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Systematic Observation of Coach Feedback in Elite Youth Volleyball

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SYSTEMATIC OBSERVATION OF COACH FEEDBACK IN ELITE YOUTH VOLLEYBALL

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
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ABSTRACT

The purpose of the study was to understand the relationship of coach feedback during time-outs to the performance of 16-18 year old volleyball players in competitive match play situations. The systematic observation of coach feedback during 89 time-outs was recorded using the Coach Time-Out Observation Instrument (CTOOI). Out of the 879 feedback statements that were made during the 89 time-outs, the CTOOI categorized coach feedback for technical feedback (with an internal or an external focus), tactical feedback (referring to our team or the opponent), and psychological feedback (as either encouraging or discouraging remarks). Data from the Game Performance Assessment Instrument (GPAI) were collected for the "quarterback of the volleyball team:" the setter. Data were collected to evaluate setter performance for the four rallies before the time-out and the four rallies immediately after the time-out. The GPAI measured setter positioning, decision making, and skill execution.

The multiple regression analysis did not show any feedback strategy to be significant for the entire group of setters in terms of performance improvement. However, as the literature on coach feedback had suggested, when the setters were divided into groups of higher and lower skilled setters, significance was found for certain coach feedback types in each group of setters. For higher skilled setters, significant improvement in setter performance ($p = .03$) came from feedback that was tactically oriented towards the opponent in combination with technical internal feedback. For lower skilled setters, setter decision-making was improved significantly ($p = .05$) by time-out feedback characterized by psychologically encouraging over and above discouraging remarks that were made during the time-out.

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CHAPTER ONE

INTRODUCTION

What is the most effective way to coach the game of volleyball to high school aged girls competing in competitive club volleyball? The modus operandi of traditional coaching is to break the game down into "fundamentals" or technical skills. However, when technique precedes tactics, skill development detached from game play takes precedence over the use of skills in game play itself. Maxwell (2003) has argued that the oversimplification of practice to mere drilling of technical skills is at odds with athletes having success in the game of volleyball during competition. Bortoli (2010) suggested that young athletes need more than this narrow view of coaching: "Inherent in the game are situational constraints which require complex mental decisions and physical adjustments under pressure" (p. 454).

It is quite possible that a disconnect between coaching skills as delivered to athletes in practice and playing the game skillfully can occur if coaching consists of the practice of skills in closed situations. Not only are the tactical components removed (knowing what to do in particular situations), but critical components of the technical response (how to perform in these particular conditions) could also be lost, and thus, a very limited transfer of skills in practice to the demonstration of these skills in the game occurs. Thus, the dilemma for coaches today is to try to unlearn the traditional ways of thinking about coaching, to coach in a way that is different from the way that athletes were coached one generation ago, and to learn new ways of thinking about coaching that will produce a transfer of knowledge and skills from the practice court to the game.

This is not to say that the teaching of fundamental skills has no value to the success of the athlete. After all, as Rink, French, and Tjeedsma (1996) point out, the ability of the athlete to execute skills will, indeed, influence the tactical options that are available to them. What this study advocates is a balanced approach to coaching the game of volleyball that will be reflected in the kind of feedback coaches give to their players. The traditional model, which values teaching techniques over tactics, has over-prioritized the amount of time spent on technique development apart from its contextual relevance in a game situation.

Rovegno (1995) and Maxwell (2003) have argued that the coaching of technique and the coaching of tactics should be inseparable. In fact, they are inseparable. A finely tuned motor response as an adaptation to a decision made on the court in real time is what the coach seeks and what athletes and spectators would define as a great play. Rovegno brilliantly frames the essential need for more focus upon tactical decision-making skills by stating, "rather than controlling the complexity of performing in a motor activity by controlling the complexity of the coordination and control demands of efficiency, coaches should control complexity by controlling the environmental demands themselves" (1995, p. 301).

Based upon the literature in Teaching Games for Understanding (TGfU), a very effective way to coach volleyball is to incorporate the coaching of technique with the coaching of tactical strategies and to use a 'tactics first' approach (Vande Broek, Boen, Claessens, Feys, & Ceux, 2011) so that athletes can control environmental demands (Harvey, 2006) when they perceive a situation tactically and then quickly select appropriate techniques that will help them to succeed in competition. In this study, I have examined the extent to which coach feedback strategies affect player performance in the game of volleyball. Based upon the literature review, a most

concise way to accomplish this is to look at the effect of coach feedback during the time-outs in the match on the performance of the "quarterback" of the volleyball team: the setter.

The time-out is an excellent and concise period of time in which to evaluate coach feedback. American sports that incorporate time-outs include volleyball, basketball, ice hockey, and football. In volleyball and basketball, instructions during time-outs are sent to the team as a whole, with the brunt of the responsibility to execute the requests of the coach falling first upon the setter in volleyball or, to give an example from another sport, the point guard in basketball. In volleyball, the setter is the target for every first ball that the team passes, and it is up to the setter to make the tactical decisions and deliver the ball to the hitters with technical form and accuracy (ball positioning) in order to give the team the best opportunity to score points. The collective nature of the time-out is also a valuable characteristic of the time-out as the coach is given the opportunity to tell everyone on the team his or her thoughts about the game as it is unfolding. Together, and as a collective body, the players interpret what the coach is requesting.

The time-out is also an excellent place to garner an accurate measurement of coaching feedback strategy. In volleyball, there are five different times in a competition where coaches can give feedback to the their players: 1) prior to the match, 2) during play itself, 3) during substitutions, 4) between sets, and 5) during time-outs. Of each of these, Ker (1996) has stated that time-outs represent points of particular importance in the direction that a team will take during competition because the time-out allows the coach to attempt to influence the rhythm of the match, to give tactical information to all of the team's players, and, since they occur before a given set is completed, to potentially modify the outcome of the set by positively affecting the performance of the players. During the time-out, the coach is usually "all-in."

The time-out also encapsulates the philosophy that the coach is putting into use, more than at any other time of the competition. Mesquita, Sobrinho, Rosado, Pereira, and Milisteted (2008) point out that the nature of information given by coaches during the time-out reflects the type of approach that frames their instructional process in general. As a consequence of the type of feedback given by the coach during the time-out, the athletes' attention is directed towards certain aspects of the competition and away from others. At more than any other time of the match, the athlete is focused on the coach's words.

In terms of whom the volleyball coach is directing their attention towards when giving feedback during the time-out, studies have shown that the coach is more focused on the setter than any other player with his or her feedback instructions offered during the time-out (Moreno, Santos, & Ramos, 2005). Moreno, in the study of expert coaches and their communication to the athletes in volleyball during time-outs, collected data that determined the percentage of communication given to the group collectively and to specific individuals on the team during time-outs. In this study, Moreno found the setter to be the most targeted individual in time-out communication. The data on coach feedback during time-outs indicate communication is directed towards the group collectively (54% of the time), towards the setters individually (21% of the time), towards the middle hitters individually (10% of the time), towards the outside hitters individually (8% of the time), and towards passers individually (7% of the time). In interpreting the results of the Moreno study, the setter, as "quarterback" of the team, is involved directly with 75% of the coach communication during time-outs (collective communication 54%, plus individual setter communication 21%). The setter is also the athlete on the team that is most directly involved with comments to others on the team. This can be stated because in a volleyball game rally the ball is either heading towards the setter who is the target of the pass, or

coming from the setter and going directly to the hitter. Moreno's data show us that the setter is the athlete who is most influenced by the coach feedback during a time-out being addressed directly (75% of the time) and indirectly (the other 25% of the time). For the purpose of this study, then, I have analyzed coach feedback during time-outs and determined the performance effect that the coach feedback has on the setter in volleyball.

The most practical way to observe the impact of coach feedback upon the setter is not to merely look at the score of the game before and after the time-out, as was done in previous studies such as that of Boutmans (1991) where the author investigated the influence of the time-out on the score of the team that called it and determined that the time-out had a positive influence based upon an improvement in game score. Instead, research data in this study were collected more specifically on the performance of the key player on the team, the setter, and measured the change in performance by the setter on technical and tactical skills from four rallies before the time-out to four rallies after the time-out. I also calculated the setter ball placement skill score means for each setter and placed the setters into two groups, the higher skilled and lower skilled setters, in order to determine if there was a significant difference in effective coach feedback strategies for each of these two groups. This calculation is explained in chapter 3.

Statement of Problem

The problem for this study was to investigate how the coach, through the use of coaching feedback, could facilitate the execution of movement skills in a manner that would enhance the performance of the setter in competitive game situations. Thus, the task was to determine the relationship between different types of coach feedback during time-outs and setter performance in the games. The study was carried out to determine the effect that coach feedback strategies have on the improvement of the two major areas of game performance. Those two areas are,

first, the skill execution capabilities of the setter, and second, the decision-making capabilities of the setter in a game situation. Furthermore, the extent that coach time-out feedback negatively affected performance by causing the setter to think negatively of herself due to the feedback that was given to her was also evaluated.

Research Questions

This research study answers the following research questions with regard to the effectiveness of coach feedback during time-outs to positively affect the performance of the setter in volleyball competition. Specifically, the study investigated:

1. What kind of coach feedback (or combination of coach feedback types) is most effective during a time-out in volleyball to positively affect the setter's performance, as measured by the Game Performance Assessment Instrument (GPAI), in a volleyball match?

2. Is there a difference in the most effective type of coach feedback during time-outs for higher skilled setters versus for lower skilled setters, or is it similar for both groups?

3. For both of the above questions, using the coach feedback (independent) variables under consideration: 1) technical feedback with an internal focus, 2) technical feedback with an external focus, 3) tactical feedback with an internal focus ("us"-our team), 4) tactical feedback with an external focus ("them"-our opponent), and 5) the use of encouraging remarks versus discouraging remarks, could it be determined if any particular combination of the coach feedback independent variables yielded any significant result or generalizable conclusions regarding optimal coach feedback strategies as they relate to: the overall game performance of the setter, the skill performance of the setter, and the decision making performance of the setter?

Definitions

Attention Control- The ability to pay attention in a sport setting whereby the competitor gains an advantage over his or her opponent by being able to attend to relevant cues which will give the competitor a competitive edge by being able to anticipate the direction, speed, or flight of the ball when on defense, or the movement of the individual and group defense when on offense (Pereira, Mesquita, & Graca, 2010).

Focus of Attention- Attention that the setter has that can be either external or internal. An internal focus is directed at the athlete's own body movements, an external focus is directed at the effects that his or her movement have on the environment (ball, implement, etc…)

Set- The set is usually the second contact that a team makes with the ball. The main goal of setting is to put the ball in the air in such a way that it can be driven by an attack into the opponent's court. The setter coordinates the offensive movements of a team and is the player who ultimately decides which player will actually attack the ball and try to hit it over the net and score a point.

Skillful Player- A player who is effective in not only controlling and directing the ball, i.e. technique, but who includes other critical aspects of skilled play in his/her practices, e.g. supporting a teammate with the ball with a good set at the correct angles and distances, or covering for team-mates at the correct angles and distances in defense" (Harvey, 2006, p. 167).

TGfU- Teaching Games for Understanding- Harvey (2006) defines TGfU as "a pedagogical strategy aimed at getting the participants to understand the strategies and tactical complexities of the game as well as knowing when and where to utilize and apply the techniques of the game" (p. 52).

Scope of Study

A sample was selected from a population of coaches of over 350 club volleyball teams at the 16-18 year old age level. With a limited travel budget to collect data, it should be noted that the tournament that was attended to collect data was in the Midwestern United States of America. Thus, the samples collected reflected coaching styles more indicative of volleyball coaching styles in the Midwestern USA as opposed to, for example, coaching styles from the west coast. Admittedly, the sample should be called, under the circumstances, a convenience sample. Nevertheless, ten coaches of 16-18 year old girls participating in club volleyball teams were selected for the study. All of the teams were at the club volleyball level and thus regionally competitive. In USA Club volleyball, teams are either ranked nationally, regionally, or locally. All ten coaches who signed their teams up for this regional ranking tournament have evaluated and placed their teams at the regionally competitive level.

Significance of Study

The research questions have examined whether an appropriate combination of psychological, tactical, and technical coach feedback assists the setter in volleyball to improve her performance from what it was on average for four rallies before the time-out to what it was on average for four rallies after the time-out. Answers to these questions adds to the research base being established in the area of effective coach feedback during time-outs by tying the theoretical research in this area to tangible on-the-court performance of setters in games. This

has a strong practical value as the results could assist a coach in being more confident that the feedback strategies that he or she incorporates have proven value in actual competitive situations.

CHAPTER TWO

REVIEW OF LITERATURE

Literature on coach feedback has demonstrated that the feedback statements provided by the coach are important influences upon athlete learning and performance (McGown, 1994). Hoffman (1983) identified the necessary capacities of a successful coach to include the ability to identify technical and tactical errors, and to prescribe solutions to those errors by means of feedback provided by the coach to the players. Research in expert and exceptional performance has found that expert coaches are better than novice coaches in evaluating, for example, descriptive sequences of swimmers swim strokes and the motor execution of shot putters (Ericsson & Lehman, 1996).

Literature on Teaching Games for Understanding (TGfU)

Teaching Games for Understanding has been used in sport coaching theory to make coaching more athlete-centered while at the same time engaging the athletes as learners in active listening and purposeful movement on the court or field of play. In this study, TGfU informs the direction of the research to identify what makes a time-out helpful to the setter in volleyball at both the higher skilled and lower skilled levels. One critical aspect of enhancing coaching feedback strategies that TGfU theory can assist with involves the ratio of technical to tactical feedback to be given and the prioritization of which kind of feedback should be given in competitive volleyball situations. On the one hand, those advocating a prevalence of tactical feedback argue that the overemphasis on technical feedback has caused task decomposition, or lack of transfer between the elements of the motor skill to the whole skill itself, and inevitably, to

a game situation. An example of this would be isolating the steps of the approach jump from the actual hitting of the ball in volleyball.

