Using Serve Return Training Programs to Influence Self-Efficacy Perceptions of Division III Tennis Players

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Abstract

Video training showed improvements to athletic skills such as decision-making and anticipation (Broadbent, Causer, Williams, & Ford, 2015). Research indicates that development of these skills results in athletes reporting higher degrees of confidence in their abilities (Caserta & Singer, 2007). Confidence encompasses the idea of self-efficacy, which refers to someone's perceptions that in a specific task or situation, he or she has the ability necessary to successfully perform the desired action (Bandura, 1977). Performance is explained when combining self-efficacy perceptions and physical performance factors (Feltz, 1988). Barling and Abel (1983), for example, found that aspects of tennis performance, some of which include footwork, anticipation, accuracy, and concentration, consistently were positively related to self-efficacy. Two methods shown to increase confidence levels include task-specific practice and mastery experiences (Caserta & Singer, 2007). However, a research gap occurs in studying self-efficacy and deliberate practice techniques together during both practice and competition situations. As part of a larger study, the purpose of this study was to investigate effect of deliberate practice methods, either through a video analysis or reaction time training program, on the serve return self-efficacy of National Collegiate Athletic Association (NCAA) Division III tennis players. The 18 participants (8 male, 10 female) were randomly assigned to either the serve return video training program or the reaction time training program. At the conclusion of the deliberate practice training programs, participants audio recorded responses to open-ended questions about the effects of their assigned training program on serve receive performance, and their general reactions to their training program. The results of this study indicated that most participants perceived the training program as having a positive impact including increasing their confidence, improving their serve return ability, and developing faster reaction times.

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Introduction

Athletes continue to push themselves to get better and not only be the best they can be, but to be the top athletes in their sports. This drive to be better forces athletes to find alternative ways to enhance their performance. An increase in research surrounding the benefits of using psychological skills and interventions in sport encourages athletes to expand their focus to include this psychological component into their traditional physical training (Weinberg & Gould, 2007). Just as physical skills related to sport can be trained, so can the psychological skills beneficial to sport performance. Krane and Williams (2006) argued that athletes can learn psychological skills through skill education and practice. Krane and Williams synthesized numerous sport psychology studies to conclude that peak athletic performance is associated with an athlete-specific psychological profile of high self-confidence and expectations of success. An athlete's psychological profile can be enhanced through a multitude of psychological interventions designed to improve his or her confidence levels.

Significance of Problem

Some of the psychological interventions used to elevate confidence include modeling, verbal encouragement and instruction, and visualization of past successful performances (Bandura, 1997). However, one of the psychological interventions receiving little attention in building self-efficacy is video analysis training structured with deliberate practice principles. For example, what effect might video training have on enhancing the self-efficacy of NCAA Division III men's and women's tennis teams for their serve returns? The effects are currently unknown, but video training could have a dramatic influence on the serve return performance of collegiate tennis players. Performance is impacted by so many different variables that it is important to look at the interactions between all of them in addition to their individual impact.

Thus, it was the purpose of this study to investigate the effectiveness of an intentional focus on serve returns through two different deliberate practice training programs in improving the serve return self-efficacy of NCAA Division III tennis players.

Literature Review

Some Psychological Skills Influencing Sport Performance

Two psychological skills frequently studied in sport for performance enhancement are self-efficacy and decision-making. These two skills are related in that self-efficacy involves an athlete's situation-specific confidence, while decision-making involves the acquired ability an athlete possesses to take contextual information and previous experience to create and execute an appropriate response (Bandura, 2006; Broadbent, Causer, Williams, & Ford, 2015). Naturally, as athletes play at higher levels, their amount of contextual information increases as does their amount of prior experiences hence expert performance being associated with high levels of accurate decision-making abilities (Causer & Ford, 2014).

One method of training athletic decision-making to increase the athlete's response speed and accuracy is engaging in cognitive deliberate practice (Ericsson & Ward, 2007). Deliberate practice is the intentional practice of specific skills designed with the aim of improvement (Ericsson, 2016). Self-efficacy, decision-making, and deliberate practice can be thought of as a cyclical reaction chain as depicted in Figure 1. Engaging in deliberate practice starts the reaction. Deliberate practice leads to an increased decision-making ability by the athlete resulting in the increase in his or her self-efficacy for executing the practiced skill and thus motivating him or her to continue engaging in deliberate practice initiating the cycle once again. The integration of deliberate practice into a practice regimen showed an increase in the athlete's intrinsic motivation, and self-efficacy is an influential component of motivation (Vink,

Raudsepp, & Kais, 2015). Athletes are spending designated time working on a specific skill or situation and that intentional focus to improving in that area would logically lead to the athlete's confidence increasing.

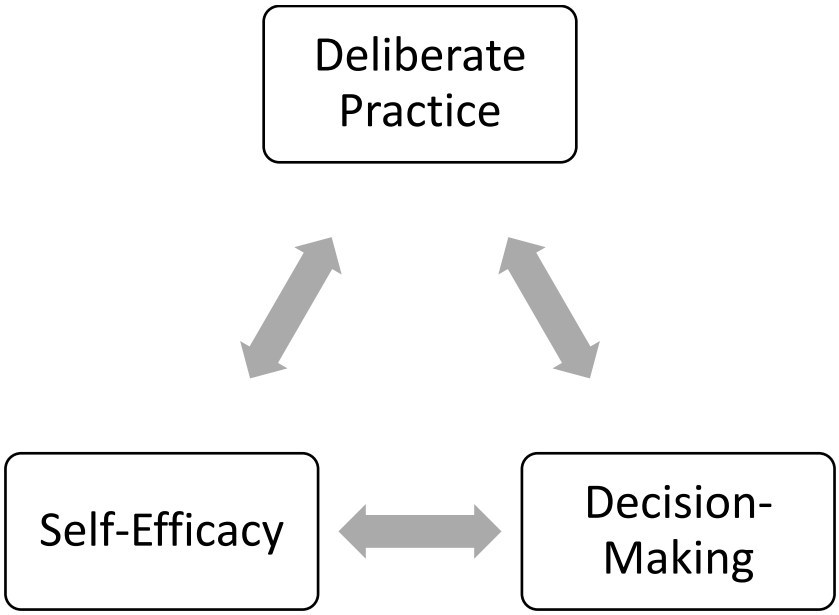

Figure 1. Relationship between self-efficacy, decision-making, and deliberate practice.

Training that provides athletes with immediate feedback and the opportunity to correct their skills, such as video analysis training protocols, results in the largest amounts of performance improvement when compared to athletes having to seek feedback on their own (Ericsson & Ward, 2007). Video analysis training protocols have been shown to be an effective method to train and test decision-making in sport with research on tennis (Broadbent et al., 2015; Caserta & Singer, 2007; Farrow et al., 1998; Miller & Gabbard, 1988; Rikli & Smith, 1980; Tenenbaum, Levy-Kolker, Sade, Liebermann, & Lidor, 1996), soccer (Causer & Ford, 2014; Put et al., 2016), juggling (Franks & Maile, 1991), and powerlifting (Franks & Maile, 1991).

Furthermore, researchers used video analysis to train various skills in tennis such as serve return (Farrow et al., 1998), forehand and backhand drives (Miller & Gabbard, 1988), serving form (Rikli & Smith, 1980), and various tennis strokes (Tenenbaum et al., 1996). However,

previous research using video analysis protocols tended to focus on the beginner or novice tennis players, leaving a large gap in the research on the effects of video analysis protocols on the self-efficacy of collegiate level and elite tennis players.

Self-Efficacy

The concept of self-efficacy originated from a theoretical framework presented by Albert Bandura (1977). Self-efficacy is the perception someone has about his or her ability to accomplish a specific situational goal or task (Bandura, 2006). Bandura (1977) formed his self-efficacy theory on the assumption that psychological processes can create and strengthen someone's self-efficacy. Bandura (1977) establishes self-efficacy as a cognitive process where someone assesses his or her expected ability to perform a behavior. The determining factor for the execution of that behavior is that person's perception of success based off his or her expected ability (Bandura, 1977). Self-efficacy also controls the efforts of behavior performance; someone might have enough self-efficacy to initiate the behavior, but if it's perceived the behavior will not be successfully accomplished, the person will stop his or her efforts (Bandura, 1977). Self-efficacy does not disappear after the behavior has begun, it influences the effort put into the behavior as well as the determination level in the face of challenges.

Four sources of information develop self-efficacy: previous performance accomplishments, vicarious experiences, verbal persuasion, and physiological arousal (Bandura, 1977). Bandura (1977) established these four sources of information because he analyzed self-efficacy from the social learning perspective. Each source of information is important because of the varying information each one provides. No source has the same level of influence or provides the same information. Performance accomplishments are derived from the mastering experiences the individual achieved, vicarious experiences are the expectations originating from

witnessing the experiences of others performing an activity, verbal persuasion is the suggestion that others interject about the ability of the individual, and emotional arousal is an individual's physiological activation to assess his or her stress vulnerability (Bandura, 1977). Due to the task mastery experience occurring personally, performance accomplishments afford the most reliable efficacy information (Feltz, 1988).

