

Techniques to Aid Motor Learning in Teaching Volleyball Skills

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### **Abstract**

The purpose of this study was to examine the techniques to aid motor learning in teaching volleyball skills with players on a volleyball team during the off-season. This study utilized a modified case study design of a pretest, a treatment, and the posttest. There was no randomization of subjects in the study. An instrument was developed by the researcher to record serving, setting, and passing results. The data did show an increase in player efficiency for the volleyball skills of serving, setting, and passing. Additional studies are needed with a broader sample to validate the techniques to aid motor learning in teaching volleyball skills.

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## CHAPTER I

### INTRODUCTION

#### Overview

Volleyball is a popular sport for the youth and for collegiate athletes across the United States. The popularity of volleyball has led different philosophies and teaching techniques among junior coaches and collegiate coaches. Coaches at all levels instill different techniques for teaching volleyball skills. Over the past twenty-five years, there has been tremendous growth in teacher and coaching education. The research into teaching and coaching has improved techniques to aid motor learning in teaching volleyball skills. A number of volleyball coaches continues to coach with unsuccessful motor learning techniques when teaching volleyball skills. As a result, there is inconsistency and a significant gap in the level of volleyball training across the country. The youth and collegiate coaches have a responsibility to coach with successful techniques to aid motor learning in teaching volleyball skills.

#### Statement of Problem

What is the effectiveness of different techniques to aid motor learning in teaching volleyball skills?

The researcher designed the study to determine whether different strategies aid motor learning in teaching volleyball skills over the course of eight weeks.

#### Hypothesis

For this study, the null hypothesis is proposed. There will be no impact of motor learning in teaching volleyball skills with positive feedback, video feedback, and the mental imagery techniques.

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### **Operational Definitions**

Volleyball skills, including passing, serving, and setting, were measured by the researcher. The participants passed ten balls from the researcher serving the volleyball. The passes were graded on a zero-, one-, two-, or three-point scale. The participants served ten volleyballs to randomly selected areas on the volleyball court. The volleyballs served in the area were recorded as a positive out of ten serves. Lastly, the participants set ten volleyballs to a designated target, and the volleyballs going inside the target were recorded as a positive out of ten sets.

## CHAPTER II

### LITERATURE REVIEW

This literature review discusses the components of motor learning and examines techniques to aid motor learning in teaching volleyball skills. The first section of the literature review provides insight about volleyball skills and the strong volleyball skills that influence winning. In the second section, the motor learning components are described. Finally, the third section of the literature review discusses the strategies for improving motor learning in teaching volleyball skills.

#### **Strong Volleyball Skills**

The volleyball game is characterized by a combination of six main skills: serve, serve receive, set, attack/spike, block, and dig (Eom & Schutz, 1992). Players on the volleyball team need to learn and possess these skills to compete and participate in volleyball. The setter's main job is to receive the passes and set the hitters to spike. The hitter's success is dependent on the success of the pass to the setter (Croitoru, 2014). The block acts as a defensive and offensive movement to stop the opponent's attack and is the most difficult skill because of the mental aspect (Patsiaouras, Moustakidis, Charitonidis, & Kokaridas, 2011).

"Volleyball is included in sports where individual success of final efforts such as successful attack or an effective block, is achieved by the harmonious collaboration of the preceded player's efforts" (Patsiaouras et al., 2011, p. 149). Patsiaouras et al. (2011) evaluated the basic skills that helped a team win points and the match. The serve is evaluated based on service error, opponent points, total serves, and points after serve. Secondly, the serve receive is evaluated on serve receive total, first attack kill after serve receive, serve receive error, and excellent serve receive. The attack is evaluated based on the points after attack, attack error, and

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total attack number. Evaluation of the team and individual volleyball skills are used with a computerized recording to collect data (Eom & Schutz, 1992).

The Jonckheere-Terpstra test is a statistical analysis test used to evaluate winning and losing in volleyball. Based on a test by Patsiaouras et al. (2011), results showed a significant difference between the winning and losing teams in areas of service points, blocks, serve receive errors, and total reception. A high-level volleyball program should focus on training the serving, decrease of serve receive errors, blocking, offense tactics and the spike (Patsiaouras et al., 2011).