In the Teaching Games for Understanding (TGfU) literature, game situations are the motivational impetus for all technical learning. The TGfU model originated in the United Kingdom at Loughborough University by two former practitioners turned researchers, Bunker and Thorpe, (1982) who became tired of watching teachers teach techniques only for them to break down in game play. Bunker and Thorpe sought teaching methods in motor skill development that would transfer into game situations. For Bunker and Thorpe, meaningful instruction should include cognitive outcomes such as "what to do" and "when to do it" as well as the actual "how to do it" that was previously associated with motor performance instruction.

The TGfU coaching theoreticians also insist that tactical feedback should refer to specific and relevant events occurring in the competition. Ker (1996) elaborates on this theme by stating that contextualization of tactical information is important when the volleyball coach is giving verbal feedback during competition. That is, the coach must avoid making references only to his or her own team. When the coach also makes reference to the actions of the opposing team, the following advantages occur. First, and most importantly, a minimization of inappropriate responses to the opponent's style of play will occur among team members, and complementarily, a maximizing of his or her own team's strong points will emerge. Thus, the type of feedback the coach provides during competition (Isberg, 1993) influences the attentional focus of the athlete as well as the performance of the athlete in competition.

The TGfU model emphasizes the fact that tactical skill works in tandem with technical skill. Despite previous research trends, the proposition is not an "all technical feedback" or "all tactical feedback" proposition. As Hopper (2002) has stated, the either/or debate has missed the

essential point that the most effective coaching feedback is student centered: "To combine skills and tactics a teacher needs to understand the developmental needs of the learner. In other words, what tactical awareness can learners comprehend and what level of skillfulness can they achieve. Skill progression implies a back and forth marriage with tactical awareness, where skill performance is realized" (p, 46).

Literature on Coaching Feedback Strategies

In order to achieve the goal of improving coach feedback in game situations during time-outs, coaches should become more self aware of their feedback strategies. Rowing coaches, for example, (Millar, Oldham, & Donovan, 2011) were observed giving coaching instructions, and it was found that they could not accurately identify the type, nature, or timing of the feedback that they were giving. During training, coach communication was coded, and afterwards, by means of questionnaires, the coaches demonstrated that their recall of what was stated during training was quite inaccurate. When the coaches thought they had provided a great deal of tactical information, they, in fact, had primarily offered information of a technical nature. Pereira et al. (2010) conducted a study in volleyball that demonstrated the same phenomenon. In this study, the coaches perceived that their time-out coaching feedback was more tactically oriented than it actually was. Instead, their feedback was predominantly technically oriented.

Besides mistakes by coaches regarding what is being said to athletes during time-outs, another factor may be that coaches underestimate the mental capabilities of their players. A study by Leslie-Toogood and Martin (2003) demonstrated that, although volleyball coaches showed a high degree of confidence in their ability to evaluate the mental skill strengths and weaknesses of their athletes, there was little agreement between the coaches' perception of the athletes' mental

capacities and the actual mental skill capacities of the athletes they coached. Each of the above studies demonstrates that when the traditional approach to motor skill teaching in sport has been "technique dominated," where "structured lessons that sequentially teach a list of movement skills to a group of learners" occurs (Werner, Thorpe, & Bunker, 1996, p. 31), it is not surprising that mental skills of athletes have been underestimated and underdeveloped.

Literature on the Constraints Led Approach to Motor Skill Acquisition

The athlete's performance and the coach's coaching ability are inevitably evaluated by how successfully movements are coordinated and controlled with respect to the dynamic environment of team sports. Thus, it is very important to have a theory of motor skill development that allows a place for an athlete's mental skills to flourish. Chow, et al. (2007) argued that within the construct of TGfU, that the work of Newell (1986) was very helpful in identifying how, from a motor control perspective, productive tactical decisions and technical movements could emerge within the constraints inherent in sport participation. Newell's constraints-led approach to motor skill development provides scaffolding for the TGfU pedagogical methods to develop.

Newell classifies constraints into three distinct categories to provide a framework for understanding how movement patterns emerge during game task performance. (See Appendix A). The three categories of constraints are performer constraints, environmental constraints, and task constraints. Newell also classifies the game participant, the athlete, as being at one of three stages of learning: the coordination stage, the control stage, or the skill stage (Newell, 1991). For Newell, it is important to be aware of the stage of learning that the athlete is in and to

understand the type of constraints that are most detrimental or beneficial to the learner at that point in time.

The first category of constraints is the performer constraint. The performer constraints are the physical attributes of the athlete that will impose physical limitations on the skill level of the athlete. Body composition, muscular strength, muscular endurance, power, agility, and flexibility all fall into this category. Neuroanatomical differences that can widen such a gap at puberty present intrinsic differences in development among individuals. Skill level becomes a performer constraint and is related to the appropriate type of feedback that a coach should give. Castaneda and Gray (2007) found that youth players who are lower skilled players were unable to use advanced tactics because they were constrained by their inability to perform the necessary movement skills. A conclusion from this finding is that skills and tactics constrain each other and develop in tandem. A practical application of this finding would be for coaches to avoid tactical feedback that might overwhelm their athletes if they are competing against opponents who are superior in terms of the skilled execution of fundamental game tasks. The athlete in the coordination stage of development is already overwhelmed by attempting to perform the skills themselves. Research on the types of feedback that work best in this scenario should be investigated.

When faced with the dilemma of detrimental performer constraints to athletes in the coordination stage of development, as outlined above, research has shown that coaches should explore the value of stabilizing environmental constraints that occur in game competition. Besides the most basic environmental constraints (light, temperature, gravity, and altitude), important environmental constraints are social and psychological in nature. Peer groups, social norms, and coach feedback tone are factors that can strongly influence athletes who are

developing proficiency in sport skills. Moreno (2007), upon interviewing 25 coaches, found that the ratio of positive feedback comments to negative feedback comments from coaches to players should be 4:1. That is, four positive comments for every one negative remark. The coach, as he or she offers feedback during the time-out, must ask himself or herself if there are clear performer constraints in the game and what psychological construct can be used to stabilize the performer constraints in the system. As Moreno (2007) has discovered, the best way to limit environmental constraints is via encouraging remarks to the athlete.

Other research literature supporting the benefits of encouraging over discouraging remarks for the athlete can be found in elaboration on the inverted U theory. The inverted U theory states that each athlete has a zone of optimal functioning and that performance will decrease once the athlete becomes overly aroused. The inverted U theory and the zone of optimal functioning in sport have also been specifically examined with respect to players of higher and lower abilities. A study by Jokela and Hanin (1999) found that, on average, lower skilled athletes tend to perform better at a lower state of arousal whereas higher skilled athletes can manage greater amounts of environmental interference, which includes coach feedback. Thus, when a coach yells negative and discouraging remarks to a team with lower skilled athletes, a high arousal environment is brought about and the lower skilled athlete will move beyond their zone of optimal functioning, and, as a result, their performance will decrease rather rapidly.

The third type of constraint in Newell's model is the task constraint. In order to achieve the appropriate coordinated movement goal, the athlete must have an accurate perception of the information that is coming in and then take action with the appropriate physical movement. When performer and environmental constraints are limited (they do not constrain the system),

task constraints are the only remaining obstacle to successful expert performance. Thus, task constraints are more specific to particular performance contexts than environmental constraints. Along the lines of task constraints, an important task of coach feedback during game play is to "allow game players to become better at detecting key information variables that specify certain movements from a myriad of noncritical variables" (Chow et al., 2007, p. 260). Athletes can then, "attune their movements to essential information sources… thus establishing essential information-movement couplings that can regulate behavior" (Newell, 1991, p. 227). Athletes in the control stage (to some degree) and in the skill stage are best positioned to take advantage of task constraints. By the time the athlete reaches the control stage, athletes can keep information about the surrounding environment and the corresponding bodily movements together. They benefit from task simplification, a term that refers to the process of simplifying the process of information pickup and coupling such information to movement patterns (Newell, 1985).

Literature on the Value of Tactical Feedback to Improve Technical Sport Skills

Isolating tactical information about opponent movement and connecting the information to an appropriate and strategic counter movement provides the probability of an immediate and appropriate physiological response, connecting tactical feedback with technical performance. In the literature on expert performance, the ability to pick out relevant visual cues in this tactical sense is a key to performance expertise. To illustrate this point, in a study by Piras, Lobietti, and Squatrito (2010), the tactically oriented visual search strategy in sports was demonstrated to influence performance. The differences in fixations and saccadic eye movements between expert volleyball players and novice subjects was studied by carrying out an analysis of eye shifting during the observation of a game situation. Fifteen novices and fifteen experts were asked to

observe a setter set the ball forward or backward. From the video that measured eye shifting, the number and length of time the eye fixations occurred was tabulated. The results showed the experts had fewer long gazes, and shifted eye movement to key aspects of the ball flight, looking at initial pass trajectory, and then quickly shifting attention to the setters' hands, disregarding the entire trajectory of the ball. The novices followed the whole course of the ball to the setter and to the hitter, missing out on essential tactical information along the way. The experts extracted more task-relevant information from each fixation than did the novice athletes. The strategy used in the gathering of visual information was correlated to player skill proficiency.

In a study with similar conclusions to the Piras et al. 2010 study, Wright, Pleasants, and Gomez-Meza (1990) also investigated the differences between experienced and novice players to detect and use information from visual sources in a volleyball match. In the study, both groups viewed film sequences simulating offensive attack patterns by a defensive backcourt player preparing to intercept an incoming spike. Sequences were presented before and after the offensive setter's initial contact with the ball. The time period of 167 milliseconds before and after setter contact was a rich source of usable information to the experienced defensive player but was not used by (or was completely missed by) the novice.

The significance of the evidence of these information-movement couplings that occur when visual cues are used to elicit anticipatory movement patterns is the basis for the correlation between tactical and technical skill demonstrated among expert performers and the seeming lack of such a relationship among lower skilled performers. The development of expertise that takes up to ten years (Ericsson & Lehman, 1996) of deliberate practice and encompasses focus, hard work, and meaningful coach feedback all along the way, has no short cuts. Ericsson's and Lehman's (1996) research in expert performance has shown that talent alone is a poor predictor

of expert performance, while deliberate practice is a much stronger predictor. Consequently, Coaches, by analyzing where his or her athletes are presently situated on the tactical and technical matrix of skill, can create meaningful learning environments in practice and provide feedback to players in games that, in this student-centered way, keeps them moving in the right direction from a psychological, tactical, and technical point of view toward the expertise that is desired.

One study designed to enhance coach feedback by introducing a greater degree of tactical feedback about the opponent (the variable PTACO in this study) had mixed results. Moreno et al. (2007) and her research team attempted to positively influence the verbal behavior of coaches during time-outs by increasing the amount of tactical information about the opponent that was given during time-outs in competition. Using a supervisory feedback intervention, a group of master coaches gave suggestions to inexperienced coaches regarding the kinds of statements they were making during time-outs. It was determined that the feedback given by the inexperienced coaches to athletes prior to the intervention phase was essentially tactical comments about his or her own team. During the intervention, tactical comments showed an improved higher percentage of comments made regarding tactical strategies related to the opponents, and what the opponents were doing on the court. Thus, this coaching approach made athletes more aware of visual cues that would assist them in better anticipation skills and be in better position on the court. After the intervention phase, however, the researchers reported that the post-intervention tendencies reverted back to pre-intervention proportions of feedback statements made by the coach during the time-out. Because performance outcomes of the athletes coached by the beginning coaches were not measured, perhaps the beginning coaches did not recognize the

performance improvements (if any) their athletes were making as a result of the tactical feedback they were giving about their opponents.

Blomqvist, Vanttinen, and Luhtanen (2005), in research on soccer play, statistically supported the argument that tactical knowledge of the sport translated to game performance. They found that players who responded better in problem representation situations also performed more efficiently in game play situations, thus relating game understanding to game performance. Blomqvist et al. also found through systematic observation that in competitive game situations players' decision-making events occur more often than skill executions at a ratio of 7:1. From a practical teaching perspective, this means training in off-the-ball movements in game play should be prioritized in games teaching if game performance improvement is the goal.

Fenoglio (2003) further demonstrated a successful modification of boundaries and rules in an example of modified soccer training research. This study found that the smaller games gave players increased opportunities to respond i.e., make decisions, implement motor execution patterns, and gain feedback (internal) from poor decisions and poor skill executions (implicit learning in the game context). This study found that 4 vs. 4 small sided games provide 585 more passes, 481 more scoring attempts, 301 more goals, 525 more 1 vs. 1 encounters, and 436 more dribbling tricks when compared to 8 vs. 8 games, lending support to the notion that contextual game play aids in declarative knowledge development. The USAV volleyball impact curriculum also teaches drills that emphasize this concept.

It is hoped that by measuring performance results of setters as the dependent variable in this study, that coach feedback strategies that are beneficial to setters at both and higher skill and lower skill levels will emerge. Moreno (2007) advised future researchers who examine verbal feedback of volleyball coaches to take into account additional variables such as skill level of the

players and coach experience when analyzing the data. In the present study, skill level is, indeed, an important variable to consider and include as a factor when evaluating volleyball coach feedback during time-outs.

Literature on the Value of Technical External Coach Feedback

Before reviewing the instruments to be used in this study, a final area to review has to do with technical feedback. Is there significance in the directionality of technical feedback? Technical feedback from the coach that is internal has to do with the body movement itself that the coach would like the athlete to execute; technical feedback from the coach that is external focuses upon the object (affecting the trajectory of the ball, etc…) and may have an added value for the setter, particularly one that is lower skilled. Ehrlenspiel and Maurer (2007) explained why an external focus in movement execution may be more beneficial for the lower skilled setter. They state that external focus in movement execution accentuates exteroceptive (especially visual) sensory information while an internal focus highlights interoceptive sensations. Thus, a higher external focus in motor learning may better produce external effects (an appropriate trajectory of the ball, etc..) particularly at beginning stages of learning of a motor skill.