Within the four sources of efficacy, there are a variety of different factors crafting the underlying perceptions of one's ability. Behavioral, physiological, cognitive, and environmental factors combine to shape a person's self-efficacy, or the strength to which a person feels confident in his or her ability to successfully complete the task in front of them (Whaley & Schrider, 2014). The interaction between person, environment, and behavior drives the complexity of individual perceptions and emphasizes the necessity for the different informational inputs developing self-efficacy.

Constructs Related to Self-Efficacy

Within sport and exercise, research has used alternative, but related concepts to self-efficacy. These concepts are goal-orientated but differ in the perceptions emphasized or the purposes predicted (Feltz, Short, & Sullivan, 2008). Particularly, the related constructs that seem to be of frequent study include sport confidence, self-confidence, perceived ability, and perceived competence (Feltz et al., 2008). Sport confidence and self-confidence are constructs most like self-efficacy as they measure the perceptions someone has about successful performance, but differ in that they do not contain action planning component required for successful performance (Feltz et al., 2008). Perceived competence and perceived ability are also goal-oriented constructs, but do not include a specific result occurring from the perceptions such

as attaining a goal (Feltz et al., 2008). Table 1 provides a brief definition of each related construct and a sport specific tennis sample question.

Table 1

Self-Efficacy and Related Constructs Studied in Sport and Exercise

Construct	Definition	Sport Specific Tennis Sample Question
Self-Efficacy	The perception that one has the ability needed to successfully perform a desired behavior (Bandura, 1977)	"How confident are you that you can accurately serve return against this opponent?"
Sport Confidence	The belief one possesses about his or her ability to have successful performance in sport (Vealey, 1986)	"Compared to the most confident tennis player you know, how confident are you that you can perform a successful serve return in the State Tennis Finals?"
Self-Confidence	The belief and positive expectations one has about his or her performance in competition (Martens, Burton, Vealey, Bump, & Smith, 1990)	"In a match, are you confident that you can perform a successful serve return?"
Perceived Competence and Perceived Ability	The belief that one has in his or her ability within a specific domain or task resulting from numerous environmental interactions (Feltz, 1988)	"Do you feel that you are better than others on your team at serve return?"

Table 1

Sport confidence. Sport confidence is the extent to which an athlete believes he or she has the capability to be successful in sport (Vealey, 1986). Since success is defined differently for everyone, sport confidence emphasizes the individual's perceptions of success based upon

the type of goals towards which he or she is striving (Vealey, 1986). The focus of sport confidence is on an individual's perceptions of attaining a specific goal based upon his or her current abilities, but unlike self-efficacy, does not include competency areas specific to each sport, but competency areas for sport in general (Feltz, 1988). Without consideration for the nuances within each sport, sport confidence does not provide the most predictive power for success in specific sport situations (Feltz, 1988). Sport confidence also fails to consider the thought process and action planning necessary for engaging in behaviors that lead to achieving the goal (Feltz et al., 2008).

Self-confidence. Self-confidence is the belief in and positive expectations for one's self regarding his or her performance during competition (Martens et al., 1990). The Competitive State Anxiety Inventory – 2 measures self-confidence as a subcomponent of anxiety (Martens et al., 1990). Self-confidence is operationally defined as the conceptual opposite of cognitive anxiety which is the negative thoughts, expectations, and self-evaluation of one's performance (Feltz, 1988; Martens et al., 1990). Self-confidence was shown to enhance performance while cognitive anxiety was shown to impair it (Martin & Gill, 1991). Like sport confidence, self-confidence overlooks the necessity of cognitively processing through the possible behaviors and accurately selecting the one resulting in successful performance during the specific situation (Feltz et al., 2008).

Perceived competence and perceived ability. Perceived competence and perceived ability are related to someone's belief in his or her ability within a specific context based upon prior interactions (Feltz, 1988). Perceived competence and perceived ability refer to the general ability for someone to master a task (Feltz, 1988). There is no reference to a specific competitive

situation or time frame and thus used to explain participation motivation rather than performance on specific tasks (Feltz, 1988).

Superiority of Self-Efficacy

Self-efficacy is one of the most influential psychological constructs related to performance and achievement within sport (Feltz et al., 2008). Self-efficacy and other related constructs have commonalities between them, but unlike the others, self-efficacy is a practical theoretical model guiding self-perceptions of confidence during a specific situation (Bandura, 1997). Related constructs based around confidence are not embedded within theory, but are catchwords used in sport (Bandura, 1997). Confidence provides a nondescript reference to an amount of belief a person has but fails to mention to what specifically that belief is pertaining (Bandura, 1997). Bandura theorizes that self-efficacy beliefs are the result of the complex cognitive processing of information from various sources creating self-appraisals and self-persuasions (Feltz et al., 2008). The complexity of self-efficacy as a construct emphasizes the unique components within self-efficacy. As a common cognitive mechanism present in all realms of life, self-efficacy balances self-appraisal perceptions and the resulting thought patterns, emotional and behavior reactions, and motivational levels (Feltz et al., 2008).

Unlike other constructs, self-efficacy represents specific domains of functioning instead of an overall global trait (Feltz et al., 2008). Self-efficacy goes beyond the perceptions of being able to accomplish motor skills and offers an explanation for the changes in one's desire and expectations of successfully accomplishing or performing a specific task (Feltz et al., 2008). These fluctuations occur because self-efficacy, unlike the constructs of confidence, measures the various dimensions of expectations (Bandura, 1977). Self-efficacy expectations vary in magnitude (level), strength, and generality meaning the expectations differ for each person based

upon the levels of performance attainment, the sense of perceived mastery in conjunction to the levels of performance attainment, and the extent to which it applies to other situations (Bandura, 1977). Not always will a successful experience result in the increase in ambition, nor an unsuccessful experience to decreased levels of ambition (Feltz et al., 2008). The numerous components forming self-efficacy exemplify that it is a specific form of state sport-confidence (Martin & Gill, 1991). Self-efficacy is both task and context specific while maintaining firm focus on one's self-assessment of his or her abilities (Zimmerman & Cleary, 2006).

With the array of information encompassed within the construct of self-efficacy, Feltz (1988) argued that other constructs studied within sport, such as sport confidence and movement confidence, are unnecessary. Trait sport confidence and competitive orientation were created to explain situational sport confidence, but do not appear to be adding additional conceptual understanding or dimensions not already included in self-efficacy (Feltz, 1988). None of the alternative constructs provide information not already captured by self-efficacy, expressing the validity of its continued use in research (Martin & Gill, 1991).

Research on Self-Efficacy and Sport

Self-efficacy is a versatile construct with the ability to affect the numerous nonpathological behaviors occurring within sport like anticipation, concentration, and accuracy (Barling & Abel, 1983). Self-efficacy is an influential construct within sport in part because of its strong relationship to the reasons an athlete chooses and continues working towards a specific goal (Halper & Vancouver, 2016). The impact self-efficacy has over athletic success is another explanation for its importance in sport as these perceptions influence both motivation and thought processes (Bandura, 1997). Combined with other factors such as physical capability and development of skill, self-efficacy is a main ingredient in athletic success (Feltz et al., 2008).

Perceived self-efficacy consistently contributes a necessary component for explaining performance (Feltz, 1988). There is a significant relationship between self-efficacy and athletic performance that spans numerous sport tasks and other physical activities (Feltz, 1988). The effect of continuously strengthening one's self-efficacy perceptions the more perseverance he or she is an increasing perseverance displayed while working towards a specific goal while also having a higher likelihood of successfully performing (Bandura, 2006). Higher self-efficacy beliefs strongly imply that those individuals are likely more capable than those with lower self-efficacy beliefs which then likely results in a higher performance (Halper & Vancouver, 2016). An athlete also tends to view his or her goals as being worthwhile when having higher self-efficacy because of the belief in possessing the resources necessary to accomplish his or her goals (Halper & Vancouver, 2016). In one study, athletes who were high in self-efficacy outcome expectations completed their runs faster than individuals who had lower self-efficacy outcome expectations (Martin & Gill, 1991).

Research on Self-Efficacy and Tennis

Barling and Abel (1983) looked at the relationship of self-efficacy and the performance specifically of a tennis serve. Looking at self-efficacy strength, response-outcome, and assessed tennis performance, Barling and Abel (1983) found that unlike the response-outcomes and valence expectancies, self-efficacy beliefs was the only variable to consistently correspond to the performance behaviors. The tennis players' self-efficacy beliefs consistently and positively related to various aspects of their performance such as footwork, anticipation, accuracy, power and spin, and concentration (Barling & Abel, 1983). The use of task-specific practices with personal mastery experiences led to enhanced confidence levels (Caserta & Singer, 2007).

Task-specific practice is a practice method that can be leveraged for increasing self-efficacy through the personal accomplishments informational source of self-efficacy (Bandura, 1997).