### **Motor Learning**

The components of motor learning are observational practice, feedback, and self-controlled practice (Wulf, Shea, & Lewthwaite, 2010). Neuroscience shows the premotor areas activated in motor learning (Lage et al., 2015). Observational practice incorporates motor learning through observing others. Past research has shown that observing others in motor learning as a critical component for motor learning. The individual will receive information related to the goal or mistakes to avoid through observational practice (Wulf et al., 2010).

Feedback for motor learning involves the quality of the movement or the information of the outcome (Wulf et al., 2010). The two types of feedback given to the athlete are intrinsic feedback and extrinsic feedback. The extrinsic feedback is from an outside source, typically a coach or educator. The intrinsic feedback is through the athlete's own senses of touch, sight, and hearing (Raiola, Parisi, & Salvatore, 2014). According to Raiola et al. (2014), "The feedback returns to athlete feedback information from the senses or from the outside world on a particular movement" (p. 405). In the feedback, the focus of attention on the effect of the individual's movement is directed for motor learning. The external focus of the performer will promote automatic processes (Wulf et al., 2010).



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Self-controlled practice is physically practicing a motor skill with the individual having control of the practice. Learners should not be passive in motor learning and should have self-control in the physical aspect of practice (Wulf et al., 2010). Without some type of physical practice, learning a motor task is not possible (Allami et al., 2014).

Lastly, motor learning is associated with the firing of the circuits in the frontal lobe. Neuroscience shows motor learning is associated with the activation of the frontal lobe. The frontal lobe is composed of three sections, the prefrontal cortex, primary motor area, and the premotor area (Lage et al., 2015). Research has shown reports of activation in functional brain networks of the fronto-parietal, cerebellum, basal, ganglia, motor and premotor cortex after improvements in physical practice and motor learning (Allami et al., 2014).

The use of motor skills is an important component of proficiency for individuals in different professions. A number of different training methods are used for teaching motor skills. Motor learning is important for volleyball because the skills each player possesses determine the success of the match (Patsaiaouras et al., 2011). As Wulf et al. (2010) state, “learning is typically defined as a relatively permanent change in a person’s capability to perform a skill” (p. 76). The objective for training and motor learning for one’s profession is to enhance learning and transfer, not to facilitate performance in practice (Wulf et al., 2010).

### **Strategies for Improving Motor Learning**

Professions involving motor learning adopt different techniques from other professions (Pugh, 2012). There are a number of strategies to improving motor learning. According to Lin, Wu, Udompholkul, and Knowlton (2010), the practice schedule of random order incorporates the contextual interference effect on motor learning. The contextual interference effect is practicing different skills in a random order and results in greater retention. The blocked order is practicing

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a skill repeatedly in the same manner (Lin et al., 2010). The random order is practicing two or more skills in different orders (Lage et al., 2015). According to Lin et al. (2010), practicing random order induces better retention than a blocked order.

Shea and Morgan (as cited in Lin et al, 2010) conducted a contextual interference study focused on learning three arm-movement tasks. The subjects learned the tasks in a blocked or random order. As a result, “retention and transfer were greater following random acquisition than after blocked acquisition” (Lin et al., 2010 pps. 929-930). There was greater effort needed during the random acquisition and poorer performance, but the random acquisition resulted in a better long-term retention (Lin et al., 2010). In the end, contextual interference requires greater cognitive work, which leads to enhanced learning and retention (Lage et al., 2015).

Mental imagery or visualization involves mentally represented actions (Allami et al., 2014). Mental imagery has been adopted by a number of professional athletes. The practice of mental imagery prior to engaging in motor tasks has shown to benefit the physical practice and learning of skills (Pugh, 2012). The practice of motor imagery activates the motor systems in the premotor cortex. Based on research, during the mental rehearsal of motor skills, the fronto-central regions undergo neural changes (Allami et al., 2014). Pugh (2012) points out, “the concept of mental rehearsal is based on the premise that symbolic rehearsal of a motor task activates similar neural processes to those used in actual performance” (p. 405). Mental imagery can replace up to seventy-five percent of physical practice and improve motor performance (Allami et al., 2014).

