. Are there any specific skills you would have liked to had more time to develop? Will you try and develop those on your own? (perception)
4. How often will you attempt to play tennis in the future?

Appendix B

Interview Questions

Week 1

1. What, if any, feedback do you remember being given for correctly performing the forehand skill? (skill content)
2. How did you feel after receiving the feedback for the forehand skill performance? Was this feedback helpful? (perception)
3. What do you consider the critical elements for performing the forehand skill in tennis? (critical thinking)

Week 2

1. Which feedback statements were most helpful during the learning of the backhand skill today? (critical thinking)
2. When do you feel most confident of your tennis backhand ability? (perception)
3. What feedback cues helped the most in performing the backhand successfully? (skill content)

Week 3

1. What are the specific skill cues you remember for learning a forehand/ backhand swing in tennis? (skill content)
2. Which feedback statement made the most impact on your forehand/backhand tennis performance this week? (perception)
3. Why do most beginners tend to hit the ball very high over the net? (critical thinking)

Week 4

1. When performing the serve, what feedback statements helped the most in learning this tennis skill? (critical thinking)
2. How do you feel about performing a serve during a tennis match after this week? (perception)
3. What cues are you going to use when attempting a tennis serve? (skill content)

Week 5

1. Why is footwork so important when performing a forehand shot in tennis? (skill content)
2. What specific aspect of the forehand are you having trouble perfecting? (critical thinking)
3. How would you feel if a friend invited you to compete in a tennis tournament with them? (perception)

Week 6

1. What specific thoughts about your backhand technique did you consider during the practice sessions? (critical thinking)
2. What skills have you learned that help you feel more comfortable playing tennis with friends or with inviting friends to play tennis with you? (perception)
3. Which specific element of the backhand skill is the hardest for you to master? (skill content)

Week 7

1. What part of your serve was enhanced by using the "reach for the sky" drill during the practice sessions this week? (skill content)
2. Why is it important to practice your toss for a tennis serve? (critical thinking)
3. Which feedback statement allowed you to feel confident about performing your tennis serve this week? (perception)

Week 8

1. How much confidence do you have about your tennis ability after these past eight weeks of practice? (perception)
2. Which singles strategy will work best for when you are playing a match and why? (critical thinking)
3. If you were going to teach your friend how to contact the ball properly for a forehand shot, what cues would you use? (skill content)

Appendix C

Training Practice Sessions

Week 1

Forehand Activities

Day 1 ï Movement, control, and coordination

Warm up - Dynamics
Hand-eye coordination work without racquet
Racquet work with ball - rolling/ self rally/ juggling/ bouncing
Forehand swing progression
Small court continuous forehands

Day 2 ï Advanced movement, coordination, and begin quickness

Warm up - Dynamics
Quick forehands for swing establishment
Controlled/ precision swinging with footwork added
Hit and Run drill
Cross court continuous forehands

Week 2

Backhand Activities

Day 1 ï Decision on swing preference, coordination, and contact of ball

Warm up ï Ball control
Racquet work with ball/ self rally/ juggling/ bouncing
Backhand swing progression- determine one or two handed
Quick backhands for swing establishment

Day 2 ï Quick feet, contact points, and movement to the ball

Warm up ï Contact points
Footwork drills
Small court continuous backhands
Down the line and cross court backhands

Week 3

Forehand/backhand switching

Day 1 ï Coordination, decision making, and spatial concepts

Warm up ï Coordination
Juggling with tennis balls, no racquet
Juggling with tennis balls across the net (4, 3, 2, 1)
Footwork drills off of a toss (forehand/backhand)
Simon says drills

Day 2 ï Swing control, and contact area

Warm up ï control (quick, slow)

Target practice with forehand and backhands with drop balls
Down the line forehand/ backhands with a toss
Cross court forehand/backhands off a toss
Contact with follow through on drop balls (forehand & backhand)
Up and back work

Week 4

Serving

Day 1 ï Toss control, contact on ball, aim with racquet head

Warm up ï Dynamics
Toss for serve
Arm swing for serve
Progressive serving drill
Aim is just as important as power.