Deliberate Practice

Given the relationships between self-efficacy and performance, psychological interventions should include task-specific practice specifically utilizing the deliberate practice technique. Deliberate practice is a training method where an athlete spends practice time dedicated to working on specific, coach determined goals (Ericsson & Ward, 2007). The goals that the coach has specified for the athlete are practiced using purposeful drills designed to improve his or her performance related to those goals (Ericsson & Ward, 2007). Deliberate practice is not merely the repetition of drills, and comparatively seen and understood as a training method superior to repetition (Johnson, Tenenbaumb, & Edmonds, 2006). Going into practice with specific skills to focus on and prioritize is one aspect of deliberate practice (Rosen, 2011). Johnson and colleagues (2006) determined that deliberate practice is more effective than a traditional practice full of repetition. Part of this superiority is that experience by itself is not predictive of someone's performance level, but rather that concentration and work ethic in practice and experience lead to improved performance (Johnson et al., 2006). Achieving expert performance is also not just about physical talent or abilities, expert status is achieved through athletic development and the desire to put in the time and work to reach the highest level (Johnson et al., 2006). It is pivotal that beyond the physical abilities to complete the athletic tasks necessary, the athlete is also able to know what to do in any situation while playing or practicing, he or she needs to present a positive attitude and attribution especially around teammates and when it might be difficult to uphold (Johnson et al., 2006).

Deliberate practice also includes a component of problem solving and immediate feedback (Ericsson & Ward, 2007). After the immediate feedback, it is important for athletes to receive the opportunity to repeat the drill or skill to incorporate the feedback into their performance (Ericsson, 2016). Performance improvement occurred most frequently when players received immediate and valid feedback from the activity and participated in training tasks providing validation for their actions (Ericsson & Ward, 2007). The focus and intention components of deliberate practice make the practice time more productive and effective compared to practices of repetition (Johnson et al., 2006).

Creation of deliberate practices takes time and effort on the part of the coach, as he or she needs to balance the individualized portion of practice while still maintaining intentional team practices. Rosen (2011), a NCAA Division I Big Ten volleyball coach, suggested steps coaches can take to create their own sport specific deliberate practice. Rosen's steps include: 1) prioritize time to develop skills essential to success, 2) maximize all players' contact with the ball (even during warmups), 3) throughout practice progress from controlled to uncontrolled situations, 4) link the skills to one another, and 5) create a competitive and fun environment during practice.

Practices that include Rosen's (2011) steps are beneficial, but performance improvement occurs during deliberate practice that incorporate opportunities for athletes to correct the skill's techniques (Ericsson & Ward, 2007). As the purpose of deliberate practice is to improve upon specific aspects of athletes' performances, their training must be accompanied with immediate and valid feedback during all training situations (Ericsson & Ward, 2007). These components of deliberate practice produce performance improvements because the athlete is not only entering practice with specific focuses, but he or she also has practices consisting of elements intended to optimize his or her training time (Johnson et al., 2006). Experienced athletes also appear to have

a high drive to excel in their sport, a dimension of deliberate practice (Gonclaves, Diogo, & Carvalho, 2014). The desire to excel is closely tied to another dimension of deliberate practice, the determination to compete, and both dimensions are representations of expert performance (Gonclaves et al., 2014).

Expert performance, a main ambition of most athletes, is achieved through the acquisition of both cognitive and physiological mechanisms. Cognitive mechanisms, such as decision-making and anticipation, of expert performance usually involve a combination of cognitive abilities. Developed cognitive mechanisms establishes an expert performer's ability to plan, evaluate, and reason through his or her environmental context and needed performance reaction (Ericsson & Ward, 2007). Deliberate practice develops cognitive performance elements including problem solving and feedback and with its being to have set practice time to intentionally focus on performance areas, deliberate practice is also beneficial to use to improve decision-making abilities (Ericsson & Ward, 2007).

Decision-Making

Decision-making is the capability someone possesses to use both the information currently acquired from a situation and knowledge from past experiences to create and execute an appropriate directed action or set of actions (Causer & Ford, 2014). Decision-making is one component of cognitive athletic performance and is one of the most critical facets within sport performance in general (Hepler & Chase, 2008). The purpose behind decision-making is to accomplish a goal through the execution of "correct" action choices (Causer & Ford, 2014). Decision-making appears to be an acquired skill thus capable of being learned (Causer & Ford, 2014). Since decision-making is an acquired skill, theoretically, that ability should increase as an athlete gains more experience. Tenenbaum and colleagues (1996) found that

expert tennis players were indeed superior in correctly anticipating the final location of the ball after a tennis stroke compared to novice players.

Although there is not one definition of expert performance that has been agreed upon by researchers, for the purposes of this study, expert performance will be considered an athlete's highest standard of performance to be at the highest level, competing in professional and international leagues (Swann, Moran, & Piggott, 2015). As this definition indicates, expert performance is heavily influenced by the amount and diversity of experiences of an athlete. Decision-making along with expert performance are dependent upon an athlete's sport situation specific knowledge. This is apparent because Causer and Ford (2014) concluded that decision-making is an acquired skill and as an athlete gains experience it is the anticipation response that improves (Tenenbaum et al., 1996). Expert players can recognize the emerging sport-specific patterns while being attuned to the early or advance cues their opponents give off through postural movements because of their array of previous experience (Broadbent et al., 2015). Tenenbaum and colleagues (1996) asserted that athletic expertise, although involving the skill to anticipate future events early, is mainly arising from the ability to ascertain a lot of information from the environment in the moment. Expert tennis players were superior in their anticipation decisions for determining final ball location to novice players, apparent especially during conditions where the athlete was given a short periods of video exposure (Tenenbaum et al., 1996).

Thus, decision-making is two-fold, evaluating information and choosing the correct plan of action. The ability to make an accurate decision is just as much a part of decision making as coming up with a plan of action. Expert tennis players were found to be able to generate accurate options about the likely outcomes for any of the situations because their experience

enabled them to use situational probabilities to refine the potential outcomes (Broadbent et al., 2015). Causer and Ford (2014) also found that expert players had significantly higher levels of response accuracy compared to their less skilled counterparts.

Response accuracy is not only beneficial to the athlete's decision-making process, but his or her confidence (or self-efficacy) in decision-making. In a study done with expert tennis players, the experts had higher confidence levels than their lesser skilled counterparts did about their anticipated decisions (Tenenbaum et al., 2015). Tenenbaum and colleagues (2015) found that as more contextual information was presented, tennis players experienced increased confidence about their anticipated decision. Broadbent and colleagues (2015) also found that when tennis athletes were given many contextual variables, such as game score, opponent tendencies, and opponent characteristics, they could respond with increased accuracy.

Decision-making and self-efficacy closely interact with one another influencing an athlete's performance. The effect of decision-making training on an athlete's self-efficacy over a period has yet to be studied despite the potential performance benefits from the long-term interaction. However, numerous studies conducted looked at decision-making enhancement through video-analysis (Broadbent et al., 2015; Caserta & Singer, 2007; Causer & Ford, 2014; Farrow et al., 1998; Put et al., 2016; Tenenbaum et al., 1996). Video analysis, much like deliberate practice, is another training strategy intended for enhanced athletic performance.

Video Analysis

There are many ways in which an athlete can train and prepare for sport performances. With the shift in available technology, there has been a push to see and understand the benefits of integrating technology into practice regimens (Franks & Maile, 1991). Video-based training appears to be one of the most frequently studied forms of

technology used to enhance an athlete's performance. Video-based training can deviate depending on the focus, but overall video-based training includes using clips of performances, either by the athlete or an opponent, to train the cognitive aspects of performance, to focus on the mechanics of a skill, to study an opponent and his or her tendencies, or to analyze prior personal performances to learn from previous faults. Adding video demonstrations to training has many advantages: athletes can view the video as often as they want, the video can be taken at many different angles, the speed of the video can be adjusted, the athlete can look at parts of the skill or the skill in its entirety, and enhancing self-efficacy through vicarious experience (Franks & Maile, 1991; Bandura, 1977). There are however varying modes in which coaches and researchers utilize video-based training, a likely factor in the conflicting results Miller and Gabbard (1988) found about using various visual aids.

Miller and Gabbard (1988) looked at the effect videotape has on a tennis player's backhand and forehand drives using three condition groups. The condition groups consisted of a control group just receiving instructor feedback, a group receiving the replayed videotape and instructor feedback, and a group receiving loop-film instruction and instructor feedback (Miller & Gabbard, 1988). Miller and Gabbard (1988) found that the group given the videotape replay and instructor feedback displayed improved drive mechanical form and had greater anticipation and enjoyment than the other two condition groups. Farrow and colleagues (1998) also found that beginning tennis players within the condition group using video-based perceptual training had a significantly faster serve anticipation than the placebo and control groups.