Further evidence on the benefits of an external focus during technical skills is based on scientific evidence on muscle activity using electromyography (EMG) that has explained performance differences under external versus internal focus conditions. Zachary, Wulf, Mercer, and Bezodis (2005) looked at muscle EMG activity in basketball free throw shooting when athletes adopted an external focus (basket) versus an internal focus (wrist motion) and discovered that shooting accuracy was enhanced under the external focus condition. EMG data showed that not only was movement efficiency enhanced, but also, there was a reduction in

"noise" in the motor system that is known to hamper fine motor control. Wulf, Zachary, Granados, and Dufek (2006) also demonstrated better performances in jump reach on a vortec based upon external focus of attention. In the jump reach study, EMG data were also collected and they indicated similar results to those found by Zachary et al. with regard to enhanced movement efficiency and a reduction of "noise" in the motor system. Specifically, in the jump study, larger joint torques, greater joint velocities, and increased jump heights were attained by those subjects adopting an external point of focus. Thus, the direction of technical feedback (internal or external) can affect not only isolated joint movements (shooting a basketball) but also dynamic multi-joint actions (jump reach).

Poolton (2006) also demonstrated that an external focus of attention given through technical feedback may be effective because it reduces the demands on information processing relative to an internally focused instruction. The externally focused performer processes movement effect information, while the internally focused athlete prompts processing demands that are greater as "conscious processing of both the movement effects and information from internal feedback sources (proprioceptive feedback loops)" (Poolton, 2006, p. 97) are required. An external focus can overcome the predisposition to focus internally, especially when a new skill set is required, or when the performer attempts to "reinvest" in movement coordination mechanics, or identify problems and formulate solutions to poor motor skill execution. This happens when the coach expresses verbal knowledge of performance errors in order to correct movement errors. The current study explored whether the type of technical feedback given during the time-outs of a volleyball match had any specific effect, either positively or negatively, on lower skilled and/or higher skilled setters.

Literature on Evaluation Instruments: GPAI and CTOOI

The final area of the literature review deals with the literature that supports the instruments to be used in this study to measure coach feedback and player performance. The Coach Time-Out Observation Instrument (CTOOI) was used to measure several types of coach feedback (the independent variables). Since 1975, there has been research done in the area of systematic observation of coaches in sport. Most of these studies had focused on coach feedback in practice settings. The Arizona State University Observation Instrument (ASUOI) was developed in the 1980s to measure coaching behavior and coaching feedback in a variety of team sports and in a number of team practice settings. Other observational tools have been developed to better understand the content of verbal information provided by a coach during practice and in competition. The Coaching Behavior Assessment System (CBAS) has been widely used in the field in practice settings. The CBAS captured coach feedback that was categorized as either positive or negative reinforcement of skill, corrective feedback, general encouragement, general criticism, and strategy (Hastie, 1999). Studies that provide quantitative examination and beneficial categories of analysis of the time-out in games include the System of Analysis of Information during Competition (SAIC) developed by Piña and Rodrigues (1993), and The Coach Time-Out Observation Instrument (CTOOI) developed by Hastie (1999).

A main purpose of the development of CTOOI was to assist in the correlating of "time-out information with post time-out action" (Hastie, 1999, p. 477). With such correlations, a researcher could identify patterns of communication that result in positive post time-out play. Thus, assisting the researcher to identify the type of coach feedback during a time-out that could improve performance following the time-out. The CTOOI consists of three primary categories that comprise the communication statements made by coaches to their players during time-outs.

These statements are either technical statements, tactical statements, or psychological statements. The technical statements are those statements made that are related to skill performance. They are statements made to the players about their performance of skills in the game. The statements are generally corrective in nature. The tactical statements are those statements made that relate to strategic game matters. These statements are regarding past or future tactical actions or decisions made by players. These include statements made by the coach about future strategic plans. The psychological statements are those statements that are related to the emotional/cognitive aspects of play. These statements include remarks about concentration, arousal, self-esteem, and confidence (Hastie, 1999).

Regarding the measurement of game performance, the Game Performance Assessment Instrument (GPAI) was used to measure the dependent variable: volleyball setter game performance. Several studies have used the GPAI to assess player performance. Some of these settings have been in K-12 physical education environments and others have been in sport environments. This section gives a brief overview of the use of GPAI in K-12 physical education settings, but it focuses mainly on the use of GPAI in sport settings. The GPAI is a valuable tool that can be used to measure not only an athlete's on-the-ball skills, but also, most importantly, the players' movement away from the ball. Movement away from the ball is a result of the athlete's decision-making strategies. The developers of the GPAI prioritized off the ball movement because their study of team sports indicated that 70% of movement in a team sport occurs away from the ball. Thus, in order to accurately evaluate the overall performance of the athlete, off the ball movement should also be taken into account. In addition to off the ball movement, the authors of the GPAI also wanted to record decisions made with the ball that did not necessarily get counted in a typical stats sheet. Thus, categories for "putting teammates in a

better position" were also included in the GPAI. For the setter position in volleyball, the GPAI could account for aspects of performance that typical statistics could not do. Harvey (2006) successfully used the GPAI to measure soccer skill improvement and decision-making improvement in game settings among middle school physical education students.

Summary of Literature Review

The literature review has examined the debate between the value of a technically oriented versus a tactically oriented coach feedback orientation. Coach feedback, as indicated in the TGfU literature is most beneficial when a combination of technical and tactical feedback is student-centered and focused upon the learner. Using Newell's constraints-led approach to motor skill acquisition as a theoretical model to explain differences in an athlete's motor skill performance, the performer, environmental, and task constraints that Newell has defined, provides a framework for understanding the obstacles that an athlete faces in competition. Since the coach is also concerned about performance and tries to positively affect performance, the literature review has also discussed areas where the coach can improve his/her own coaching feedback strategies. In addition to being more aware of what they are saying to their athletes, coaches can also be more aware of the mental skills of their athletes and attempt to cultivate these mental skills through feedback that has a tactical orientation and is grounded in technical skill.

Also presented in the literature review was the debate over the effect of coach feedback on technical skill performance and the rivaling theories that each emphasize in the different aspects of coach feedback. Coach feedback on technical skill that emphasizes an internal focus of attention on the part of the athlete is touted in the literature on expertise and elite performance (Ericsson & Lehman, 1996) as being a critical component of successful coaching and successful

performance. On the other hand, researchers (Vance, Wulf, Tollner, McNevin, & Mercer, 2004) who advocate that a coach elicits an external focus of attention while the athlete performs a technical skill, have data from physiological muscle measurements (EMG activity) that support their findings as well.

The final section of the literature review has addressed the selection of the instruments to be employed in this study. The Coach Time-Out Observation Instrument (CTOOI) was used to collect data for the independent coach feedback variables, and the Game Performance Assessment Instrument (GPAI) was used to collect data for the dependent variable, setter performance difference from before to after the time-out. The CTOOI and the GPAI were both chosen because they were well suited for the data collection needed in order to conduct this study, for investigating the research hypothesis, and for their proven reliability and validity in the field. In the Experimental Design section of Chapter Three, the specifics of the validity and reliability of the CTOOI and the GPAI are discussed in further detail.

CHAPTER THREE

METHOD

In this section of the research study, the steps taken to gather data are described and explained. The selection and characteristics of subjects, informed consent procedures, confidentiality of data, and the details of instrumentation are given as well.

Participants

The sample was a convenience sample of ten coaches selected from youth volleyball coaches from ten United States Volleyball (USAV) club teams of girls from the ages of 16-18 years old. Coaches' age (M=39.5, SD=10.6) and experience (M=11.4, SD=6.9) showed a strong amount of experience and maturity. There were five male and five female coaches in the sample. The two-day tournament where the data were collected was located in the Midwestern United States of America where volleyball has been competitive for 25 years. The teams from the top to the bottom of the two six team pools were equally matched. During the first day and a half of the tournament, match play was conducted in a round robin tournament format, where each team played the other team a total of two games. In 20 of the 30 matches observed, the results were split, with one win and one loss for both teams. The tournament was classified as a regional ranking tournament. This is the second highest type of USAV tournament, with the highest type being a national qualifier where three of the winning teams get automatic bids to the USAV national tournament in the summer. The coaches at the tournament have all received a level of training that the USAV has deemed essential for effective coaching. In fact, the USAV has a minimum level coach education requirement for all of the club coaches in the organization. The certification comes from the curriculum known as The Increased Mastery and Professional

Application of Coaching Theory (IMPACT). IMPACT certification is completed after attendance and participation in a five-hour course that each coach must complete before being allowed to coach. There is also an accompanying on-site or online test that each coach must pass after completing the IMPACT training. Informed consent was obtained from each coach participating in the research study. The consent form was approved by the university's institutional research review board. Included in the consent form were the purpose of the study and a detailed description of the mechanics of the study (see Appendix B). The mechanics of the study were systematically laid out so that the coaches would know that the study would not interfere with their coaching of the game or be a distraction to their players. With regard to maintaining confidentiality, the consent form indicated that all references to team and individual names in the transcriptions of the audio recordings would be made generic and unidentifiable. Provisions in the coach consent form also indicated that all digital audio recordings of the time-outs would be destroyed once the time-outs were transcribed. At the tournament where research was conducted, twelve coaches were asked to participate. Two of the coaches approached declined to participate in the study; the other ten coaches were willing participants and signed off on the consent form. Because a sample of convenience was used and coaches, for example, from the west coast were not a part of this study, the generalizability of the results to the population at large should be made with some caution. This is not to say that coaching on the west coast is much different than it is in the Midwest, particularly since all coaches undergo the same IMPACT training nationwide, but, it is simply to suggest that if the sample was taken from coaches nationwide, the results may have been different.

Other participants in the study include the setters from each of the 10 teams from which coach time-out feedback data were collected. It was determined that consent was not needed

from the setters in the study because they did not knowingly participate in the study, and did not, in this sense, participate. Neither was there any videotaping or other recording of actual volleyball setter performance during the data collection process. That is to say, all coders entered their game performance assessment data using the GPAI on paper in real time during the competition itself.

Procedure

In this section the instruments used in the study are described in detail. The instruments that were selected were the GPAI to measure setter performance and the CTOOI to measure coach time-out feedback (CTOOI). This section highlights the procedure by which the coach time-out feedback was categorized and the setter performance was recorded. The validity and reliability of the GPAI and the CTOOI are also reported. The third aspect of the procedure section is to explain the method of rater training that was conducted and validated for the GPAI, and how coder training was conducted and validated for the CTOOI in this study.

Categorizing the coach feedback statements using the CTOOI was done based upon the category definitions, examples, and rules listed in Appendix C. (See Appendix C for a complete listing of how to classify and properly code any coach feedback statements) By design, the categories of technical, tactical, and psychological feedback covers the gamut of must any type of feedback that could be given by a coach during a time-out. Of the 879 coach feedback statements made in this study, there were less than .06% of coach comments that could not fit in Hastie's general categories for types of coach feedback (5 of 879). For Hastie, The CTOOI instrument itself needed to be comprehensive and have a category for any type of coach feedback that could be given. A brief study of the Coach Time-Out Observation Instrument (CTOOI) Categories (Appendix C) also demonstrates the ease at which 99.4% of coach feedback

statements can be coded. For example, a Technical Internal (TECI) coach feedback statement is coded as such when the following conditions are met. First, there is a fit from the statement made by the coach with the definition of a particular kind of feedback that tells the coder what key aspects of the coach feedback comment to look for. In the case of TECI, the definition states that the coach gives the player corrective information about skill performance and makes reference to bodily movement as the focus of the corrective information. Then, the coder is given specific examples that assist in the process of coding the coach feedback statement. For example, in PTECI one of the examples is: "You need to try to bend your knees" (Hastie, 1999, p. 474). Thirdly, each type of coach feedback is given rules that help the coder with the process of coding statements that might be more difficult to categorize. For example, the rules for TECI are that, "the statement must include information about skill corrections or improvement, and be stated in a nonthreatening manner" (p. 474). Beyond the technical and tactically classified coach time-out feedback comments, the CTOOI also helps the coder of coach time-outs categorize comments that are more psychological in nature. The Encouraging Remarks (ER) definition is quite concise, "the coach makes positive reference to players with the purposes of rewarding, increasing confidence, or self esteem" (p. 475). Examples of ER are also included in the CTOOI. Statements such as: "Good job, Beth, way to go" (p. 475) help the coder feel more capable in the coding process. The guidelines for the coding of Discouraging Remarks (DR) were also helpful, as they classified coach remarks that made a negative reference to players that might reduce player confidence. Examples of coach feedback statements such as "That was rubbish. How can you play like that?" (p. 475) also clarify the coding process for the CTOOI coders.

To collect the data for the CTOOI in this research study, two Sony® digital voice recorders with dynamic audio capabilities were used. One recommended feature of these

recording devices is that they reduce ambient sound and background noise. This feature was important for the gym setting where the audio recordings were done. Other important features were the 750 hours of recording time on each device and digital stamping of each coach time-out that was recorded, that could later be associated with time-outs as they were listed on the GPAI. During the tournament, the coders, who were collecting data for the GPAI as well, would go into the huddle of both teams when the time-out was taken by either coach. There, each coder recorded the time-out, which would later be transcribed and coded with the CTOOI. The coaches put their players at ease about the coders recording the time-out events, and the recording coder stood on the fringe of the huddle with their arm extended to where the microphone of the recorder could pick up the coaches' feedback. (There were two recording sessions at a previous tournament to verify sound quality of the coach talking in the team huddle with the microphone placed in this particular position.) After the recording of the time-outs was completed, all 89 time-out recordings were manually transcribed into Microsoft® Word, where the coding of the CTOOI took place. Coding of the CTOOI took place according to the categories found in Appendix C and described above. For this study, two of the four coders were given copies of the CTOOI transcribed data, and they were asked to code the CTOOI time-out data into the six categories of the CTOOI. In this research study, the CTOOI inter-rater reliability was 96% accurate, as during the 89 time-outs recorded, there were only 36 statements out of the 859 coach time-out statements (V=859) where the CTOOI coders had some disagreement regarding the coding of a particular statement. In each case, the coders discussed the matter and made a uniform coding decision regarding the classification of the particular statement in question. (See Appendix D for a sample of a transcribed and coded coach time-out feedback statement.)