Day 2 ï Contact on racquet, timing of contact, angle of racquet head

Warm up ï Dynamics and regular game warm up
Progressive serving drill
Power serving
Spin serving
Control for second serve

Week 5

Forehand Advanced - Drop shots/ lobs

Day 1 ï Hand/eye coordination, patience, and contact

Warm up with patience drills and juggling
Timing and adjustment of footwork/ contact area on the racquet
Footwork drills for appropriate forehand contact point for drop shot
Appropriate follow through for drop shots
Use of drop shot for winning the point

Day 2- Footwork, concepts, and timing of contact

Warm up with footwork drills
Lob technique with topspin off of forehand
Follow through work on lobs
Contact points for lob placement
Quick lobs for swing correction
Placement and timing of lobs during a match

Week 6

Backhand Advanced - lobs and drop shots

Day 1 ï Footwork, coordination, and space awareness strategy

Warm up ï Dynamics and footwork drills
Timing and adjustment of footwork/ contact area on the racquet
Footwork drills for appropriate backhand contact point for drop shot
Appropriate follow through for drop shots

Use of drop shot for winning the point

Day 2- Footwork, concepts, and timing of contact
Warm up with footwork drills
Lob technique with topspin off of backhand
Follow through work on lobs
Contact points for lob placement
Placement and timing of lobs during a match
Reading the opponent and position of the ball

Week 7

Serving Advanced

Day 1 ï Toss control, contact on ball, aim with racquet head
Warm up ï Dynamics
Toss for serve/ Reach to sky Fence Trap
Progressive serving drill
Aim Game drill
Serving game - in/out

Day 2 ï Contact on racquet, timing of contact, angle of racquet head
Warm up ï Dynamics and regular game warm up
Progressive serving drill
Spin serving
Control for second serve

Week 8

Strategies for singles/ doubles play

Day 1 ï Coordination, strategy, and concepts for singles
Warm up ï Dynamics and regular game warm up
Footwork Drills
Line shots (forehand/backhand)
Ball striking to angles for approach shot
Playing strategies for singles, side to side
Playing strategies for singles, up and back

Day 2 ï Review skills needed specific to the individual participant.

Appendix D

USTA. (2012). NTRP Playing levels. Retrieved from http://www.usta.com/Play-Tennis/USTA-League/Information/1655_General_Characteristics_of_Various_NTRP_Playing_Levels/

General Characteristics of Various NTRP Playing Levels

To place yourself:

A. Begin with 1.5. Read all categories carefully and then decide which one best describes your present ability level. Be certain that you qualify on all points of all preceding levels as well as those in the level you choose.
B. When rating yourself assume you are playing against a player of the same gender and the same ability.

General Characteristics of Various NTRP Playing Levels
(Wheelchair players please see note below)

1.5
You have limited experience and are working primarily on getting the ball in play.

2.0
You lack court experience and your strokes need developing. You are familiar with the basic positions for singles and doubles play.

2.5
You are learning to judge where the ball is going, although your court coverage is limited. You can sustain a short rally of slow pace with other players of the same ability.

3.0
You are fairly consistent when hitting medium-paced shots, but are not comfortable with all strokes and lack execution when trying for directional control, depth, or power. Your most common doubles formation is one-up, one-back.

3.5
You have achieved improved stroke dependability with directional control on moderate shots, but need to develop depth and variety. You exhibit more aggressive net play, have improved court coverage and are developing teamwork in doubles.

4.0
You have dependable strokes, including directional control and depth on both forehand and backhand sides on moderate-paced shots. You can use lobs, overheads, approach shots and volleys with some success and occasionally force errors when serving. Rallies may be lost due to impatience. Teamwork in doubles is evident.