Miller and Gabbard (1988) believe that loop-film viewing provides an athlete with more opportunities to use it to develop a model through imitation or demonstrations. Modeling through video viewing and analysis provides the athlete with resources likely unavailable

otherwise (Franks & Maile, 1991). Videotapes or video demonstrations are also easier to adapt as the athlete's skill improves thus keeping that athlete engaged while expanding his or her abilities and skill set (Franks & Maile, 1991). With video analysis, the athlete is provided with accurate and powerful information that influences performance (Rikli & Smith, 1980). Many participants training with video feedback perceived it to have a positive impact on their performance (Rikli & Smith, 1980).

The participants' perceptions of increased performance due to the video feedback lead to the general conclusion that video analysis training tends to positively impact an athlete's self-efficacy. Tenenbaum and colleagues (1996) found expert players, rather than their novice or intermediate counterparts, reported higher confidence in their anticipatory decisions. Video analysis training thus seems to be an appropriate technique to use to increase an athlete's self-efficacy for any sport skill. With the already established positive relationship between the use of video analysis to train decision-making, it is suitable to implement a video analysis training protocol in the present study's intention to increase the tennis players' decision-making accuracy and speed.

Researchers used video analysis to train tennis skills such as anticipatory ability to return a serve, performance of forehand and backhand drives, tennis serving form, and anticipatory decisions (Broadbent et al., 2015; Caserta & Singer, 2007; Ericsson & Ward, 2007; Farrow et al., 1998; Miller & Gabbard, 1988; Rikli & Smith, 1980; Tenenbaum et al., 1996). These researchers, however, tended to investigate the effectiveness of video analysis training in beginner or novice athlete populations. The collegiate level and elite tennis players populations lack empirical evidence for the effect video analysis training may or may not have on their skill enhancement. This video analysis training protocol will be implemented with NCAA Division

III collegiate tennis players and will use a deliberate practice design as the intentionality within its structure allows the focus to be specifically on the effects training has on serve return and serve return self-efficacy.

Purpose and Research Question

The purpose of this study was to examine the impact two different deliberate practice training programs have on the serve return self-efficacy of NCAA Division III tennis players. Using self-efficacy theory and the implementation of two different serve return deliberate practice training programs, this study aimed to explore a connection between the two. The primary research question asked, how does focusing more on serve returns using deliberate practice methods, either with a video analysis training component or a reaction time training component, impact NCAA Division III tennis players' serve return self-efficacy? It was hypothesized that the participants would gain self-efficacy in their serve return throughout the training program because of the focus on serve return and improvement.

Methods

Participants

Participants were recruited from a NCAA Division III Midwestern college and were current members of the college's men's or women's tennis teams or practice squads. Participants were included if they were at least 18 years old, able to speak and read English, and signed the consent form seen in Appendix A. The 17 participants were randomly assigned to either the serve return video analysis deliberate practice training program or the reaction time deliberate practice control training program. Of the 17 participants, eight were from the men's team and nine were from the women's team, and their ages ranged from 18–22 years old (M = 19.39, SD = 1.25). Many of the participants were first-year students (50%), 16.67% were sophomores, 22.22% were juniors, and 11.11% of the participants were seniors. A majority (83.33%) of the participants were White or Caucasian, 11.11% were Asian, and 5.56% were Hispanic. Most of the participants (83.33%) were on the varsity team and 16.67% of participants were on the practice squads. Participants ranged in not only overall tennis experience, but also collegiate tennis experience. Participants ranged from 6–15 years of tennis experience (M = 10.39, SD = 2.69) and 0.5–3.5 years of collegiate tennis experience (M = 1.42, SD = 1.06). An overwhelming majority of participants (77.78%) had no prior video training experience, three participants had some prior video training experience, and one participant had a year's worth of prior video training experience. None of the participants were compensated for participating in the study but were given an individualized report of their results and averaged results from the rest of the participants upon completion of the study.

Measures

Demographics. The demographics questionnaire collected information regarding the participant's age, gender, ethnicity or race, years of tennis experience, varsity or practice squad status, position (if on the team and known), years of collegiate tennis experience, video training or analysis experience, current class year, and handedness. The demographics information was collected on paper as seen in Appendix B.

E-Prime video analysis training protocol. E-Prime is a software package designed to create and run psychological experiments (Spapé, Verdonschot, van Dantzig, & van Steenbergen, 2014). For the current study, researchers used E-Prime to collect and store experimental data to be exported into a different statistical software for analysis. The E-Prime Video Analysis Training Protocol consisted of 10 videotaped serves, and recorded participant response accuracy, reaction time, and perceptual cue information.

Post-experiment interview. Upon completion of the three-week intervention, participants verbally responded to interview questions about their perceptions of personal serve return expertise, serve return self-efficacy, perceptions of serve return improvement, and perceptions of the deliberate practice training programs. The interview lasted approximately eight minutes and responses were audio recorded for transcription. The interview consisted of questions about participants perceptions of personal serve return expertise, serve return self-efficacy, perceptions of serve return improvement, and perceptions of the deliberate practice training programs. The specific interview questions can be seen in Appendix C.

Design

The larger study used a mixed methods intervention design that lasted three weeks. The deliberate practice training programs occurred for three weeks during the teams' off-season

captain's practices while they were in their January course term. Participants were randomly assigned to either the video analysis deliberate practice training program or the reaction time deliberate practice training program; each program consisted of half the men and half the women's teams. Participant assignment is depicted in Figure 2. The video analysis deliberate practice training program received deliberate practice serve return video analysis training each day (Monday–Wednesday) prior to practice while the reaction time deliberate practice training program received deliberate practice reaction time training using Stroop Tests prior to practice.

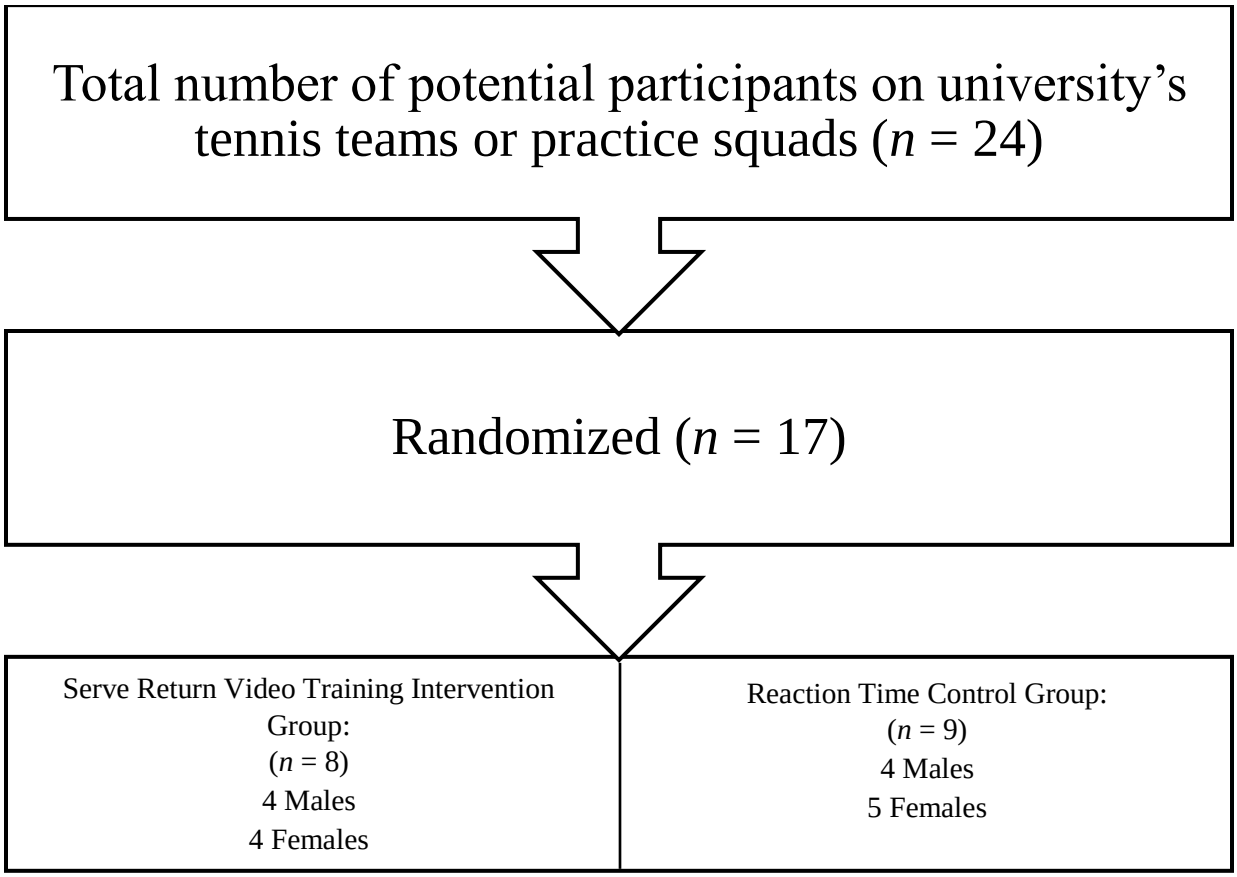

Figure 2. Sampling and flow of participants from January 3rd–January 24th.