The Coach Time-Out Observation Instrument (CTOOI) has been field tested as a valid and reliable instrument (Hastie, 1999). Firstly, the CTOOI has been field tested for both discriminate and predictive validity. For discriminate validity, 10 varsity collegiate coaches classified 30 coach time-out comments in the three main categories of the CTOOI (tactical/technical/psychological) with kappa statistic for the placement of the coach comments into the four categories at .958. For predictive validity, two researchers trained with the instrument independently, and the level of agreement between two researchers reached 98 percent for all 30 time-out comments. For reliability testing of the CTOOI, 20 students were trained in the allocation of coaching statements to correct categories. Each was given 25 statements to code, then the test was re-administered one week later. Stability was calculated using the Wilcoxon matched signed pairs rank test ($t=6$, $p < .025$). (Hastie, 1999)

The other instrument employed in this study, the Game Performance Assessment Instrument (GPAI), was designed to be a flexible observation instrument that could be used either with video or in real time to observe the performance of any invasion, net/wall, field/run/score, or target game. Outside of the GPAI, there have been more detailed volleyball setter decision-making rubrics (Mesquita et al., 2008); however, for the purpose of this study, capturing the basic quality of the decisions made and the skills performed by the setter was accomplished by means of the GPAI volleyball coder guide. (See appendix E). Once all the data from a game were collected, the GPAI tally sheet was designed for simplicity in adding up the technical and tactical volleyball setter performance at the end of each match, and recording them on the tally sheet. (See appendix F) The GPAI allowed the research coders to classify volleyball setter performance in real time at the court where the observations occurred. Both tactical and technical data was collected using a two-person team of coders on each side of the net. The first

person would call out the score for the type of setter decision or skill to be evaluated, and the other person would record the result on the tally sheet. This occurred on both sides of the net, meaning that four coders were working together (2 per team) during a volleyball match.

In previous studies, the two primary categories of the GPAI had been field tested in volleyball for validity (the extent to which the instrument measures what it is designed to measure) and reliability (the consistency of results). Rater training on the GPAI was used for the four primary coders for this study. The raters went through two sessions where selected rallies from previously video taped volleyball matches were played back first in real time, and then in slow motion. The raters coded setter technical skill and tactical decision making performance on the GPAI tally sheets, and scored over 95% Inter Observer Agreement (IOA) by the end of the training sessions.

For volleyball, in terms of validity, previous independent *t* tests showed the ability of the GPAI to distinguish high from low performers in volleyball. (Statistically significant at .01 level, with Effect Size at 1.58 for Volleyball Skill Execution, and 1.50 for Volleyball Game Decisions Made.) (Oslin, Mitchell, & Griffin, 1998). In the past, for the reliability of the GPAI, the test-retest method was used to obtain the stability-reliability coefficient. Retesting was completed on more than 30% of the volleyball studies using videotapes of player performance. The volleyball correlations for the test-retest method were .94 (decisions made and support) and .85 (skill execution) (Memmert, 2008). These findings were similar to the IOA after the coder training sessions in this study.

Experimental Design

The data collected from the CTOOI gave the proportions of the types of feedback given during the timeout and its correlation to athlete performance as measured by the GPAI. The

design of this study has been stated as the measurement of the change in performance by the setter on technical and tactical skills from four rallies before the time-out to four rallies after the time-out on the same technical and tactical skills. The setters' performance as it relates to the types of coach feedback given during a time-out (N=89) was measured during all of the time-outs, and also, after dividing the time-outs (N=42) with setters that demonstrated higher technical ball placement skills, and time-outs (N=47) with those setters who have lower technical ball placement skills. This particular division of the setters into two groups was done in order to determine if coach feedback strategies were, or should be, different for higher or lower skilled setters.

The method by which the higher skilled and lower skilled setters were divided into two groups was a simple procedure. Based upon this procedure, there were five setters at the tournament who were classified as higher skilled setters, and five setters who were classified as lower skilled setters. In the procedure, the variable used to distinguish one group from the other was the ball placement variable (TEC-P) from the GPAI instrument. Ball placement was a scale of 0-3 on the GPAI with three being the highest score and zero being the lowest score (see appendix E for TEC-P scale details). The overall number of setting attempts recorded in this study (N=506) was used to determine the mean ball placement score for all setters (M=2.3). If the ball placement mean was above 2.3, it was determined that the coach was working with a higher skilled setter. If the ball placement score from the GPAI TEC-P variable was 2.3 or below, then it was determined that the coach was working with a lower skilled setter. Thus, Coach 1 (N=52, M=2.4), Coach 2 (N=64, M=2.5), Coach 7 (N=56, M=2.4), Coach 8 (N=32, M=2.4), and Coach 10 (N=32, M=2.6) were giving coach feedback to setters whose ball placement scores were above 2.3 and were thus categorized as higher skilled setters. Coach 3

(N=62, M=2.3), Coach 4 (N=52, M=2.3), Coach 5 (N=64, M=2.2), Coach 6 (N=60, M=2.3), and Coach 9 (N=32, M=2.0) were giving feedback to setters whose ball placement skills were 2.3 or below, and were thus categorized as lower skilled setters. In the study, each coach only had one setter for whom data was collected. If someone other than the setter set the ball, that particular line of data were not included in this study. Because each coach called a different number of time-outs throughout the course of the two day tournament, the number of time-outs where coach feedback was given to the higher skilled setters (N=42) and the number of time-outs where coach feedback was given to the lower skilled setters (N=47) was not equal, even though five setters were in each category of higher skilled and lower skilled setters.

The design of setter performance evaluation using the GPAI, as seen in the coder guide took into account the flow of setter movement during a rally in a match. Because coding began in the volleyball GPAI at the base defensive position, data collection began either when the setter's team served the ball or when the setter's team first established base position after hitting the ball over the net after receiving the serve. The collection of a complete row of data during a rally could also be interrupted by a teammate blocking a ball to the floor for a point, or when the setter dug the ball on the first contact while in her defensive position. If the pass was not accurate enough for the setter to have at least two options (2 hitters to set the ball to), the line was also discontinued. Whenever either of these events occurred, the coder began a new line of data entry, and that particular rally was not counted in the GPAI as it was incomplete. There was also one of the original 90 time-outs that could not be counted for this study. This time-out occurred at the conclusion of a match, prior to the final point, and there were not four post event rallies to tally on the GPAI. This CTOOI data for this particular time-out was, thus, unusable for the purposes of this research study.

Statistical Analysis

Using multiple regression analysis, the researcher compared the main categories of coach feedback: tactical (our team or opponent focused), technical (internal or external focus), and psychological (encouraging minus discouraging remarks), and looked for the significant ($P \leq 0.05$) categories of effective coach feedback in relation to GPAI data and the setters' overall performance as well as improvement in their decision making and technical skill execution from four rallies before to four rallies after the time-out. Data from the CTOOI was converted into a proportion (see second row and fourth row of appendix D) by dividing the number of the particular type of coded feedback statements by the volume (VOL) of feedback statements made during the time-out. Combined data from the CTOOI and the GPAI were then entered into SPSS, the results of which are discussed in Chapter Four of this research study. (For an example of combined data from CTOOI and GPAI that demonstrates the two instruments being integrated prior to entry into SPSS, see Appendix G).

CHAPTER FOUR

RESULTS

The results section included three sets of data that have been collected. First, coach time-out feedback to all setters (N=89) was listed in Tables 1-10. Second, coach time-out feedback to higher skilled setters (N=42) was listed in Tables 11-20, and third, coach feedback to lower skilled setters (N=47) was listed in Tables 21-30. For each set of data, the relevant descriptive statistics given were the number of time-outs, correlations, means, and standard deviations (in Tables 1,11, and 21). In addition to the descriptive statistics for each of the three setter groups, there were also three analyses run on the effects of the coach time-outs to each setter group. In total, nine different instances of multiple regression analysis were run, those being a multiple regression analysis for each of the three instances of the dependent variable (overall, skill, and decision making improvement during performance) for each of the three groups of setters. Each multiple regression was a backward selection where SPSS entered all of the independent (predictor) variables into the model and the weakest predictor model was then removed and the regression recalculated. The procedure was repeated until only the useful predictor variables remained in the model.

Regression analysis reported the setters' overall performance improvement as a result of coach time-out feedback (Tables 2-4, 12-14, and 22-24), the setters' skill improvement as a result of coach time-out feedback (Tables 5-7, 15-17, and 25-28), and the setters' decision-making improvement as a result of coach time-out feedback (Tables 8-10, 18-20, and 28-30). For each of the three categories for each setter group, three specific data tables were presented. First, the model summary table gave data concerning the effectiveness of the model (R^2 and R^2 adjusted) that described how the model explains the variation in the dependent variable (GPAI

score). Second, the ANOVA table was presented and checked to see if the model as a whole had a significant relationship with the dependent variable (GPAI setter performance difference); it thus demonstrated the predictive value of the independent variables in the model (F score difference, and its *p* value.) The third table was the coefficient table. In this table, the standardized coefficient Beta value and the *t* test are reported which determined the significance of each independent variable that was part of the refined model. A larger Beta indicated a stronger effect of the independent variable on the values of the dependent variable (setter performance). The *t* test determined if the relationship of each independent variable with the dependent variable was statistically significant ($p < .05$). After the descriptive data were reported for each group (Tables 1,11, and 21) and prior to each of the subgroupings of data (Tables 2-10 for all setters, Tables 12-20 for higher skilled setters, and Tables 22-30 for lower skilled setters), a summary of results was provided.

Tables 1-10: All Setters

From Table 1, the means for all of the different types of coach feedback were reported. Since these numbers are proportions, I have reported the total proportion of coach feedback types given to all setters during time-outs. To all setters, the overall proportion of tactical feedback (PTACO (.10) + PTACU (.32)) was 42%. The total proportion of technical feedback (PTECE (.07) + PTECI (.09)) was 16%. The overall proportion of encouraging remarks (PER (.32)) was 32%, and the overall proportion of discouraging remarks (PDR .10) was 10%. In Table 1, PERminusPDR (M= .22) represents the overall positive influence of non tactical or non technical remarks made by the coach. From Table 1, the primary type of coach feedback among all

coaches during time-outs was Tactical-Us (PTACU) (M=.32), and Encouraging Remarks (M=.32) .

Table 01- Correlations (All Setters)						
Feedback Type		Skill Dif (SKD)	Dec. Mak. Dif (DMD)	Total Dif (TD)	Mean	Std. Deviation
PTECI	Pearson Correlation	0.07	0.08	0.09	.09	.14
	Sig. (2-tailed)	0.52	0.45	0.40		
	N	89.00	89.00	89.00		
PTECE	Pearson Correlation	0.03	-0.09	-0.03	.07	.10
	Sig. (2-tailed)	0.80	0.42	0.79		
	N	89.00	89.00	89.00		
PTACO	Pearson Correlation	0.14	0.01	0.10	.10	.13
	Sig. (2-tailed)	0.19	0.93	0.35		
	N	89.00	89.00	89.00		
PTACU	Pearson Correlation	-0.08	-0.09	-0.10	.32	.21
	Sig. (2-tailed)	0.45	0.42	0.35		
	N	89.00	89.00	89.00		
PERminusPDR	Pearson Correlation	-0.09	0.12	0.00	.22 PER .32 - PDR .10	.29
	Sig. (2-tailed)	0.38	0.24	0.97		
	N	89.00	89.00	89.00		

Tables 2-4: All Setters: Total Performance Difference (TD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted all setters' total performance difference (TD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 2), the results of the refined regression model indicate the refined regression model was a very poor fit, describing 0% (R^2 adj = 0.0%) of the variance in total performance difference (TD) scores. From the ANOVA Table (Table 3), it is reported that the group of independent variables did not reliably predict the dependent variable (F (1,87)= 0.87, *p*= .35), and was statistically

insignificant. The Coefficient Table (Table 4) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on total performance difference (TD) from before to after the time-out. One final note, when for all setters, total performance difference was related to the independent coach feedback variables, the proportion of tactical feedback about the opponent (PTACO) was the highest predictor (Beta = 0.10, p= .35) of total setter performance difference from before to after the time-out.

Table 02: Model Summary (All Setters: TD: Total Performance Difference)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.16[a]	0.02	-0.03	4.95	0.02	0.42	5.00	83.00	0.83
2	.16[b]	0.02	-0.02	4.92	0.00	0.00	1.00	83.00	0.96
3	.15[c]	0.02	-0.01	4.89	0.00	0.15	1.00	84.00	0.70
4	.14[d]	0.02	0.00	4.87	0.00	0.20	1.00	85.00	0.66
Refined	.10[e]	0.01	0.00	4.87	-0.01	0.95	1.00	86.00	0.33

a. Predictors: (Constant), PERminusPDR, PTACO, PTECI, PTECE, PTACU
b. Predictors: (Constant), PTACO, PTECI, PTECE, PTACU
c. Predictors: (Constant), PTACO, PTECI, PTACU
d. Predictors: (Constant), PTACO, PTECI
e. Predictors: (Constant), PTACO

Table 03: ANOVA (All Setters: TD: Total Performance Difference)

Model		Sum of Squares	Df	Mean Square	F	Sig.
Full	Regression	51.51	5.00	10.30	0.42	.83[a]
	Residual	2030.24	83.00	24.46		
	Total	2081.75	88.00			
Refined	Regression	20.56	1.00	20.56	0.87	.35[e]
	Residual	2061.19	87.00	23.69		
	Total	2081.75	88.00			

Table 04: Coefficients (All Setters: TD: Total Performance Difference)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
Full	(Constant)	0.78	1.68		0.47	0.64
	PTECI	2.97	4.07	0.09	0.73	0.47
	PTECE	-2.04	5.23	-0.04	-0.39	0.70
	PTACO	3.62	4.27	0.10	0.85	0.40
	PTACU	-1.40	2.85	-0.06	-0.49	0.62
	PERminusPDR	-0.10	1.90	-0.01	-0.05	0.96
Refined	(Constant)	0.43	0.66		0.65	0.51
	PTACO	3.69	3.97	0.10	0.93	0.35

Tables 5-7: All Setters: Skill Difference (SKD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted all setters' skill difference (SKD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 5), the results of the refined regression model indicate the refined regression model was a very poor fit, describing 1% (R^2 adj = 1.0%) of the variance in setter skill difference (SKD) score. From the ANOVA Table (Table 6), it is reported that the group of independent variables did not reliably predict the dependent variable (F (1,87)= 1.73, *p*= .19) and was statistically insignificant. The Coefficient Table (Table 7) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on setter skill performance difference (SKD) from before to after the time-out. One final note, when for all setters, setter skill performance difference was related to the independent coach feedback variables, the proportion of tactical feedback about the opponent (PTACO) was the highest predictor (Beta = 0.14, *p*= .19) of setter skill performance difference.