4.5
You have developed your use of power and spin and can handle pace. You have sound footwork, can control depth of shots, and attempt to vary game plan according to your opponents. You can hit first serves with power and accuracy and place the second serve. You tend to overhit on difficult shots. Aggressive net play is common in doubles.

5.0
You have good shot anticipation and frequently have an outstanding shot or attribute around which a game may be structured. You can regularly hit winners or force errors off of short balls and can put away volleys. You can successfully execute lobs, drop shots, half volleys, overhead smashes, and have good depth and spin on most second serves.

5.5
You have mastered power and/or consistency as a major weapon. You can vary strategies and styles of play in a competitive situation and hit dependable shots in a stress situation.

6.0 to 7.0
You have had intensive training for national tournament competition at the junior and collegiate levels and have obtained a sectional and/or national ranking.

7.0
You are a world-class player.

Players in Wheelchairs:
Players in wheelchairs should use these general characteristics to determine their NTRP skill level. The only differences are as follows: Mobility: while players in wheelchairs may have skills that would normally provide them a certain rating, the mobility factor suggests that when competing against able-bodied players, they should participate at an NTRP skill level that provides for competitive rather than compatible play. Serving ability: Due to the nature of the playerôs injury or disability, a powerful serve may not be possible. In this case, it may be more realistic to self-rate below 4.0 as service strength becomes key beyond this level.

Many tournament players in wheelchairs have already received an NTRP rating. Wheelchair players should check with players whose skills match their own before determining their rating. The very best world-class players in wheelchairs have an NTRP rating in the low 4.5s.

Appendix E

Example of Counterfactual Feedback

The following samplings are only a small portion of the total feedback used during eight weeks of practice sessions with four participants. These examples are excerpts from the transcripts obtained through eight weeks of videotaped practice sessions of each participant.

Examples:

If that foot comes up, are you going to be able to push off of it?

Try keeping the base wide - If I have a skinny base how is your balance? Then when you have a wider base, if someone comes to push you over are you going to fall?

Where do we want your weight to go when you hit? ***Response: Toward the net.***

Where should your body movement go? ***Response***: ***toward the net.***

If you see (the ball) up here, then what can you do to make that adjustment?

There you go. Those last couple, they kind of hit off the edge of the racket can you tell? Or did you think you were hitting the, do you know where the ball hit on the racket? Ok, does that mean that you arenôt watching the ball?

If you get there after the ball then you donôt hit very well. if you can get there quick and wait you will have a better chance.

If you are having to run é how quickly are you going to be able to run é with your arm back?

If you had it right beside then, why is that where you want it?

Why are those going up do you think? ***Response: Because my arm is turning and pointing the racket face up.***

If you are running forward, your racket is already moving, so then when you try to swing it is moving even faster. What you want to do instead is control that? ***Response: When you are running in to get the ball try to not swing as hard just control.***

If you were in a game or when you play with him (your husband) can you hit it purposely away from where he is? ***Response: Probably, but not every time.***

If you think about it do you go ahead and then hit it that way some of the time? ***Response:***

Yeah

What do you remember about your serve? ***Response: The ball has to be in front of me, and high, and I have to contact higher. I have to stand like this.***

If you couldnôt get there with your feet then you had to use your one hand instead of two? ***Response: It is easier sometimes.***

If you have that other hand on there (the racket) then is it easier for you to swing? ***Response:***

OK

If you contact it up here, look what happens, then itôs just going to go way up. But if you hit it on the side, the racket face, where is it going to go?

Ok now you see how high that is going? What does that mean for where you need to

contact? Think about your feet again, where is your weight when you are hitting?

How are you going to hit harder? ***Response: Push off the back foot.***

What the best thing to have for your forehand to start? ***Having it back.*** When you come through where are you going to contact? ***Middle, sweet spot.*** Also, positioning, where do you want the contact in terms of body position? ***On the side***. How is your racket face when your hitting? ***Pretty much flat.***

How is your body when you are done? ***Towards the net***

What happens to your ball a lot of the times? Response: It spins backwards ï then what direction is it going? ***Response: Up***.