Purposive sampling. Participants were chosen through purposive sampling, which is intentionally seeking participants with specific characteristics and qualities because of the lack of research surrounding that population (Morse, 2004). Purposive sampling allows researchers to

focus on a particular population to develop and expand knowledge of a specific topic or theory (Morse, 2004). Research surrounding video analysis training protocols in tennis has typically focused specifically on novice tennis players. There is a gap in the literature concerning the effects of video analysis training protocols on advanced and elite tennis players. Therefore, the current study began to address this gap by investigating video analysis training protocols with a purposive sample of Division III collegiate (advanced) tennis players.

Procedure

Recruitment and consent. Institutional Review Board (IRB) approval was received prior to the beginning of the study. An email thoroughly explaining the study was sent to all potential participants one week prior to the researchers coming to practice. This week gave potential participants time to prepare any questions or concerns about study participation. One week after participants received the explanatory email, the researchers attended practice to explain the study and answer questions. The head tennis coach was not in attendance while participants were given time to decide whether or not to consent to study participation. This ensured confidentiality as the coach did not know who did or did not consent to participation. Participants were given a blank consent form and adequate time to read and sign the consent form while the researchers walked around the room to answer questions and collect forms. Each form, signed or not, was collected individually to ensure participant consent remained confidential from other teammates.

Randomization. Participants from both the men's and women's teams were randomly assigned to either the video analysis deliberate practice training program or the reaction time deliberate practice training program after all the consent forms were collected by the researchers. The forms were shuffled and then divided into males and females before they were given a study

ID number, 1–8 for males and 12–20 for females, from a random number generator. Participants with odd study ID numbers were placed in the video analysis deliberate practice training program while participants with even study ID numbers were became the reaction time deliberate practice training program. Because the men's and women's teams practice and compete separately, they observed different video analysis trainings; however, all participants' data was analyzed together.

Intervention procedures. Each week was structured similarly throughout the three-week intervention. A calendar of the daily activities can be seen in Appendix D. Prior to the intervention start, the head researcher sat down with everyone and explained the scoring system used throughout, how to accurately fill out the score sheets, and if there were any questions. This assured that before the study began participants understood the scoring system.

Video analysis deliberate practice training program. Participants in the video analysis deliberate practice training program trained using video analysis trainings with E-prime three days per week for approximately five minutes per practice. Male participants in the video analysis deliberate practice training program watched male servers while the female participants watched female servers. The servers in the videos were selected because they had never competed against the participants but were of college age and skill level. The video servers were a mix of skill levels, one of the two female models was left-handed while all three male models were right-handed. Participants in the video analysis deliberate practice training program needed to accurately anticipate the direction of the video clip serve by tapping the key associated with that direction.

The video clips were randomly presented based on serve location and participants could view their response accuracy after the serve replay. Participants were given the opportunity to

improve their serve anticipation in the future by having their accuracy score displayed on the screen. Tips to improve the participants' serve anticipation were given on piece of paper (Appendix E) that participants were asked to read through prior to the video analysis training. Participants reread the specific portion of the tip sheet related to the serve they just watched before the replay occurred. A ten-second time delay was included in the videos to given them time to read the tips. The feedback highlighted cues that help accurately anticipate a serve's direction, for example, "look at your opponent's eyes."

Participants completed these training videos prior to the start of their normal practice. Each day, the video clips presented in the video analysis training protocol differed in the order the serves were displayed. Some video clips were repeated during the intervention, but this was limited whenever possible and was never repeated in full sequence. The first two days of the intervention each week included the video analysis training at the beginning of practice and then the remainder of the practice time was unaltered. The third day of the intervention each week consisted of the video analysis training protocol at the beginning followed by intra-squad practice matches. The last component involved another brief individual audio recording session to response to the post-match self-efficacy questions. The researchers walked around the fieldhouse during the matches to verify the serve return quality sheets were being scored accurately.

Reaction time deliberate practice control training program. The general procedure structure for the reaction time deliberate practice control training program as identical to that for the video analysis deliberate practice training program but included the reaction time videos in place of the video analysis training videos. Rather than completing the video analysis training protocol, the reaction time deliberate practice training program completed a series of Stroop

Tests three days a week lasting for approximately three minutes. The Stroop Test is a psychological measurement used to calculate an individual's selective attention and processing speed. Times for the Stroop Test were different, but the number of repetitions was not as there were 10 trials for both. There were 1.5–2.5 seconds of random variation between each trial to assure participants were not learning to jump a consistent time. This was the best control group possible because both groups were receiving a type of video training.

Post-intervention data collection. After the three-week programs, participants completed a brief post-intervention interview.

Data Analysis

Qualitative data analysis. The primary research question, how does focusing more on serve returns using deliberate practice methods, either with a video analysis training program or a reaction time training program, impact NCAA Division III tennis players' serve return self-efficacy, was also analyzed from the lens of the qualitative data collected on the audio recorders. Participant responses were coded and dominant themes were established across participants (Braun & Clarke, 2006). Thematic analysis was used to better understand the participants' general perceptions and the effects of the training protocol. Specifically, the thematic analysis looked at the open-ended explanations participants had about their perceived ability to return serves. This provided the opportunity for a deeper understanding of the impact confidence perceptions on subsequent performance situations. The audio was analyzed into different themes based upon Braun and Clarke's (2006) guidelines for thematic analysis in psychological research.

Results

The open-ended post-experiment interview questions were included to investigate the various ways in which the participants felt the deliberate practice training programs affected their perceptions and self-efficacy about their serve returns. A variety of responses arose from the thematic analysis indicating each participant's experience was unique and the effect of the deliberate practice training program's addition to his or her normal practice routines was complex. Three main themes presented across participants regarding their perceptions of participating in the deliberate practice training programs and its effect: positive perceived impact, neutral perceived impact, and negative perceived impact. An illustration of the thematic structure resulting from these responses can be seen in Figure 3.

Positive Perceived Impact of Training Program Participation

Most of the participants viewed their participation in the deliberate practice training programs as beneficial for at least one component of their serve return. The positive perceptions appear to be the more dominant response indicating that there is value in adding a deliberate practice training program such as this one to collegiate tennis practice with the intent of enhancing both serve return component skills and serve return self-efficacy. Within the main theme of a positive perceived impact, three separate themes emerged regarding the impact the training program appeared to be having: enhanced perceptions or cognitions, enhanced performance, and perceived future improvement and benefits.

The training program elicited many different sub-themes of the enhanced perceptions or cognitions participants experienced. One participant experienced an enhanced tennis identity as he specifically mentioned multiple times that he is "definitely a better returner now" because of his participation in the training program. Another sub-theme that was coded for was the

participant's perception of his or her increased serve return expertise. One participant perceived the training to help as "I'd say like I'm definitely like smarter when I'm returning serves", while another reflected "I guess I honestly thought I would probably be better after ya know 15 years of playing tennis, I thought I had a pretty good idea of where the ball was going. Um, but I realized that maybe I was picking up on inaccurate cues." Participants also mentioned that the training program helped them increase their focus, attention, and awareness on various aspects of the serve return. As one participant put it, "It made me realize how much I need to pay attention to my opponent's body language and so that I can be ahead of the serve and kind of just really pay attention to that." The training helped another participant as he or she mentioned "I would definitely say that I am more cognizant of serve returns and kind of like what I need to do in order to give myself the best change." One final sub-theme that was consistently brought up by participants was their increased confidence from the training program. This increased confidence took a number of forms as one participant said, "I'd say I feel a bit more comfortable, confident in my ability to return serves," and another mentioned, "I'm more calm, I have more a rhythm." The participants indicated that many different cognitions and perceptions were enhanced due to involvement in this training program and these were not the only enhancements that occurred.

The next theme repeatedly seen throughout the responses involved the participant's increased confidence. This theme, like that of enhanced perceptions or cognitions, produced several different sub-themes: faster reaction time, focus and improvement of technique, improved serve return ability, provided aspects to work on, and increased anticipation skill. Many participants expressed their faster reaction times because of the training and one mentioned that "even just watching the videos the last few weeks I've noticed I can, uh, pick up

where the serve is going a little faster." Others noticed the change in focus and improvement in the technique since the training program, "I'm just more on my toes and I'm looking, looking for it more." Enhanced performance was also seen through the improved serve return ability participants experienced, "I feel like I have better tools, it's kind of under, under practiced skill" and "I definitely feel like my return percentage has just been going up." Participants frequently saw their improving performance occur through the sub-theme of the training program providing them with aspects they needed to work on. For example, "it's kind of highlighting what I'm doing wrong" and "I realized that a lot of people have different techniques and I really need to, uh, take in what a different, the different person's style" and the training program has "allowed me to see what I still have to work on." One final, specific way participants perceived their performance to enhance was through their improvement in their ability to anticipate, "I realize that if I could guess where my opponent was serving 90% of the time than I just had to commit myself," and "I think it got every, the team thinking more about how, how to anticipate the serves." Participants indicated anticipation improved because "it helped me be able to read better, to read the toss better," and "I feel like I know where they [the serves] are going better."