Table 05: Model Summary (All Setters: SKD: Skill Difference)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.19[a]	0.04	-0.02	3.31	0.04	0.63	5.00	83.00	0.68
2	.19[b]	0.04	-0.01	3.29	0.00	0.00	1.00	83.00	0.98
3	.19[c]	0.03	0.00	3.27	0.00	0.14	1.00	84.00	0.71
4	.17[d]	0.03	0.01	3.26	-0.01	0.56	1.00	85.00	0.46
Refined	.14[e]	0.02	0.01	3.26	-0.01	0.79	1.00	86.00	0.38

a. Predictors: (Constant), PERminusPDR, PTACO, PTECI, PTECE, PTACU
b. Predictors: (Constant), PERminusPDR, PTACO, PTECI, PTACU
c. Predictors: (Constant), PERminusPDR, PTACO, PTECI
d. Predictors: (Constant), PERminusPDR, PTACO
e. Predictors: (Constant), PTACO

Table 06: ANOVA (All Setters: SKD: Skill Difference)

Model		Sum of Squares	Df	Mean Square	F	Sig.
Full	Regression	34.26	5.00	6.85	0.63	.68[a]
	Residual	907.85	83.00	10.94		
	Total	942.11	88.00			
Refined	Regression	18.41	1.00	18.41	1.73	.19[e]
	Residual	923.70	87.00	10.62		
	Total	942.11	88.00			

Table 07: Coefficients (All Setters: SKD: Skill Difference)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Full	(Constant)	0.51	1.12		0.46	0.65
	PTECI	1.53	2.72	0.07	0.56	0.57
	PTECE	-0.07	3.49	0.00	-0.02	0.98
	PTACO	3.44	2.86	0.14	1.20	0.23
	PTACU	-0.69	1.90	-0.04	-0.36	0.72
	PERminusPDR	-1.09	1.27	-0.10	-0.86	0.39
Refined	(Constant)	0.18	0.44		0.41	0.68
	PTACO	3.50	2.65	0.14	1.32	0.19

Tables 8-10: All Setters: Decision Making Difference (DMD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted all setters' decision-making difference (DMD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 8), the results of the refined regression model indicate the refined regression model was a very poor fit, describing 0% (R^2 adj = 0.0%) of the variance in decision-making difference (DMD) score. From the ANOVA Table (Table 9), it is reported that the group of independent variables did not reliably predict the dependent variable (F (1,87)= 1.38, *p*= .24) and was statistically insignificant. The Coefficient Table (Table 10) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on setter decision-making performance difference (DMD) from before to after the time-out. One final note, when for all setters, setter decision-making performance difference was related to the independent coach feedback variables, the proportion of encouraging remarks minus discouraging remarks (PERminusPDR) was the highest predictor (Beta = 0.12, *p*= .24) of setter decision-making performance difference.

Table 08: Model Summary (All Setters: Decision Making)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.18[a]	0.03	-0.03	2.66	0.03	0.54	5.00	83.00	0.74
2	.18[b]	0.03	-0.01	2.65	0.00	0.01	1.00	83.00	0.94
3	.17[c]	0.03	-0.01	2.64	0.00	0.27	1.00	84.00	0.61
4	.16[d]	0.02	0.00	2.63	0.00	0.38	1.00	85.00	0.54
Refined	.13[e]	0.02	0.00	2.62	-0.01	0.75	1.00	86.00	0.39

a. Predictors: (Constant), PERminusPDR, PTACO, PTECI, PTECE, PTACU
b. Predictors: (Constant), PERminusPDR, PTECI, PTECE, PTACU
c. Predictors: (Constant), PERminusPDR, PTECI, PTECE
d. Predictors: (Constant), PERminusPDR, PTECI
e. Predictors: (Constant), PERminusPDR

Table 09: ANOVA (All Setters: Decision Making)

Model		Sum of Squares	Df	Mean Square	F	Sig.
Full	Regression	19.25	5.00	3.85	0.54	.74[a]
	Residual	588.28	83.00	7.09		
	Total	607.53	88.00			
Refined	Regression	9.49	1.00	9.49	1.38	.24[e]
	Residual	598.04	87.00	6.87		
	Total	607.53	88.00			

Table 10: Coefficients (All Setters: Decision Making)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Full	(Constant)	0.27	0.90		0.30	0.77
	PTECI	1.43	2.19	0.08	0.65	0.51
	PTECE	-1.96	2.81	-0.08	-0.70	0.49
	PTACO	0.18	2.30	0.01	0.08	0.94
	PTACU	-0.71	1.53	-0.06	-0.46	0.64
	PERminusPDR	0.99	1.02	0.11	0.96	0.34
Refined	(Constant)	0.02	0.35		0.05	0.96
	PERminusPDR	1.13	0.96	0.12	1.17	0.24

Tables 11-20: Higher Skilled Setters

From Table 11, the means for all of the different types of coach feedback to higher skilled setters were reported. Since these numbers are proportions, I have reported the total proportion of coach feedback types given to the higher skilled setters during time-outs. To the higher skilled setters, the overall proportion of tactical feedback (PTACO (.11) + PTACU (.34)) was 45%. The total proportion of technical feedback (PTECE (.07) + PTECI (.09)) was 16%. The overall proportion of encouraging remarks (PER (.32)) was 32%, and the overall proportion of discouraging remarks (PDR .07) was 7%. In Table 11, PERminusPDR (M=.25) represents the overall positive influence of non tactical or non technical remarks made by the coach. From Table 11, among coaches of higher skilled setters that the primary type of coach feedback during time-outs was Tactical-Us (PTACU) (M=.34) Regarding tactical feedback, the proportion of tactical feedback regarding the opponent (PTACO, M=.11) was 11% and the proportion of technical feedback regarding internal focus (PTECI, M=.09) was 9%. PTACO and PTECI combined for 20% of total coach feedback during the time-outs to higher skilled setters.

Table 11: Correlations (Higher Skilled Setters)						
		Skill Dif (SKD)	Dec. Mak. Dif (DMD)	Total Dif (TD)	Mean	Standard Deviation
PTECI	Pearson Correlation	0.27	0.19	0.29	0.09	0.12
	Sig. (2-tailed)	0.08	0.24	0.06		
	N	42.00	42.00	42.00		
PTECE	Pearson Correlation	0.15	0.08	0.15	0.07	0.11
	Sig. (2-tailed)	0.33	0.61	0.34		
	N	42.00	42.00	42.00		
PTACO	Pearson Correlation	0.27	0.23	0.30	0.11	0.12
	Sig. (2-tailed)	0.09	0.15	0.05		
	N	42.00	42.00	42.00		
PTACU	Pearson Correlation	-0.07	-0.15	-0.13	0.34	0.21
	Sig. (2-tailed)	0.64	0.34	0.41		
	N	42.00	42.00	42.00		
PERminusPDR	Pearson Correlation	-0.22	-0.04	-0.18	0.25 PER= .32 PDR= .07	0.33
	Sig. (2-tailed)	0.16	0.79	0.26		
	N	42.00	42.00	42.00		

Tables 12-14: Higher Skilled Setters: Total Performance Difference (TD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted higher skilled setters' total performance difference (TD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 12), the results of the refined regression model indicate the refined regression model was, in terms of effectiveness, an inadequate fit as a whole, describing 12% (R^2 adj = .12) of the variance in total performance difference (TD) score. From the ANOVA Table (Table 13), however, in terms of efficiency, it is reported that from the group of independent variables a statistically significant model was found that could reliably predict the dependent variable, high skilled setters total performance difference scores. (F (2,39)= 3.88, p= .03). The proportion of

tactical opponent feedback (PTACO) and technical internal feedback (PTECI) combined to create the statistically significant model. The Coefficient Table (Table 14) displays that, although there is significance for the model to predict the dependent variable, not a single independent variable of coach time-out feedback had any statistically significant effects on higher skilled setter total performance difference (TD) from before to after the time-out. When for higher skilled setters, setter total performance difference was related to the independent coach feedback variables, the two independent variables PTACO (Beta= 0.29, p=.06) and PTECI (Beta = 0.27, p=.07) were the highest predictors of higher skilled setter total performance difference.

Table 12: Model Summary (Higher Skilled Setters: TD: Total Performance Difference)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.43[a]	0.18	0.07	4.03	0.18	1.62	5.00	36.00	0.18
2	.43[b]	0.18	0.10	3.97	0.00	0.01	1.00	36.00	0.92
3	.42[c]	0.18	0.11	3.94	-0.01	0.33	1.00	37.00	0.57
Refined	.41[d]	0.17	0.12	3.91	-0.01	0.47	1.00	38.00	0.50

a. Predictors: (Constant), PERminusPDR, PTECE, PTECI, PTACO, PTACU
b. Predictors: (Constant), PERminusPDR, PTECE, PTECI, PTACO
c. Predictors: (Constant), PTECE, PTECI, PTACO
d. Predictors: (Constant), PTECI, PTACO

Table 13: ANOVA (Higher Skilled Setters: TD: Total Performance Difference)

Model		Sum of Squares	Df	Mean Square	F	Sig.
Full	Regression	131.50	5.00	26.30	1.62	.18[a]
	Residual	584.12	36.00	16.23		
	Total	715.62	41.00			
3	Regression	126.10	3.00	42.03	2.71	.06[c]
	Residual	589.52	38.00	15.51		
	Total	715.62	41.00			
Refined	Regression	118.78	2.00	59.39	3.88	* .03[d]
	Residual	596.84	39.00	15.30		
	Total	715.62	41.00			

Table 14: Coefficients (Higher Skilled Setters: TD: Total Performance Difference)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
Full	(Constant)	-0.75	2.20		-0.34	0.74
	PTECI	9.02	5.80	0.26	1.55	0.13
	PTECE	3.56	5.98	0.10	0.60	0.55
	PTACO	8.39	5.41	0.25	1.55	0.13
	PTACU	-0.35	3.57	-0.02	-0.10	0.92
	PERminusPDR	-1.23	2.20	-0.10	-0.56	0.58
3	(Constant)	-1.31	0.95		-1.37	0.18
	PTECI	9.91	5.23	0.28	1.90	0.07
	PTECE	3.87	5.63	0.10	0.69	0.50
	PTACO	8.76	5.11	0.26	1.71	0.09
Refined	(Constant)	-1.13	0.91		-1.24	0.22
	PTECI	9.58	5.17	0.27	1.85	0.07
	PTACO	9.65	4.90	0.29	1.97	0.06

Tables 15-17: Higher Skilled Setters: Skill Difference (SKD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted higher skilled setters' skill difference (SKD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 15), the results of the refined regression model indicate the refined regression model was a poor fit, describing 5% (R^2 adj = .05) of the variance in higher skilled setter skill difference (SKD) score. From the ANOVA Table (Table 16), it is reported that a model of independent variables could not significantly predict the dependent variable (F (1,40)= 3.18, p= .08). Model #4 (the PTECI/PTACO model) came the closest (F= 3.07, p= .06). The Coefficient Table (Table 17) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on higher skilled setter skill performance difference (SKD) from before to after the time-out. One final note, when for higher skilled setters, setter skill performance

difference was related to the independent coach feedback variables, the proportion of technical internal feedback (PTECI) was the highest predictor (Beta = 0.27, p= .08) of higher skilled setter skill performance difference. Closely behind PTECI was the proportion of tactical feedback from Model #4 (PTACO) (Beta= 0.25, p= .10).

Table 15: Model Summary (Higher Skilled Setters: SKD: Skill Difference)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.410[a]	0.17	0.05	2.86	0.17	1.46	5.00	36.00	0.23
2	.410[b]	0.17	0.08	2.82	0.00	0.01	1.00	36.00	0.91
3	.395[c]	0.16	0.09	2.80	-0.01	0.51	1.00	37.00	0.48
4	.369[d]	0.14	0.09	2.80	-0.02	0.91	1.00	38.00	0.35
Refined	.271[e]	0.07	0.05	2.86	-0.06	2.83	1.00	39.00	0.10

a. Predictors: (Constant), PERminusPDR, PTECE, PTECI, PTACO, PTACU
b. Predictors: (Constant), PERminusPDR, PTECE, PTECI, PTACO
c. Predictors: (Constant), PERminusPDR, PTECI, PTACO
d. Predictors: (Constant), PTECI, PTACO
e. Predictors: (Constant), PTECI

Table 16: ANOVA (Higher Skilled Setters: SKD: Skill Difference)

Model		Sum of Squares	df	Mean Square	F	Sig.
Full	Regression	59.48	5.00	11.90	1.46	.23[a]
	Residual	294.16	36.00	8.17		
	Total	353.64	41.00			
4	Regression	48.16	2.00	24.08	3.07	.06[d]
	Residual	305.48	39.00	7.83		
	Total	353.64	41.00			
Refined	Regression	26.03	1.00	26.03	3.18	.08[e]
	Residual	327.61	40.00	8.19		
	Total	353.64	41.00			

Table 17: Coefficients (Higher Skilled Setters: SKD: Skill Difference)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
Full	(Constant)	-0.42	1.56		-0.27	0.79
	PTECI	5.99	4.12	0.24	1.45	0.15
	PTECE	3.02	4.24	0.12	0.71	0.48
	PTACO	5.04	3.84	0.21	1.31	0.20
	PTACU	0.29	2.53	0.02	0.11	0.91
	PERminusPDR	-1.20	1.56	-0.13	-0.77	0.45
4	(Constant)	-0.56	0.65		-0.86	0.40
	PTECI	6.37	3.70	0.26	1.72	0.09
	PTACO	5.90	3.51	0.25	1.68	0.10
Refined	(Constant)	0.07	0.55		0.12	0.90
	PTECI	6.73	3.78	0.27	1.78	0.08

Tables 18-20: Higher Skilled Setters: Decision Making Difference (DMD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted higher skilled setters' decision-making difference (DMD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 18), the results of the refined regression model indicate the refined regression model was a poor fit, describing 3% (R^2 adj = .03) of the variance in higher skilled setters' decision-making difference (DMD) score. From the ANOVA Table (Table 19), it is reported that the group of independent variables did not reliably predict the dependent variable (F (1,40)= 2.14, p= .15), and was statistically insignificant. The Coefficient Table (Table 20) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on higher skilled setters' decision-making performance difference (DMD) from before to after the time-out. One final note, when for higher skilled setters, setter decision-making performance difference was related to the independent coach feedback variables, the proportion of tactical

feedback about the opponent (PTACO) was the highest predictor (Beta = 0.23, p= .15) of higher skilled setters' decision-making performance difference.