Videotaped performances and practices are used all over the world in a variety of sports (Seifried, 2005). In a volleyball experiment conducted by Raiola et al. (2014), the experimental group with video analysis improved significantly in the spiking skill compared to the control

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group with no video analysis. According to Seifried (2005), video recordings are used as a teaching tool for the self-check method, guided discovery method, and the divergent teaching method. The self-check method allows the student to use video as a feedback tool and to compare his or her motor performance based on the teacher's standards. The guided-discovery method enables the student to discover the answers to a set of concepts and prevents passive learning of motor skills. Videotapes provide visual information in motor skills and can be used to guide students in understanding concepts. The divergent teaching method enables the student to discover a number of different solutions. With the use of the videotapes, coaches are able to use the divergent teaching method to set up scenarios for the student for motor learning (Seifried, 2005).

Lastly, different types of feedback affect motor learning and performance. Based on previous studies on coaching behavior and feedback, practice atmospheres that stimulate positive feelings based on performance results can boost self-efficacy, motor performance, and learning (Ávila, Chiviacowsky, Wulf, & Lewthwaite, 2012). In Ávila et al.'s (2012) study, 32 ten-year-old children were tested on throwing beans bags with their non-dominant arm onto a circular target. The participants who received feedback indicating better performance than their peers demonstrated superior learning. In the retention test, the group who received positive feedback scored higher accuracy scores than the control group (Ávila et al., 2012).

In another study by Saemi, Porter, Ghotbi-Varzaneh, Zarghami, & Maleki (2012), participants were tested on throwing tennis balls and given feedback on the knowledge of the result after good trials or knowledge of the result after poor trials. The group with feedback after knowledge of good trials received higher scores than the group who received feedback after poor trials. Next, the retention test showed significantly higher scores for the group who received

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knowledge of good trials. Therefore, motor learning and performance is enhanced with the use of positive feedback and knowledge of results after good trials (Saemi et al., 2012).

### **Summary**

This review of the literature suggests there are numerous ways to teach motor learning. Volleyball is a sport that requires a variety of different skills to learn and use in competition. However, the review suggests a number of different strategies to improve motor learning and retention. The contextual interference effect improves learning and retention through the random practice schedule. Secondly, the use of mental imagery prior to physical practice improves learning and performance of motor skills. Giving positive feedback and feedback after the knowledge of good trials improves motor learning and performance. Finally, videotapes can be effective teaching tools to incorporate learning and to self-check motor skills.

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## CHAPTER III

### METHODS

This study examined the impact of techniques used to aid in motor learning in teaching volleyball skills for Division III female volleyball players.

#### Design

This study utilized a modified case study design of a pretest, a treatment, and the posttest. There was no randomization of subjects in the study. The performance of the volleyball skills was measured from pre- to posttest as described in greater detail in the “Instrument” section of this chapter.

#### Participants

The participants in this study are athletes of the women’s volleyball team at a small liberal arts college in Baltimore, Maryland. The study included three female volleyball players from three different states in the age range of 18-20. The participants were selected because they were the underclassmen on the volleyball team and those who needed the most skill development.

#### Instrument

Three volleyball skills were tested for the pre- and posttest measurements. The pretest skills consisted of serving the volleyball, passing the volleyball, and setting the volleyball. The skills were performed in the off-season, prior to the start of spring practices. At the conclusion of spring practice, the same three skills were used again.

#### Procedure

This study was conducted over the course of eight weeks from the end of February until the end of April. The subjects were randomly assigned treatment for the experiment to

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understand which treatment impacted motor learning in teaching volleyball skills. First, the subjects participated in the pretest prior to the start of spring practice. The pretest consists of testing the volleyball skills of passing, serving, and setting. The three volleyball skills were chosen based on the impact the skill had for winning in volleyball. The next six weeks consisted of the subjects being trained in each volleyball skill with a specific treatment from the researcher. The final week consists of the posttest without the use of any treatment. The subjects were told of the intentions of the study and that all information would be confidential.

The researcher used the positive feedback technique for athlete number one. After the subject performed a good repetition, the researcher gave verbal positive feedback to the subject. Athlete number two used video feedback technique for learning volleyball skills. After the subject performed a repetition, the athlete looked at video of the previous repetition. Athlete number three used mental imagery for three minutes before performing the volleyball skill. During mental imagery, the athlete is closing her eyes and seeing herself successfully performing the skill in the internal perspective (first person point of view).