The final theme related to the positive perceived impacts was the participants' perceptions of future improvement and benefits from their involvement in the training program. This theme did not have sub-themes, but participants were optimistic about the continued benefits they perceived the program to have. "I think just making sure that you're practicing what we're learning, so making sure every time I return from now on, I'm paying attention to the things that I've learned from the video training" and "as long as I remember the key points of it, I think it will benefit more in the future." Another participant expressed that "I think as the season

continues I'll, as long as I remember the training, I'll do better" and "hopefully this training will just remind me of what I am trying to work on."

The positive perceived impact of the training program extends beyond the present as in the final sub-theme, participants indicated that they had already started to consider the future and see the ways in which the training program was going to extend into their season. This is an important finding as it indicates that the program could potentially have an effect even after its calendar duration.

Neutral Perceived Impact of Training Program Participation

Despite most participants perceiving at least one component of the deliberate practice training program to have a positive impact on their serve return, a handful of participants mentioned having neutral perceptions towards the impact of the training program. These participants did not find the program beneficial, but also did not believe it hurt their performance. One theme was drawn out from the main theme of neutral perceived impact of training program participation—neutral perceptions and reactions.

Neutral perceptions and reactions were not a common response to the training program, but two sub-themes did encompass participants' responses. Those two subthemes included no change in serve return ability, expertise, or confidence and having uncertain perceptions of the training program's effect. Many of the participants that indicated they did not perceive a change in their serve return ability, expertise, or confidence simply state in their response, "no, not really" when asked. A couple, however, did elaborate saying, "I feel like the training didn't really help my expertise" and "I felt like probably not just because I couldn't tell a huge difference in my serve return game. There's nothing I was like, oh, I definitely made this because of the reaction time training."

Many participants voiced uncertainty about the way they viewed or interpreted the effect of the training program. Many "I don't know" or "unsure" responses encompassed this sub-theme, but two responses nicely depict the uncertainty participants' perceived: "the reaction training may or may not have affected my serve returns. I can't confirm anything here" and "it's hard to say right now. I think I need to go play like full sets, um, and see if I can apply it like constantly." As shown above, some participants did not have strong reactions on either end of the perception spectrum, but rather ones of indifference indicating that the addition of this training program is likely associated with more benefits than risks on athletes' performance.

Negative Perceived Impact of Training Program Participation

Unfortunately, a couple of participants expressed they perceived the training program as having a negative impact on one or multiple components of their serve return. This was not the intention of the program, but their perceptions should be taken into account and evaluated for future improvement of the training program. Of the handful of responses expressing negative perceptions, three themes encompassed them—decreased performance or confidence, created overthinking or overanalyzing, and perceived as unhelpful. None of the three themes were further divided into sub-themes.

Very few responses indicated decreased performance or confidence as a perceived result of program participation. One participant viewed participation as harmful to his or her performance and confidence because "if I had been actively thinking about it, maybe it would've been [helpful], but um, I just never really got into the habit of it." This provides something to be considered for future research as applying the training constantly to performance, both practice and competition, is frequently a primary goal of a performance enhancement training like this.

The theme related to the training program perceived as causing overthinking or overanalyzing appeared to account for most of the negative responses. One participant responded saying, "I guess decreased it [confidence] in general because I know this sounds interesting, but, uh, I think just like when I'm focusing on it too much, I start to overthink it and I think my overall, my serve returns were weaker during this month." Another response recognized that "I can sometimes focus too much on that and then, um, the return or the serve kind of just comes at me and I'm not ready for it because I'm too busy trying to anticipate the serve." One final response expressed that the participant "also believes that it hurt my serve return abilities because sometimes when I get like too caught up in trying to anticipate I have terrible returns."

Only a handful of responses indicated the participant perceived the program as unhelpful and many of the comments were regarding the participant's misunderstanding of the training program's purpose, "it didn't really help me against people with different serve quirks." Learning the misunderstandings participants had about the program's intentions provides the opportunity for future research to enhance emphasis of the purpose and potentially give participants a general idea about realistic expectations and outcomes.

The results from the thematic analysis provided a basic understanding of the ways athletes perceive the impact of a tennis serve return deliberate practice training program that incorporates serve return video training or reaction time training, practice drills, and match play. Additionally, the results yielded several aspects to be adjusted and considered for future research. The results were constructed into the concept map depicted in Figure 3.

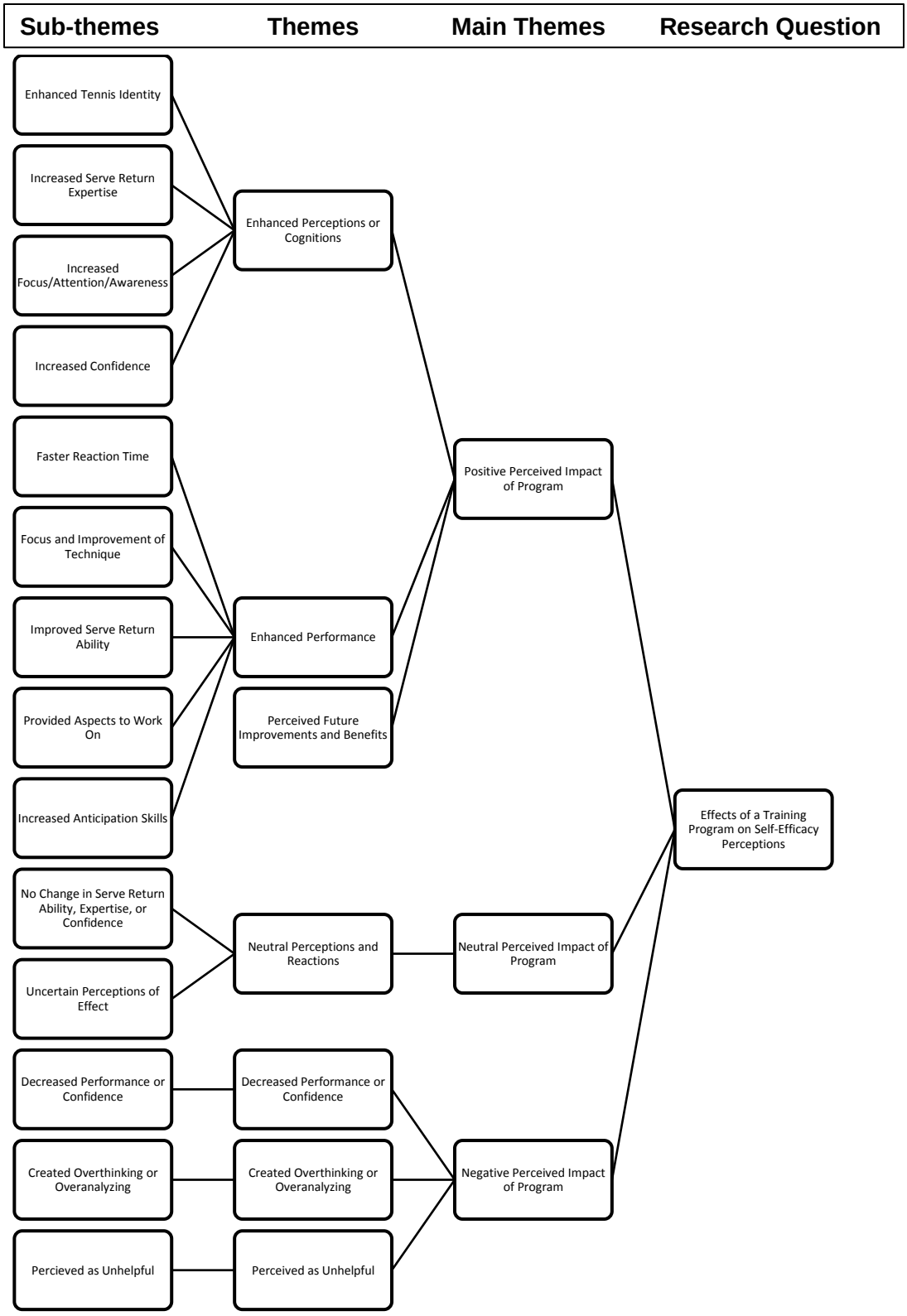

Figure 3. Thematic concept map of post-experiment interview responses regarding the effect of deliberate practice training programs on self-efficacy perceptions.

Discussion

The purpose of the present study was to investigate the impact increasing NCAA Division III tennis players' focus on serve return had using two deliberate practice training programs on their serve return self-efficacy. Gaining insight into the self-efficacy beliefs of NCAA Division III tennis players provides the opportunity for coaches to better direct and focus training methods in the future. Participants were asked open ended questions about their participation in one of two training programs giving them the opportunity to express their unique, individual perceptions. Participant responses revealed three main themes and seven themes. The main themes included positive perceived impact, neutral perceived impact, and negative perceived impact of the training program. From those main themes, the themes consisted of enhanced perceptions or cognitions, enhanced performance perceived future improvements and benefits, neutral perceptions and reactions, decreased performance or confidence, created overthinking or overanalyzing, and perceived as unhelpful.