Table 18: Model Summary (Higher Skilled Setters: DMD: Decision Making)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.29[a]	0.09	-0.04	2.22	0.09	0.68	5.00	36.00	0.64
2	.29[b]	0.09	-0.01	2.19	0.00	0.00	1.00	36.00	0.98
3	.29[c]	0.09	0.01	2.16	0.00	0.03	1.00	37.00	0.86
4	.29[d]	0.08	0.03	2.14	0.00	0.17	1.00	38.00	0.69
Refined	.23[e]	0.05	0.03	2.15	-0.03	1.29	1.00	39.00	0.26

a. Predictors: (Constant), PERminusPDR, PTECE, PTECI, PTACO, PTACU
b. Predictors: (Constant), PTECE, PTECI, PTACO, PTACU
c. Predictors: (Constant), PTECI, PTACO, PTACU
d. Predictors: (Constant), PTECI, PTACO
e. Predictors: (Constant), PTACO

Table 19: ANOVA (Higher Skilled Setters: DMD: Decision Making)

Model		Sum of Squares	df	Mean Square	F	Sig.
Full	Regression	16.71	5.00	3.34	0.68	.64[a]
	Residual	177.69	36.00	4.94		
	Total	194.40	41.00			
Refined	Regression	9.88	1.00	9.88	2.14	.15[e]
	Residual	184.53	40.00	4.61		
	Total	194.40	41.00			

Table 20: Coefficients (Higher Skilled Setters: DMD: Decision Making)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
Full	(Constant)	-0.32	1.22		-0.27	0.79
	PTECI	3.03	3.20	0.16	0.95	0.35
	PTECE	0.54	3.30	0.03	0.17	0.87
	PTACO	3.35	2.98	0.19	1.12	0.27
	PTACU	-0.64	1.97	-0.06	-0.33	0.75
	PERminusPDR	-0.03	1.21	0.00	-0.02	0.98
Refined	(Constant)	-0.32	0.45		-0.71	0.48
	PTACO	3.93	2.69	0.23	1.46	0.15

Tables 21-30: Lower Skilled Setters

From Table 21, the means for all of the different types of coach feedback to lower skilled setters are reported. Since these numbers are proportions, I have reported the total proportion of coach feedback types given to the lower skilled setters during time-outs. To the lower skilled setters, the overall proportion of tactical feedback (PTACO (.09) + PTACU (.30)) was 39%. The total proportion of technical feedback (PTECE (.08) + PTECI (.10)) was 18%. The overall proportion of encouraging remarks (PER (.30)) was 30%, and the overall proportion of discouraging remarks (PDR .10) was 10%. In Table 21, PERminusPDR (M=.20) represents the overall positive influence of non tactical or non technical remarks made by the coach. From Table 21, among the coaches of lower skilled setters, the primary type of coach feedback during time-outs was Tactical-Us (PTACU) (M=.30), and Encouraging Remarks (M=.30). The proportion of encouraging remarks minus the proportion of discouraging remarks to lower skilled setters was .20. The ratio of encouraging remarks to discouraging remarks was 3:1, for the coach feedback during the time-outs for lower skilled setters.

Table 21: Correlations (a) (Lower Skilled Setters)						
		Skill Dif (SKD)	Dec. Mak. Dif (DMD)	Total Dif (TD)	Mean	Standard Deviation
PTECI	Pearson Correlation	-0.04	0.03	-0.01	0.10	0.16
	Sig. (2-tailed)	0.79	0.86	0.94		
	N	47.00	47.00	47.00		
PTECE	Pearson Correlation	-0.08	-0.23	-0.18	0.08	0.10
	Sig. (2-tailed)	0.61	0.13	0.24		
	N	47.00	47.00	47.00		
PTACO	Pearson Correlation	0.05	-0.11	-0.03	0.09	0.14
	Sig. (2-tailed)	0.72	0.45	0.86		
	N	47.00	47.00	47.00		
PTACU	Pearson Correlation	-0.09	-0.04	-0.08	0.30	0.21
	Sig. (2-tailed)	0.54	0.79	0.59		
	N	47.00	47.00	47.00		
PERminusPDR	Pearson Correlation	0.01	0.28	0.16	0.20 PER = .30 PDR = .10	0.26
	Sig. (2-tailed)	0.93	0.05	0.27		
	N	47.00	47.00	47.00		

Tables 22-24: Lower Skilled Setters: Total Performance Difference (TD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted lower skilled setters' total performance difference (TD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 22), the results of the refined regression model indicate the refined regression model was a very poor fit, describing 1% (R^2 adj = .01) of the variance in total performance difference (TD) scores for lower skilled setters. From the ANOVA Table (Table 23), it is reported that the group of independent variables did not reliably predict the dependent variable (F (1,45)= 1.43, p= .24), and was statistically insignificant. The Coefficient Table (Table 24) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on total performance difference (TD) from before to after the time-out. One final note, when for lower skilled setters, total performance difference was related to the independent coach feedback variables, the proportion of encouraging remarks minus discouraging remarks (PERminusPDR)

was the only positive predictor (Beta = 0.12, *p*= .44) of total setter performance difference from before to after the time-out. Although statistically insignificant, all other coach feedback variables in the full model for lower skilled setters' performance difference from before to after the time-out displayed negative standardized coefficients: PTECE (Beta= -.15, *p*= .35), PTACU (Beta= -.14, *p*= .43), PTACO (Beta= -.11, *p*= .51), & PTECI (Beta= -.08, *p*= .64).

Table 22: Model Summary (Lower Skilled Setters: TD: Total Performance Difference)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.25[a]	0.06	-0.05	5.59	0.06	0.55	5.00	41.00	0.74
2	.24[b]	0.06	-0.03	5.54	0.00	0.22	1.00	41.00	0.64
3	.23[c]	0.05	-0.02	5.49	-0.01	0.29	1.00	42.00	0.59
4	.21[d]	0.04	0.00	5.45	-0.01	0.30	1.00	43.00	0.59
Refined	.18[e]	0.03	0.01	5.42	-0.01	0.62	1.00	44.00	0.44

a. Predictors: (Constant), PERminusPDR, PTECI, PTACO, PTECE, PTACU
b. Predictors: (Constant), PERminusPDR, PTACO, PTECE, PTACU
c. Predictors: (Constant), PERminusPDR, PTECE, PTACU
d. Predictors: (Constant), PERminusPDR, PTECE
e. Predictors: (Constant), PTECE

Table 23: ANOVA (Lower Skilled Setters: TD: Total Performance Difference)

Model		Sum of Squares	df	Mean Square	F	Sig.
Full	Regression	85.15	5.00	17.03	0.55	.74[a]
	Residual	1280.80	41.00	31.24		
	Total	1365.96	46.00			
Refined	Regression	41.94	1.00	41.94	1.43	.24[e]
	Residual	1324.02	45.00	29.42		
	Total	1365.96	46.00			

Table 24: Coefficients (Lower Skilled Setters: TD: Total Performance Difference)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
Full	(Constant)	2.78	2.49		1.12	0.27
	PTECI	-2.75	5.91	-0.08	-0.47	0.64
	PTECE	-8.64	9.07	-0.15	-0.95	0.35
	PTACO	-4.48	6.73	-0.11	-0.67	0.51
	PTACU	-3.51	4.44	-0.14	-0.79	0.43
	PERminusPDR	2.66	3.38	0.13	0.79	0.44
Refined	(Constant)	1.65	1.04		1.59	0.12
	PTECE	-9.92	8.31	-0.18	-1.19	0.24

Tables 25-27: Lower Skilled Setters: Skill Difference (SKD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted lower skilled setters' skill difference (SKD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 25), the results of the refined regression model indicate the refined regression model was a very poor fit, describing .01% (R^2 adj = -.01) of the variance in lower skilled setters' skill difference (SKD) score. From the ANOVA Table (Table 26), it is reported that the group of independent variables did not reliably predict the dependent variable (F (1,45)= .38, p= .54), and was statistically insignificant. The Coefficient Table (Table 27) displays that not a single independent variable of coach time-out feedback had any statistically significant effects on setter skill performance difference (SKD) from before to after the time-out. One final note, when for all setters, setters' skill performance difference was related to the independent coach feedback variables, the proportion of tactical feedback about us (our team, PTACU) was the highest negative predictor (Beta = -0.09, p= .54) of lower skilled setters' skill performance difference; however, this number is not statistically significant.

Table 25: Model Summary (Lower Skilled Setters: SKD: Skill Difference)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.14[a]	0.02	-0.10	3.75	0.02	0.17	5.00	41.00	0.97
2	.14[b]	0.02	-0.07	3.70	0.00	0.00	1.00	41.00	0.98
3	.14[c]	0.02	-0.05	3.66	0.00	0.01	1.00	42.00	0.93
4	.12[d]	0.01	-0.03	3.63	0.00	0.22	1.00	43.00	0.64
Refined	.09[e]	0.01	-0.01	3.60	-0.01	0.29	1.00	44.00	0.59

a. Predictors: (Constant), PERminusPDR, PTECI, PTACO, PTECE, PTACU
b. Predictors: (Constant), PERminusPDR, PTECI, PTECE, PTACU
c. Predictors: (Constant), PTECI, PTECE, PTACU
d. Predictors: (Constant), PTECE, PTACU
e. Predictors: (Constant), PTACU

Table 26: ANOVA (Lower Skilled Setters: SKD: Skill Difference)

Model		Sum of Squares	df	Mean Square	F	Sig.
Full	Regression	11.68	5.00	2.34	0.17	.97[a]
	Residual	575.94	41.00	14.05		
	Total	587.62	46.00			
Refined	Regression	4.88	1.00	4.88	0.38	.54[e]
	Residual	582.74	45.00	12.95		
	Total	587.62	46.00			

Table 27: Coefficients (Lower Skilled Setters: SKD: Skill Difference)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
Full	(Constant)	1.53	1.67		0.92	0.37
	PTECI	-1.71	3.96	-0.08	-0.43	0.67
	PTECE	-3.05	6.08	-0.08	-0.50	0.62
	PTACO	-0.12	4.51	0.00	-0.03	0.98
	PTACU	-2.03	2.98	-0.12	-0.68	0.50
	PERminusPDR	-0.19	2.27	-0.01	-0.09	0.93
Refined	(Constant)	0.91	0.93		0.99	0.33
	PTACU	-1.54	2.52	-0.09	-0.61	0.54

Tables 28-30: Lower Skilled Setters: Decision Making Difference (DMD)

Multiple regression analysis was used to test how the different types of coach time-out feedback predicted lower skilled setters' decision-making difference (DMD) scores from before to after the coach feedback was given during the time-out. From the Model Summary Table (Table 28), the results of the refined regression model indicate the refined regression model was, in terms of effectiveness, an inadequate fit as a whole, describing 6% (R^2 adj = .06) of the variance in decision-making difference (DMD) score. From the ANOVA Table (Table 29), however, in terms of efficiency, it is reported that from the group of independent variables a statistically significant model was found that could reliably predict the dependent variable, lower skilled setters'decision-making difference scores. (F (1,45)= 3.92, p= .05). The proportion of encouraging remarks minus the proportion of discouraging remarks (PERminusPDR) was the only predictor in the statistically significant model. The Coefficient Table (Table 30) displays that the independent variable of encouraging remarks minus the proportion of discouraging remarks (PERminusPDR) has statistically significant (Beta = 0.28, p= .05) effects on lower skilled setters' decision-making difference (DMD) from before to after the time-out. It should also be noted that all of the other independent variables in the full model have a Beta that is negative (PTECI= -.06, PTACU= -.10, PTECE= -.18, & PTACO= -.20).