If you try to hit as hard as you can, then what does that mean? ***Response: That means your racket goes faster.***

If you are already running back, then you wonôt have as much power going forward. ***Response: That makes sense.***

Do you remember what we talked about aiming towards one side or the other with the forehand?

P: Moving your body and the steps.

Instead of contacting it like that, what would be a better option for you? ***Response: Oh, forehand.***

Where do you think you should be looking when you serve? ***Response: At the ball.***

Then if you hit it out here, go ahead and swing, you come to here even if you where closer. Where is the ball going to go? ***Response: It's going to veer off that way***

If you could loosen that arm up a little bit then it will be more like a whip type of motion. ***Response: Oh, Yeah! I can see it. I definitely see it.***

if you think about it, if you hit it here the net is already above where the ball is. So how are you going to be able to hit it over? ***Response: I see, so you want it to be at the top of the bounce***.

Where do we want your weight to go toward when you swing? ***Response: Straight forward (toward the net).***

When the ball is forward, what do you need to do in order to use your regular swing? ***Response: wait for it to get to the side and sort of adjust, adjust your position.***

Appendix F

The University of New Mexico
Consent to Participate in Research

Counterfactual Feedback and Tennis

02/27/2013

Introduction

You are being asked to participate in a research study that is being done by Dr. Gloria Napper-Owen, who is the Principal Investigator and Beth Birky, from the Department of HESS. This research is studying feedback for beginning tennis instruction.

Physical education teachers must consider the most effective way to deliver instruction and feedback for maximum student learning. Counterfactual feedback assists in engaging the visual (internal) and auditory augmented feedback types in order to create an optimal learning environment which will produce the highest skill level in the shortest time possible (Sigrist, et al, 2011). Counterfactual feedback promotes critical thinking as it applies to the performance of a skill. Critical thinking is linked to better decision-making, reasoning, problem-solving, and reflective judgment in individuals (Lodewyck, 2009).

Counterfactual feedback relies on the teacher asking a directed question as feedback after a skill performance or after a series of practice attempts. The question should engage the studentôs critical thinking about the specifics of the skill. As the student considers the answer to the question, the feedback information gained from connecting the counterfactual feedback to the intended behavior will allow the student to manipulate or adjust the next performance (Epstude & Roese, 2010). The choice to alter and evaluate the subsequent performance gives the student more control and autonomy which will increase intrinsic motivation to continue the activity.

You are being asked to participate in this study because you have indicated that you have no prior experience with tennis lessons. You are healthy and able to perform basic skills training in tennis. You are older than 18. 3 people will take part in this study at the University of New Mexico.

This form will explain the research study, and will also explain the possible risks as well as the possible benefits to you. We encourage you to talk with your family and friends before you decide to take part in this research study. If you have any questions, please ask one of the study investigators.

What will happen if I decide to participate?

If you agree to participate, the following things will happen:

The researcher will be using counterfactual feedback while instructing the participant in tennis skills during a teaching session conducted on a tennis court. Each practice session will last between 45 minutes to one hour, two times per week for eight weeks. Each practice session will be focused on a specific tennis skill. During the eight weeks the instructor will teach the forehand, backhand, and the serve to the participant. The participant will fill out a journal entry after each practice session, will be interviewed by the instructor each week, and will read over transcriptions for "member check" reliability of the study.

How long will I be in this study?

Participation in this study will take a total of 2 hours per week hours over a period of 8 weeks.

What are the risks or side effects of being in this study?

The only risks are the normal inherent risks associated with performance and learning of any physical skill set.

There are risks of stress, emotional distress, inconvenience and possible loss of privacy and confidentiality associated with participating in a research study.

For more information about risks and side effects, ask the investigator.

What are the benefits to being in this study?

The participants will receive one-on-one free lessons in beginning tennis skills, these are normally valued at $30-$50/ hour. It is hoped that these tennis lessons will allow the learner to advance their current level of tennis ability to a more proficient level by the end of the eight weeks.