Most participants, from both training programs, perceived participation as having a positive impact on their serve return. Most participants felt the intentional focus on their serve return skills contributed to various successes they noticed throughout the duration of the program. Many felt that the extra time and repetitions alone were beneficial and the added components such as the reading tennis serve return tips for the video training program group as seen in Appendix E or the footwork timing strategy drills such as the one-split-one detailed in Appendix F. Responses mainly expressed that the programs were beneficial and encompassed a wide range of categorizable benefits discussed by participants of both program groups and illustrating that from the self-efficacy perspective both trainings were effective. Since there were

only a small number of neutral and negative responses, there is an indication that the training programs consist of more benefits than risks if added to normal practice routines.

Potentially, some of the differing perceptions could do with the beliefs those participants had about their athletic efficacy in the first place, which is known to impact the amount someone then gains from a training program (Bandura, 1997). Self-efficacy beliefs influence athletic performance through impacting the athlete's thought processes and motivational drives (Bandura, 1997). As with Rikli and Smith's (1980) results, this study found that responses indicated that most participants believed they had improved performance because of the video training and feedback. The handful of negative responses potentially align with a conclusion reached by some results Put and colleagues (2016) found with their assistant referees about deliberate focus on a strategy designed to enhance performance, in their case a strategy to compensate for the flash-lag effect, can potentially be the component that lead to overcompensation. Participants in this study could have experienced a lack of automaticity with their program's training habits resulting in their perceptions of the training program causing them to overanalyze or overthink their serve return. The goal of the deliberate practice training program is to, over time, decrease the amount of thinking needed because of a habit forming causing the server cues to become automatic.

Participants responded that their confidence increased because of the training programs aligns with past research finding a positive correlation between the use of a perceptual training and an increase in confidence to react to the ball quickly and accurately (Caserta & Singer, 2007). The participants in Caserta and Singer's (2007) study expressed having high levels of confidence throughout the video clips in their ability to both accurately and quickly respond to the stimuli in front of them. The various positive effects participants expressed in addition to

increased confidence such as improved serve return ability, increased focus, increased serve return expertise, and increased anticipation skills adds to previous findings that athletes indicating high levels of confidence found that to be equivalent to having effective cognitions and maintaining competitive focus (Hays et al., 2009).

These two training programs were chosen because participating in task-specific practice and mastery experiences increases someone's level of confidence with the task (Caserta & Singer, 2007). The hope is also that through various types of perceptual training an even deeper understanding of the role confidence has in successful performance outcomes (Caserta & Singer, 2007). Confidence is already known to play a role in successful performance, Bandura (1997) found that the cognitive component of athletic performance is not strictly dependent upon predictive knowledge as it is pivotal to also have the confidence to react without hesitation to those predictions.

Implications

The effectiveness of the video analysis deliberate practice training program was increased because of the additional and unintentional outcome described by one participant. Injured for the duration of the program, one participant was only able to engage in the video analysis component of the training program. Yet, despite his limited participation had some of the most positive responses to the program. He mentioned that "even just watching the videos the last few weeks I've noticed I can, uh, pick up where the serve is going a little faster." Even with involvement in one component of the training program, this participant already perceived the positive impact it was having even before stepping on a court to compete. This participant brought to light another unexpected impact of the training program, "I think especially since I haven't been playing this month, it's helped me feel like I can work on something." The implication of this perception

exceeds the intention of this study but provides evidence of the benefits video training programs have for injured athletes since they likely want to continue practicing but are under physical restrictions. The video training program enhances mental skills which are frequently overlooked during practice.

The responses from participants also elicited an implication of this study pertaining to the perceived long-term benefits of the short-term training program. Numerous responses exemplified the anticipated future benefits participants had. Participants had perceived expectations of continuing to improve imply that self-efficacy and performance enhancement programs might not need to be a training regimen expected to last for a long duration to work. Rather, these responses imply a relatively short training program can be capable of having, are at least perceived of having, lasting effects on self-efficacy and performance. Participants expressed future continued improvement heavily dependent on reminding themselves of the training, "as long as I remember the key points of it [the training program] I think it will benefit me more in the future" and "I think as the season continues I'll, as long as I remember the training, I'll do better." The future, continued improvement is a realistic implication of these training programs especially when it aligns with the participant's personal goals and ambitions, "hopefully this training will remind me of what I am trying to work on."

From this study, another potential implication comes in the development of better training programs that take into consideration more of the components athletes would like to see in their training. For example, "to make it more beneficial, I think that, uh, I think just more tips and hints of how different people serve and how that indicates where they are going to serve and what kind of serve would be helpful." Some participants explicitly asked for more, "doing more reaction training every single day instead of days we just have practice" and "doing reaction

training for a longer time, maybe having a longer sequence of little reaction time instead of just doing ten trials, maybe like 20 a day." Improving the training programs to include more of the aspects participants request offers them more opportunities to gain task-specific performance accomplishments and enhance their self-efficacy using the most reliable information source (Bandura, 1977).

Additionally, this study generally adds to the literature on self-efficacy and sport performance through the specific perceptions participants presented about their experience with the training program. Their responses themselves provide additional knowledge about the types of cognitions athletes might frequently have about their practice methods and performance capabilities. This study provides an understanding of a training program combining two different techniques, video training and deliberate practice, while providing an understanding of the role deliberate practice alone can play on self-efficacy perceptions.

Limitations

This study did contain limitations which can limit the generalizability of the results. The study consisted of a small and not diverse population sample and the programs only lasted for three weeks ending prior to their intercollegiate season beginning. Since the programs occurred over the team's January course term, the number of potential participants decreased and practices were not mandatory. The data that were collected was only from practice-related performance and intra-squad competition and some participants appeared skeptical to express their anticipated training program effects. Another limitation was that none of the participants were blinded to their program group. Participants in each group were able to see that there were two different program conditions. It was clear that some participants engaged in the serve return video training videos while others interacted with reaction time training videos. Another limitation

was that this study did not assess or measure retention of the training programs' components. This prevents the ability to see the long-term impacts these programs had on self-efficacy perceptions. A final limitation of this study occurs from one of the researcher's personal connection to the team. There is a potential that this prior, well-established relationship could have impacted the responses the participants had about the ways they viewed the training programs. These limitations emphasize the importance of future research in this area.

Future Research Directions

The results of this study prompt several directions future research can take. These future research directions can be applied to work done either with a focus on tennis or with any other sport or physical activity. Research on all varieties of sport and physical activity should be conducted using a variety of populations and would be a necessary continuation of research on this topic.

More specifically, future research is encouraged to look at alterations of these programs related to the suggestions and desires participants revealed in their responses. Put and colleagues (2016) determined that to optimize a participant's learning ability, they need to have an individualized training program and instructions. Adjustments include, having the duration of the program be longer and continue into the season and including an at-home component, potentially one that is mandatory for some and optional for others to assess the impact motivation versus obligation might have. Participants suggested even adjusting the types of feedback and tips in addition to the frequency participants receive them.

Future research is strongly encouraged to develop programs in a way that allows participants to be blinded to the training program group they are in. The programs should also include follow-up questions and retention measures to investigate the long-term impact the

programs can have. Specifically, researching these programs among injured athlete populations is an important avenue for future research considering the inevitable reality of injuries occurring among athletic populations. Another interesting future research consideration would be the inclusion of participants' past competition performances. This could be in the form of anticipating a performance outcome, assessing or rating past performance, or analyzing the performances focusing on areas of weakness.

Conclusion

The current study offered additional understanding about self-efficacy perceptions in general, but specifically those of NCAA Division III tennis players about their serve return. Information pertaining to serve return self-efficacy was attained using two different deliberate practice training programs. Participants were asked after their training program questions regarding their perceptions of the impact the training program had on their serve return performance aspects like their ability and confidence. From those responses, three main themes arose about the general impact these participants had-positive, neutral, and negative. Participants connected their training program participation with the positive impacts of enhanced perceptions or cognitions, enhanced performance, and perceived future improvements and benefits. A handful of participants expressed an overall neutral perception and reaction while some others contributed their training program participation to negative impacts experienced such as decreased performance or confidence, overthinking and overanalyzing, and the training components being unhelpful.

Overall, this study provided more information on self-efficacy and the role deliberate practice training programs have on those perceptions, both on its own and combined with video analysis. Self-efficacy plays a pivotal role on performance outcomes and the hope is these

results could assist with future performance enhancement training methods and emphasizing the value cognitions have in performance.