Table 28: Model Summary (Lower Skilled Setters: DMDL: Decision Making)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Full	.37[a]	0.14	0.03	2.95	0.14	1.28	5.00	41.00	0.29
2	.37[b]	0.13	0.05	2.91	0.00	0.11	1.00	41.00	0.74
3	.36[c]	0.13	0.07	2.89	-0.01	0.30	1.00	42.00	0.58
4	.32[d]	0.10	0.06	2.90	-0.02	1.22	1.00	43.00	0.28
Refined	.28[e]	0.08	0.06	2.90	-0.02	1.07	1.00	44.00	0.31

a. Predictors: (Constant), PERminusPDR, PTECI, PTACO, PTECE, PTACU
b. Predictors: (Constant), PERminusPDR, PTACO, PTECE, PTACU
c. Predictors: (Constant), PERminusPDR, PTACO, PTECE
d. Predictors: (Constant), PERminusPDR, PTECE
e. Predictors: (Constant), PERminusPDR

Table 29: ANOVA (Lower Skilled Setters: DMD: Decision Making)

Model		Sum of Squares	df	Mean Square	F	Sig.
Full	Regression	55.69	5.00	11.14	1.28	.29[a]
	Residual	355.63	41.00	8.67		
	Total	411.32	46.00			
2	Regression	54.72	4.00	13.68	1.61	.19[b]
	Residual	356.60	42.00	8.49		
	Total	411.32	46.00			
3	Regression	52.14	3.00	17.38	2.08	.12[c]
	Residual	359.18	43.00	8.35		
	Total	411.32	46.00			
4	Regression	41.96	2.00	20.98	2.50	.09[d]
	Residual	369.36	44.00	8.39		
	Total	411.32	46.00			
Refined	Regression	32.95	1.00	32.95	3.92	* .05[e]
	Residual	378.37	45.00	8.41		
	Total	411.32	46.00			

Table 30: Coefficients (Lower Skilled Setters: DMD: Decision Making)						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
Full	(Constant)	1.25	1.31		0.95	0.35
	PTECI	-1.04	3.11	-0.06	-0.33	0.74
	PTECE	-5.59	4.78	-0.18	-1.17	0.25
	PTACO	-4.36	3.55	-0.20	-1.23	0.23
	PTACU	-1.48	2.34	-0.10	-0.63	0.53
	PERminusPDR	2.86	1.78	0.25	1.60	0.12
2	(Constant)	1.02	1.10		0.93	0.36
	PTECE	-5.60	4.73	-0.18	-1.18	0.24
	PTACO	-3.94	3.28	-0.18	-1.20	0.24
	PTACU	-1.16	2.11	-0.08	-0.55	0.58
	PERminusPDR	2.82	1.76	0.24	1.60	0.12
3	(Constant)	0.60	0.79		0.76	0.45
	PTECE	-5.39	4.67	-0.17	-1.15	0.25
	PTACO	-3.47	3.15	-0.16	-1.10	0.28
	PERminusPDR	2.86	1.74	0.25	1.64	0.11
4	(Constant)	0.25	0.72		0.34	0.73
	PTECE	-4.82	4.66	-0.16	-1.04	0.31
	PERminusPDR	2.75	1.75	0.24	1.57	0.12
Refined	(Constant)	-0.25	0.54		-0.47	0.64
	PERminusPDR	3.30	1.66	0.28	1.98	*0.05
* significant= PERminusPDR						

Results Summary

In Tables 1-10, we have seen that for all setters in the study there was not a significant type of feedback that would cause a performance increase in either overall setter performance, setter skill performance, or setter decision making. However, when the setters were divided into two distinct groups based on their ball placement setting skills throughout the rallies tabulated in the study (higher skilled setters, M>2.30, and lower skilled setters, M≤ 2.30), certain coach feedback strategies did emerge as being statistically significant. As presented in Tables 12-14,

for the higher skilled setters, coach time-out feedback that was focused on both technical internal (PTECI) and on tactical information regarding the opponent (PTACO) was significant ($P = .03$) and increased the overall performance scores of the higher skilled setters. For the lower skilled setters, as presented in Tables 28-30, coach time-out feedback that was focused on encouraging remarks more than discouraging remarks, significantly improved ($p = .05$) the lower skilled setters' decision-making scores on the court.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

To summarize the purpose of this research study, the intent was to determine the type of coach feedback (or combination of coach feedback types) that was most effective during a time-out in volleyball to positively affect the setter's performance as measured by the game performance assessment instrument (GPAI) in a volleyball match. When considering all of the coach feedback independent variables the proportions of: 1) technical feedback with an internal focus (PTECI), 2) technical feedback with an external focus (PTECE), 3) tactical feedback with an internal focus ("us"-our team) (PTACU), 4) tactical feedback with an external focus (our opponent) (PTACO), or 5) the proportion of encouraging remarks more than discouraging remarks (PERminusPDR), it is prudent to reflect upon the literature reviewed and elaborate first on any contradictions in the findings from this study, and second, elaborate upon findings in this study that support the literature related to that particular feedback strategy. Before doing that, however, the models that did show significant coach feedback variables for improving performance need to be addressed in terms of goodness of fit.

The R^2 scores were low for both of the multiple regression models that showed significant statistical results as far as coach feedback influencing setter performance is concerned. The issue raised here is related to the debate between the effectiveness and efficiency of the model to predict the performance of the setter. For higher skilled setters, the PTACO/PTECI model (see Tables 12-14) is efficient ($F(2,39)= 3.88$, $p= .03$), but not effective (R^2 adj = .12) in predicting the overall variance in higher skilled setter overall performance. PTACO (Beta= 0.29, $p= .06$) and PTECI (Beta = 0.27, $p= .07$), though not statistically

significant on their own, also demonstrate through the Beta standardized coefficient an efficient demonstration of increased overall performance by ten percent (1/3 of a standard deviation) for the higher skilled setter in overall performance when the PTACO/PTECI coach time-out feedback model is followed. However, with a model that does not predict the entire variance in higher skilled setter performance (R^2 adj= .12), other aspects of setter performance will need to be added to the model where (R^2 adj > .50). Similarly, for lower skilled setters, the PERminusPDR model showed statistical significance (F (1,45)= 3.92, *p*= .05) when predicting setter decision making scores (see Tables 28-30), and with a standardized coefficient (Beta = 0.28, *p*= .05) also near .28, an improvement in lower skilled setters' decision making can be expected when coach feedback during time-outs is more encouraging than discouraging. Once again, however, with the PERminusPDR model having such a low ability to predict the variance in lower skilled setters' decision making (R^2 adj = .06), in future research, other independent variables will need to be identified that can contribute to improving performance. These variables can, of course, occur in contexts other than during the giving of feedback by the coach during a time-out.

With regard to how the models that were statistically significant (PTACO/PTECI) for the higher skilled setters and (PERminusPDR) for the lower skilled setters, it is appropriate to consider how these results line up with the literature reviewed in this study. For the higher skilled setters, Hopper's (2002) summation that, "skill progression implies a back and forth marriage with tactical awareness, where skill performance is realized" (p. 46), is clearly evident in the PTACO/PTECI model. In the model, the tactical (PTACO) and technical (PTECI) variables are significant together (*p*= .03), and not significant apart (*p*= .06, *p*= .07). The TGFU theories that emphasize the interweaving of tactical and technical instruction are supported by

these findings. Chow et al. (2007), in their description of a non-linear pedagogy that "allows game players to become better at detecting key information variables that specify certain movements from a myriad of noncritical variables" (p. 260), was creating a theoretical link between the tactical focus on the opponent and the freedom it gives the athlete to internally anticipate her own movements and the information-movement couplings as elaborated upon by Newell (1994). The studies pertaining to the effect of eye movement on volleyball skill (Piras et al., 2010) and focusing on relevant cues through selective attention processes (Castaneda & Gray, 2007) also contributed to the interactive contribution that a tactical focus on an opponent can have with technical motor skills.

There were two independent variables that did not contribute to either of the significant models (PTECI/PTACO and PERminusPDR) in the study. These were the proportion of tactical feedback about us (PTACU), and the proportion of technical feedback that was external (PTECE). The literature on coach feedback gives insight regarding how these particular types of feedback might not warrant significance. Recalling Isberg's (1993) research on the improved winning percentage of coaches that make more frequent reference to the actions of the opposing team, and the emphasis on the minimization of inappropriate motor responses to the opponent's style of play that occurred during Isberg's study, Ker (1996) found that contextualization of tactical information is important when the volleyball coach is giving verbal feedback during competition. It is talking about the opponent that gives tactical feedback its context. In moving from theory to practice, then, it is preferable for coaches to incorporate more comments about the opponent (PTACO) and fewer comments about their own team and their own tactical strategies (PTACU). Worthy of reflection in this study are the results from the descriptive data in the study which shows that with all setters (PTACU=32%) or divided up between higher skilled setters

(PTACU=34%), and lower skilled setters (PTACU=30%), coaches gave predominantly tactical-us (PTACU) feedback. As Ker and Isberg have stated, tactical feedback should include reference to the opponent in order to have its full effect. In this research study, tactical feedback about "our team" does not have any significant statistical value; however, it was employed on average 32% of the time by coaches during time-outs.

The other coach feedback variable, PTECE, which measured the proportion of technical external feedback and did not find a place in a significant model for setter performance, was debated in the literature review regarding its value to 16-18 year old setters. A technical external focus, stated the literature, was more helpful for beginners. Ehrlenspiel and Maurer (2007) had argued external focus in movement execution accentuates visual sensory information while an internal focus highlights internal sensations. Castaneda and Gray (2007) had demonstrated that an external focus was also better for beginners in baseball performance. Despite these findings, the PTECE was included in this study, primarily because researchers such as Vance et al. (2003) had argued that an external technical focus of attention improved the learning of motor skills, increased movement accuracy and reduced EMG activity (Zachary et al 2005), and increased jump and reach height (Wulf et al., 2006). Nevertheless, in this study, there was no significant feedback effect associated with coaches giving setters technical externally focused feedback. Thus, the proponents of externally focused feedback helping with beginning motor skills more than intermediate or advanced motor skill training, could be implied as being supported by this study. Coaches of intermediate to advanced players could, therefore, advocate their skills and expertise in being able to give a strong proportion of technical internal feedback (PTECI) as having important value in athlete development, as research in the area of expert performance (Millar et al., 2011) has illustrated in their studies on successful coaching attributes. This study,

of course, has determined that a PTECI feedback must also be combined with a PTACO feedback to have a relevant information-movement coupling of technique and tactics occur.

The next point of the study is to state that although the tactical opponent/technical internal feedback has significant value with higher skilled setters, the PTACO/PTECI model did not successfully predict performance improvement for the lower skilled setters. This is where the literature dealing with the independent variable PERminusPDR can help to understand the results regarding the significance of the PERminusPDR variable. As the literature review indicated, there are different task constraints that have their impact on motor performance. Although technical and tactical coaching feedback can minimize task constraints in a competitive situation, there are other constraints that can negatively influence lower skilled setters. While reviewing Newell's (1986) constraints-led approach to motor skill acquisition, the environmental constraints such as negative coaching coupled with performer constraints such as feelings of inadequacy and perceived lack of competence contribute to the coaches' inability to help their setters with technical or tactical feedback alone. As Jokela (1999) demonstrated, coaches need to be aware of athletes' needs for affirmation, particularly if they perceive that the opponent is "better" than they are. This study has demonstrated that modifications of coach feedback strategies should be made when working with lower skilled setters in a competitive environment. At the same time, this study has also demonstrated that the more in-tune the setter is to tactical cues when she is performing at a higher level, the greater her overall performance is going to be.

In developing a coaching feedback strategy that is efficient and effective, Newell's (1991) classification of the athlete as being at one of three stages of learning, the coordination stage, the control stage, or the skill stage, is important to remember. It is important to be aware of the stage of learning that the athlete is in and to understand the type of constraints that are most

detrimental or beneficial to the learner at any given point in time. Coach feedback to volleyball setters during time-outs in a competitive match should take into account when a performance is not going well and should be modified as demonstrated by the PERminusPDR model to be more encouraging and less technical or tactical at that point in time when performance is subpar. In the game, a coach becoming frustrated over the disparity in skill between his/her own players and the opponents and expressing that verbally to one's players has a negative effect. In the same instance, the infusion of tactical strategies or technical detail is just as detrimental, if not more so, as evidenced by the lower skilled setters' decision making model where all technical and tactical independent variables in the full model (Table 28-30) had a Beta that was negative (PTECI= -.06, PTACU= -.10, PTECE= -.18, & PTACO= -.20).

Conclusions

Conclusions from this study reveal that coach feedback during time-outs that focus tactically on the opponent and technically on internally controlled movements can positively improve ($F(2,39)= 3.88$, $p= .03$) highly skilled setter performance from before to after the time-out. The proportion of tactical opponent feedback (PTACO) and technical internal feedback (PTECI) combined to create the statistically significant model. When feedback was solely tactical regarding the opponent PTACO (Beta= 0.29, $p= .06$) or solely technical internal PTECI (Beta = 0.27, $p= .07$), the feedback was not as affective on the performance of the setter. For the lower skilled setter, most feedback should be directed towards encouragement ($F(1,45)= 3.92$, $p= .05$) and less coach feedback should be given towards the technical or tactical aspects of play. All but one of the independent variables in the full model for the lower skilled setters decision-making difference scores had a Beta that was positive (PERminusPDR, Beta= .28). The other Betas were negative (PTECI= -.06, PTACU= -.10, PTECE= -.18, & PTACO= -.20). Although

R^2 for each statistically significant model was relatively low (for higher skilled setters: PTACO/PTECI=.12, and for lower skilled setters: PERminusPDR=.06), the lack of the effectiveness of the model to predict overall performance of the setter should not discount the evidence of a statistically significant and efficient model for both higher skilled and lower skilled setters. Analysis of the standardized coefficients (Beta values) of these statistically significant variables in their refined models for higher skilled and lower skilled setters reveals that these Beta values, (PTACO=.29, PTECI=.27) for higher skilled setters and PERminusPDR=.28 for lower skilled setters, can predictably increase setter overall performance (higher skilled) and decision making (lower skilled) by nearly .30 standard deviations. In this study, data on coach time-outs revealed that for the higher skilled setters, coaches spend only 20% of their time outs giving feedback in the area of most significance (coaches of higher skilled setters PTACO/PTECI time= 20%). Thus, coaches of higher skilled setters should focus time-out feedback away from PTACU where (PTACO (.11) + PTACU (.34)) time is 45% of the coach time-out. A decrease in PTACU will occur if more tactical time is consciously focused on the opponent (PTACO). Because the total proportion of technical feedback time given to higher skilled setters, (PTECE (.07) + PTECI (.09)) was 16%, coaches of higher skilled setters could also make a conscious effort to reduce technical external feedback and make the feedback more related to internal body movement.

For the coaches of lower skilled setters, coach feedback should be geared more towards encouraging remarks. In this study, the overall proportion of tactical feedback (PTACO (.09) + PTACU (.30)) was 39% and the total proportion of technical feedback (PTECE (.08) + PTECI (.10)) was 18%. Encouraging remarks were made 30% of the time and discouraging remarks were made 10% of the time. Coaches should take from the other 70% of feedback they are giving

and allow more time to offer encouragement. More encouraging feedback could be given by decreasing the amount of technical and tactical feedback, and limiting the number of discouraging remarks made to the setter. The time to teach technical and tactical skill to a lower skilled setter is in practice, and not during a game.