What other choices do I have if I do not want to be in this study?

This study is totally voluntary participation. If you do not feel comfortable or do not wish to participate, you can learn to play tennis at another location or with another instructor.

How will my information be kept confidential?

We will take measures to protect the security of all your personal information, but we cannot guarantee confidentiality of all study data.

Information contained in your study records is used by study staff and, in some cases it will be shared with the sponsor of the study. The University of New Mexico Institutional Review Board (IRB) that oversees human subject research and/or other entities may be permitted to

access your records. There may be times when we are required by law to share your information. However, your name will not be used in any published reports about this study.

Information and videos collected as part of the study will be labeled with your initials and study number. Information (without your name) will be entered into a computer database, password protected / locked file cabinet in the Principal Investigator's office. Dr. Napper-Owen, Beth Birky, and the research assistant will have access to your study information. Data will be stored for 2 years, and then will be destroyed.

The videotaped practice sessions will only be seen by the primary researcher and the research assistant. Videotapes will be kept in a locked drawer in a locked office. Following transcription of the videotape, the information will be in a password protected database and the videos will be kept for 2 years and then destroyed.

What are the costs of taking part in this study?

There are no costs to the participant unless they prefer to buy their own tennis racquet. I will have racquets available for use at all practice sessions. All other major equipment needed for the tennis lesson will be provided. Tennis shoes and appropriate clothing is all that is required of the participant. The personal insurance of the participant will be responsible for any injury or accident that may occur during the practice sessions.

Will I be paid for taking part in this study?

There is no monetary compensation for the participants of this study.

How will I know if you learn something new that may change my mind about participating?

You will be informed of any significant new findings that become available during the course of the study, such as changes in the risks or benefits resulting from participating in the research or new alternatives to participation that might change your mind about participating.

Can I stop being in the study once I begin?

Your participation in this study is completely voluntary. You have the right to choose not to participate or to withdraw your participation at any point in this study without affecting your future health care or other services to which you are entitled.

The only circumstance that will force the investigator to withdraw the subject is too many missed sessions. If the subject does not attend at least half the practice sessions during the first 4 weeks, the investigator will need to drop the participant and secure a new participant for the study.

Whom can I call with questions or complaints about this study?

If you have any questions, concerns or complaints at any time about the research study, Dr. Gloria Napper-Owen , or his/her associates will be glad to answer them at 402-740-2599.

If you need to contact someone after business hours or on weekends, please call 402-740-2599 and ask for Beth Birky .

If you would like to speak with someone other than the research team, you may call the UNMHSC HRPO at (505) 272-1129.

Whom can I call with questions about my rights as a research participant?

If you have questions regarding your rights as a research participant, you may call the UNMHSC HRPO at (505) 272-1129. The HRPO is a group of people from UNM and the community who provide independent oversight of safety and ethical issues related to research involving human participants. For more information, you may also access the IRB website at http://hsc.unm.edu/som/research/hrrc/irbhome.shtml.

CONSENT

You are making a decision whether to participate (or to have your child participate) in this study. Your signature below indicates that you/your child read the information provided (or the information was read to you/your child). By signing this consent form, you are not waiving any of your (your child's) legal rights as a research participant.

I have had an opportunity to ask questions and all questions have been answered to my satisfaction. By signing this consent form, I agree to participate (or let my child participate) in this study. A copy of this consent form will be provided to you.

_____	_____	_____
Name of Adult Subject (print)	Signature of Adult Subject	Date
or for Child enrollment, Name of Parent/Child's Legal Guardian	or for Child enrollment, Signature of Parent/Child's Legal Guardian	

_____ _____

Legally Authorized Representative Date

INVESTIGATOR SIGNATURE

I have explained the research to the participant and answered all of his/her questions. I believe that he/she understands the information described in this consent form and freely consents to participate.

_____
Name of Investigator/ Research Team Member (type or print)

_____ _____

(Signature of Investigator/ Research Team Member) Date

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