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Appendix A
CONSENT FORM

Using Video Analysis Training Protocols to Improve Serve Return Performance in Division III Collegiate Tennis Players

You are invited to be in a research study taking a comprehensive look how video analysis training protocols can be used to increase serve return performance. You were selected as a possible participant because you are a member of the Men's or Women's St. Olaf College Tennis Team or the head coach of the team. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Joseph R Kronzer and Michelle H Caputi of the University of Minnesota. The project is being supervised by Diane M Wiese-Bjornstal Ph.D. of the University of Minnesota.

Background Information

The purpose of this research project is to examine the effectiveness of a video analysis training protocol on serve return performance. Video analysis training protocols are deliberate practice tools that use video clips to help players faster and more accurately anticipate the direction of an opponent's serve. We are also investigating the extent to which an individual's confidence and perceived expertise in their serve return matches their actual serve return performances. Forms of expertise to be examined include perceptual (e.g., "reading" the game, such as focusing attention on critical environmental cues to action), psychological (e.g., concentration, mental toughness), cognitive (e.g. decision making, i.e., deciding which to execute of several possible courses of action), physiological (e.g., training and conditioning data), and motor (e.g., practice and game statistics indicative of successful performance).

Our general research questions are:

1. Can tennis players use a video analysis training protocol to improve their serve return efficiency performance on the court in both drill and match scenarios?
2. Do players who perform better on a video analysis training protocol have higher serve return efficiency than players who do not perform well on the protocol?
3. Are there differences between genders regarding how effective are video analysis training protocols in improving on-court performance?
4. Can deliberately practicing serve returns, using a video analysis training protocol increase the self-efficacy to return serves in a match?
5. Does a tennis player's perception of serve return expertise match their objective performance level?
6. How does in-match serve return performance affect a player's confidence to hit serve returns in the future?

Procedures:

If you agree to be in this study, we would ask you to do the following things over the course of the following month:

1. Complete demographic, sport expertise, and self-efficacy measures so that we can understand your development and progress. This would include computer-based perception and decision-making tests reflecting tennis read skills, as well as online sport psychology surveys.
2. Let us come to practice to facilitate and record a tennis skills competency test, serve return drills, and practice matches.
3. Let us interview you so we may better understand your experience using a video analysis training protocol and its perceived effect on serve return performance or serve return self-efficacy.
4. Including pre- and post-study questionnaires and interviews, we will be asking for 5 hours of your time.

Risks and Benefits of being in the Study

There are limited risks associated with this study. One possible risk would be individual identifiability in the data. Our intention is to convey results in research reports as grouped findings that would protect the identity of individual athletes on the team, as well as the identity of those athletes who did, or did not, consent to participate in the project. Due to the low sample size of the intact team, however, it is possible that athletes can be identified. To reduce these risks, in any reports that we will give or publish on our findings we will not report data by position played or other personally identifying information, but will only report findings collapsed across the group or in other ways that cannot be linked to any specific athlete.

The benefits to participation in this study may include athletes gaining a better understanding of their own progress and best training and performance strategies in ways that may benefit their intercollegiate sports performances. Societal benefits may include the identification of beneficial training strategies and their applicability to in-match performance.

Compensation:

You will not receive any compensation for participating in this study.

Confidentiality:

Your coaches will not be told which athletes are or are not participating in the research project. The records of this study will be kept private. Your record for the study may, however, be

reviewed by departments at the University with appropriate regulatory oversight. We will not include any information in publications or presentations that will make it possible to identify you. To these extents, confidentiality is not absolute. Study data will be encrypted according to current University policy for protection of confidentiality.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with St. Olaf College of your position on the Tennis team. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

If you have questions about research appointments, the study, research results, or other concerns contact the researchers. You may ask any questions you have now, or if you have questions later, **you are encouraged to** contact them:

Researcher Name(s): Joseph R Kronzer, Michelle H Caputi, Dr. Diane M Wiese-Bjornstal
School of Kinesiology, University of Minnesota
Phone Number: 218-310-6045
E-mail Address (if applicable): kronz010@umn.edu

To share feedback **privately** about your research experience, including any concerns about the study, call the Research Participants Advocate Line: 612-625-1650 or give feedback online at www.irb.umn.edu/report.html. You may also contact the Human Research Protection Program in writing at D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455.

You will be given a copy of this form to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Print name: _____

Signature:_____ Date: _____

Signature of parent or guardian:_____ Date: _____

(If minors are involved)

Signature of Investigator:_____ Date: _____

IRB Code #: STUDY00001979

Version Date: 02/10/17

Appendix B

Demographics

1. Age_____

2. Gender_____

3. Race_____

4. Years of tennis experience_____

5. Current varsity member or practice squad_____

6. Current position on the team (if known–e.g., 2 singles/1 doubles)_____

7. Years of collegiate tennis experience_____

8. Video training/analysis experience_____

9. Current class year (freshman, sophomore, junior, senior)_____

10. Handedness (left or right)_____

Appendix C

After Experiment Free Response/Interview Questions

Upon completion of the experiment, participants will be asked to partake in a short interview regarding the E-Prime video analysis training protocol (VATP) intervention.

1. Do you believe the reaction training protocol was a valuable tool?

2. Did you feel more confident in your ability to return serves given your reaction training?

3. What aspect of the reaction training did you find best applied to your practice performance?

4. Do you feel that the reaction training was beneficial to your match performance?

5. How do you feel the reaction training affected your serve return expertise?

6. In what ways did the reaction training increase or decrease your confidence in your serve return abilities?

7. How did the reaction training differ from your expectations? Was its impact different than what you expected?

8. Do you think there are ways that would make the reaction training more beneficial to your performance?

9. How do you feel about the ways the reaction training may or may not have affected your serve return abilities?

10. Is there something you expected to get out of this training that you did not? If so, explain.

Appendix D

WEEK 1	**Pre-Intervention Testing**	**Day 1**	**Day 2**	**Day 3**	
	-Informed Consent	-Video analysis training or reaction time training	-Video analysis training or reaction time training	-Video analysis training or reaction time training -Match	
WEEK 2		**Day 1**	**Day 2**	**Day 3**	
		-Video analysis training or reaction time training	-Video analysis training or reaction time training	-Video analysis training or reaction time training -Match	
WEEK 3		**Day 1**	**Day 2**	**Day 3**	**Post-Intervention Testing**
		-Video analysis training or reaction time training	-Video analysis training or reaction time training	-Video analysis training or reaction time training -Match	-Exit Interview

Appendix E
Reading Tennis Serves Tip Sheet

Overall

- Look at your opponent's eyes
- Watch for serving patterns (especially on 2nd serves)
- Know your own serve return weaknesses
- Notice where the server stands
    - Wide = wide serve, T = T serve

Serve moving right to left (right handed server)

- Toss is out front (away from body)
- Flat or slice serves typically
- Typically, 1st serves

Body Serves

- Neutral toss
- Flat serves
- Slice or kick serves (aimed at the non-dominant hip of the returner)

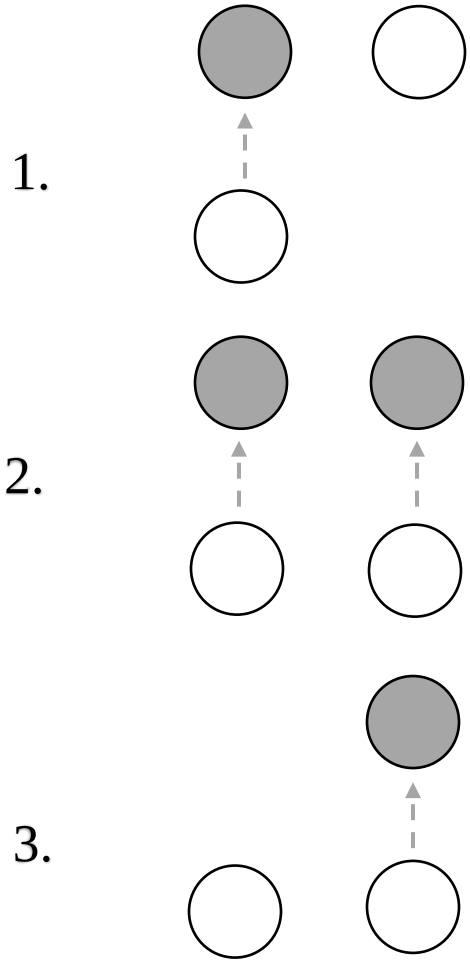
Serve moving left to right (right handed server)

- Toss is above or behind head
- Mostly kick serves (especially 2nd serves)
- Some flat serves (typically on 1st serves)

Appendix F
One Split One Drill Description

1. Take one step forward for momentum. This will be done with whatever foot is most comfortable for your serve return stance. This step will be done to get your feet parallel with one another.
2. Take one hop forward. This is done so that your land on your toes, both feet will move and remain parallel with one another.
3. Take one step forward to regain your momentum. This will be done with which ever foot you feel most comfortable with as you will establish your normal serve return stance.

-An example is show below of the foot placement during each step.



***This drill was presented to the captains by the head researcher prior to the start of practice the beginning of week 2. The captains then presented it to the team with the head researcher there for any questions.