Recommendations

From a practical standpoint as a coaching recommendation, as Blomqvist et al. (2005) has reported, the practice environment is the place to work with an athlete who is behind other more advanced players in terms of skill development and tactical awareness. The teaching of tactical skills in the practice setting allows skill execution and self-confidence to improve (Fenoglio, 2003). It is thus recommended to fully implement a coach feedback strategy in practice and in games that embraces a PTACO/PTECI coach feedback model that will deploy game-like tactical concepts into as many technical drills as possible in practice. In games, however, when the setter is under-performing or if the setter is still not proficient in skills, a feedback strategy that maintains encouragement is most important.

From this researcher's standpoint it is recommended that there be further studies to add predictor variables to the model that attempts to predict setter performance in volleyball. The R^2 for coach feedback was .12 in the PTACO/PTECI model, and that simply does not account for enough of the variance that is seen in overall performance for higher skilled setters in competitive volleyball. Implementing the PTACO/PTECI model in time-outs will not alone predict successful performance. Nevertheless, the PTACO/PTECI model (p= .03) is an encouraging beginning to the creation of such a model. It lends strong support to the TGfU coaching framework and focuses on the minimizing of task constraints through the prioritization of tactical goals in practice with the beneficial consequence of improving motor performance in

the process. Future directions along these lines will be to explore and test other predictors that could contribute to potential models (in-season resistance training protocols, player attitude assessment, nutrition, rest, muscular endurance, etc…) that could assist in the task of improving coaching practice and predicting the improved performance of players.

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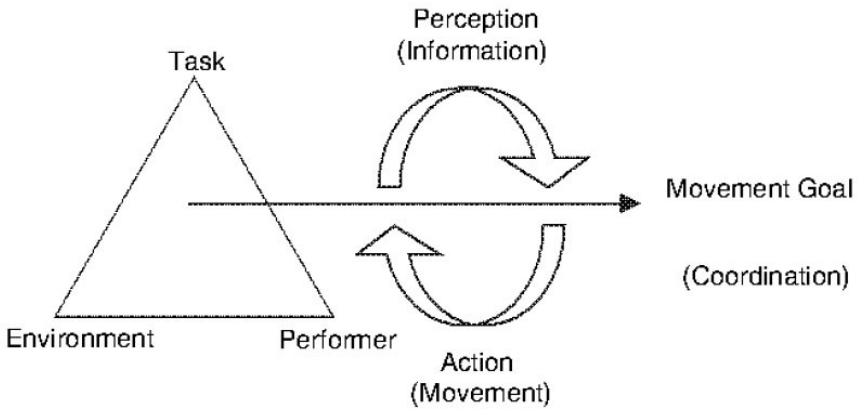
APPENDICES

Appendix A: Model of The Constraints-Led Approach to Motor Skill Acquisition



Emergence of movement behavior from the interaction of key performer, environmental, and task constraints on the learner, as modeled by Newell

Appendix B: Informed Consent Form

INFORMED CONSENT
Title: Systematic Observation of Coach Feedback in Elite Youth Volleyball
Investigator(s):
Mark David Mann, Graduate Student
Dean Gorman, Ph.D., Faculty Advisor
University of Arkansas
College of Education and Health Professions

Description: The present study will investigate the relationship between coach feedback during time-outs and athletic performance. During competition, the researcher will join your huddle with a digital audio tape recorder in record mode. The researcher will record the full thirty seconds of your time-out. The researcher will record up to ten time-outs throughout the day of play. Recording of the feedback that you will give your team will also take place when the other team calls a time-out. The researcher will not record your conversation at any other time during the match. The researcher will also be evaluating a particular player's movement, decision-making, and skill execution both before and after the time-out. This part of the data will be collected from the crowd, and will be done using the game performance assessment instrument (GPAI). The GPAI is a valid and reliable game play evaluation instrument. All player data will be collected without the players' knowledge and as such does not require their individual consent.

Risks and Benefits: The benefits include contributing to the knowledge base of the effects of coach feedback on volleyball player performance. Participation in the study could assist you in your professional practice of coaching by making you more reflective about what you are saying, and the effect of what you are saying, to your players, particularly during time-outs. There are no anticipated risks to participating in the study.

Voluntary Participation: Your participation in the research is completely voluntary. There are no payments or college credits for participating.

Confidentiality: You will be assigned a code number that will be used to match your time-out feedback with your player's performance assessment. All information will be recorded anonymously. Only the researcher will know your name, but will not divulge it or identify your answers to anyone. All information will be held in the strictest of confidence. Results from the research will be reported as aggregate data. All data will be coded in such a way that none of the individuals on the team, nor you, the coach, will be identified. After recordings have been transcribed all digital recordings of time-outs will be permanently erased.

Right to Withdraw: You are free to refuse to participate in the research and to withdraw from this study at any time. Your decision to withdraw will bring no negative consequences — no penalty to you.

Informed Consent: I, _____, have read the description, (please print) including the purpose of the study, the procedures to be used, the potential risks

and side effects, the confidentiality, as well as the option to withdraw from the study at any time. Each of these items has been explained to me by the investigator. The investigator has answered all of my questions regarding the study, and I believe I understand what is involved. My signature below indicates that I freely agree to participate in this experimental study and that I have received a copy of this agreement from the investigator.

_____ (signature)

Appendix C: Coach Time-Out Observation Instrument (CTOOI) Categories

Coach time-out feedback statements are classified into one of the following categories.

Variable Categories	Definition	Example	Rules
technical feedback with internal focus of attention. (TECI)	coach gives the player corrective information about skill performance and makes reference to bodily movement as the focus of the corrective information.	"You need to try to bend your knees." "Get your feet to the line." "lift your arms during your approach jump to give yourself more lift."	the statement must include information about skill corrections or improvement, and be stated in a nonthreatening manner.
technical feedback with external focus of attention. (TECE)	the coach gives the player corrective information about skill performance and makes reference to the external object (the ball) as the focus of the feedback information the player should attend to.	"you need to put more topspin on the ball." "make the ball dance on your float serve."	the statement must include information about skill corrections in reference to the ball, and be stated in a nonthreatening manner.
tactical feedback- referring to opponent. (TACO)	the coach gives direction about future strategic options or the Coach makes a comment about some decision the players have just made. The reference is to the opponent. This category includes consequence statements. These statements are based upon aspects the players can attend to in the present.	"If we can play tough defense, they will start to make errors." "we want to serve to their hitters who aren't passing very well." "they are hitting down the line in this rotation, so we need to move our block out."	Statements are made about tactics or strategies and places a value on certain actions that will cause opponent to make their own tactical adjustments or else perform at a lower level.
tactical feedback- referring to our team, us. (TACU)	the coach gives direction about future strategic options or the Coach makes a comment about some decision the players have just made. The reference is to our own team (us).	"we're going to play the green defense." "I told you not to commit block, stay down."	Statements are made about tactics or strategies, rather than skill performance. There needs to be a reference to player decisions.
Encouraging Remarks (ER)	Coach makes positive reference to players with the purposes of rewarding, increasing confidence, or self esteem.	"Good job, Beth, way to go." "That's it girls, top stuff."	: Statements are general in nature. Do not refer to skill execution.
Discouraging Remarks (DR)	Coach makes negative reference to players that might reduce confidence.	"That was rubbish." "What do you think you're doing? How can you play like that?"	Statements are general and do not include specific reference to specific skill performance.

Appendix D: Sample of a Transcribed and Coded Coach Time-Out using the CTOOI.

Coding is embedded inside feedback statement in brackets: (statement (coded))

RECORDINGMD46: (They are hitting line over there so in defense, Jane3, you and Jane4 both, lets go more towards the line.(TACO)) (If they set a four, you just go all the way to the line. (TACO)) (Stay about the same depth you are. Don't go too deep.(TACU)) (Lets get our right foot closer to the center line (TECI)) and (lets be facing the target when we are there.(TECI)) Ok. Ok. (Otherwise, offensively, lets stay aggressive! Lets stay aggressive.(TACU)) (keep believing in each other, and lets keep working like we were.(ER)) Ok. (Lets do it right now! You are doing good. Lets just work. (ER))

Time Out # 79	**VOL= 8 feedback statements**	**TECI**	**TECE**	**TACO**	**TACU**	**ER**	**DR**
	N of each type of Statement	**2**	**0**	**2**	**2**	**2**	**0**
		PTECI	**PTECE**	**PTACO**	**PTACU**	**PER**	**PDR**
	Proportion	**.250**	**.000**	**.250**	**.250**	**.250**	**.000**

Appendix E: The Game Performance Assessment Instrument (GPAI) Coder Guide

The GPAI will measure Game Performance by the Setter:

Coding/Scoring

The setter can earn up to 12 points for each rally:

6 tactical decision making points and 6 technical skill points.

The first three points coded are tactical points:

0-1 point= Tactical= In Base Defensive Position. No or yes. (TAC:B)

0-1 point= Tactical= Release to Defensive Position No or yes. (TAC:R)

0-1 point= Tactical= Arrive on time to target area. No or yes. (TAC:C).

The next six points coded are technical skill points: (TEC:F) and (TEC:P).

0-3 points= Technical Execution: Form (TEC:F)

1 point= Proper Body Alignment (ball on forehead, shoulders facing target)
1 point= Joint Flexion at elbows and knees.
1 point= Extension (follow through)

0-3 points= Technical Execution: Ball Placement (TEC:P)

0 points= setter ball handling error
1 points= 1 hitter option (hitter has to hit free/down ball over net),
2 points= 2 hitter options (hitter lost an area of court to hit to, but can attack ball),
3 points= 3 hitter options (hitter could, tip, roll, or hit to all areas of the court).

The last three points coded are tactical decision making points (2 TAC:D and 1 TAC:V):

0-2 points= Tactical= Setting Decision (TAC:D) (to which hitter did she set)

0 points (poor decision: hitter was not at attack line ready to approach and hit).
1 point (decent decision: double block was formed against hitter.)
2 points (excellent decision, single block or no block was formed against hitter.)

0-1 point= Tactical= (TAC:V) Coverage of Hitter: Did setter cover? No or yes.

Appendix F: GPAI Tally Spreadsheet

Each line on the GPAI tabulated tally spreadsheet represents the sum score of four rallies either prior to (line 37) or after the time-out (line 38).

In the example below from the GPAI data collected during match game 12.1, line 37 represents the sum of the data collected from the four rallies immediately prior to the time-out. Line 38 represents the four rallies immediately after the time-out (time-out #23.) Also on line 38, the total difference, skill difference, and tactical decision making score differences are calculated on the setters technical and tactical performances from before to after the time-out. The time-out number represents the CTOOI coded time-out data recorded separately using the digital audio recorders.

1	Match/gm	Coach	TO#	B	R	C	F	P	D	V	TOT	TEC Tot	TAC Tot	Tot Diff	TEC Diff	TAC Diff
37	12.1	10		4	4	4	9	11	8	0	40	20	20			
38	12.1 TO#1	10	23	4	4	4	12	11	7	0	42	23	19	2	3	-1

GPAI Legend as listed on GPAI Tally Spreadsheet

Match/gm: Match and Game Number
Coach #: The number assigned to the coach
TO #= Time-Out Number on CTOOI

Setter Performance Measures:

B= Base Position (Tactical TAC:B)
R= Released to defensive position (Tactical TAC:R)
C= Got to setting position (Tactical TAC:C)

F= Technical Form (TEC:F)
P= Ball Placement/Location (TEC:P)

D= Decision on who was set (TAC:D)
V= Covered the Hitter (TAC:V)

Appendix G: Example of Combined Raw Data from CTOOI and GPAI.

In this step of the data collection process, CTOOI data are aligned with GPAI data. All Coach Feedback Variables are listed as proportions of the coach feedback type given during the time-out.. Thus: PTECI, PTECE, PTACO, PTACU, PER, and PDR. VOL represents the total number of feedback statements made during the time-out.

Dependent Variable from Game Performance Observation Instrument (GPAI) (SKD + DMD =TD)				Independent Variables from Coach Time Out Observation Instrument (CTOOI)						
TO #	**skill dif (SKD)**	**dec. mak. dif (DMD)**	**Total dif (TD)**	**PTECI**	**PTECE**	**PTACO**	**PTACU**	**PER**	**PDR**	**VOL**
1	9.000	2.000	11.000	0.500	0.000	0.000	0.167	0.167	0.167	6.000
2	-3.000	-3.000	-6.000	0.000	0.000	0.000	0.600	0.400	0.000	5.000
3	-4.000	2.000	-2.000	0.000	0.000	0.000	0.500	0.500	0.000	4.000
4	1.000	-1.000	0.000	0.083	0.000	0.000	0.500	0.083	0.333	12.000
5	0.000	-1.000	-1.000	0.000	0.000	0.250	0.750	0.000	0.000	4.000
6	1.000	4.000	5.000	0.000	0.000	0.000	0.250	0.750	0.000	4.000
7	4.000	4.000	8.000	0.286	0.143	0.286	0.143	0.143	0.000	7.000
8	0.000	-3.000	-3.000	0.000	0.000	0.000	0.667	0.333	0.000	3.000
9	-2.000	7.000	5.000	0.091	0.000	0.182	0.091	0.636	0.000	11.000
10	1.000	-6.000	-5.000	0.111	0.222	0.000	0.333	0.333	0.000	9.000
11	2.000	0.000	2.000	0.200	0.000	0.000	0.133	0.266	0.400	15.000
12	-5.000	-1.000	-6.000	0.111	0.000	0.111	0.333	0.444	0.000	9.000
13	3.000	0.000	3.000	0.000	0.000	0.000	0.500	0.000	0.500	4.000
14	0.000	-3.000	-3.000	0.200	0.000	0.000	0.400	0.400	0.000	5.000
15	1.000	1.000	2.000	0.000	0.000	0.000	0.333	0.667	0.000	3.000