### **Chapter IV**

### **RESULTS**

This study examined the components of motor learning and the techniques to aid motor learning in teaching volleyball skills. The study involved three athletes in a modified case study methodology. Each athlete received three differing feedback techniques designed to improve his/her performance. Those techniques included positive feedback, video feedback, and mental imagery feedback. The techniques were spaced out from February 15, 2016 to April 4, 2016, and the techniques began only after baseline measurement. Performance had three measures – the dependent variables – which were volleyball skills of serving, passing, and setting.

Data for each athlete were charted and graphed. Each athlete has a data table and graphs associated with the treatments. The data charts and graphs are presented below. Critically important to this study is that for each athlete improvement occurred with each treatment.

Based on the data as graphed, the null hypothesis is rejected. The statistics gathered from the research shows that all three subjects improved from the pretest to the posttest. The positive feedback technique, the video feedback, and the mental imagery feedback showed differences in the research. Athlete #1 went from 0.5 to 0.9 in serving, 1.6 to 2.1 in passing and 0.30 to 0.60 in setting. Athlete #2 went from 0.5 to 0.9 in serving, 1.5 to 2.0 in passing and 0.20 to 0.60 in setting. Athlete #3 went from 0.5 to 0.8 in serving, 1.7 to 2.1 in passing and 0.30 to 0.60 in setting.

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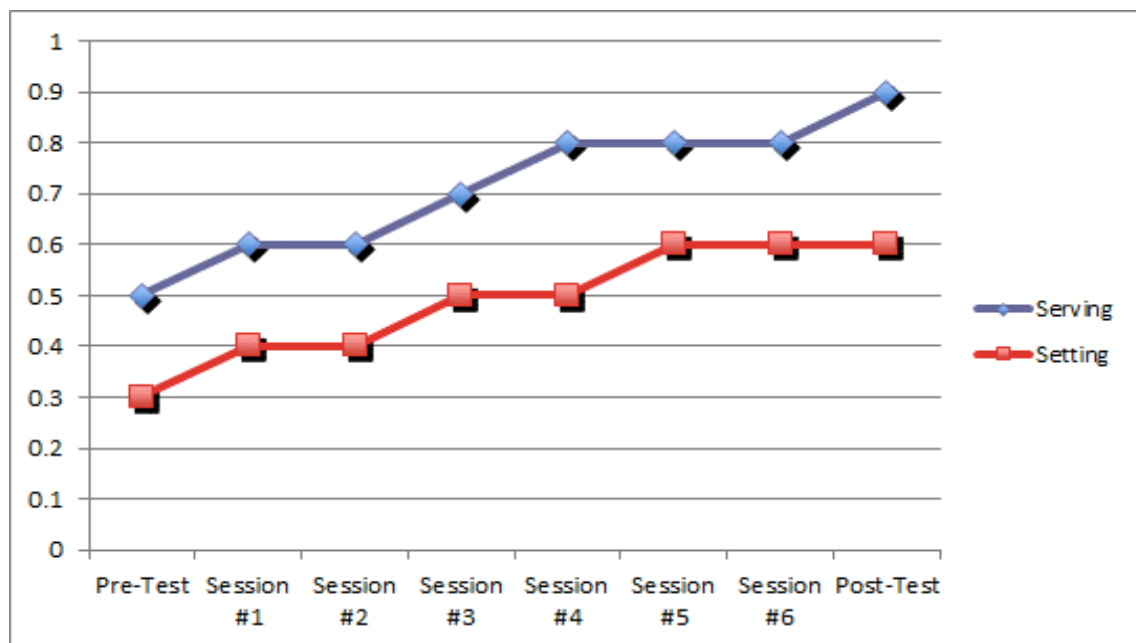
Table 1

*Data for Athlete 1: Positive Feedback*

<u>Participant</u>	<u>Session</u>	<u>Serving</u>	<u>Passing</u>	<u>Setting</u>
Athlete #1	Pre-Test	0.5	1.6	0.30
Athlete #1	Session #1	0.6	1.8	0.40
Athlete #1	Session #2	0.7	1.7	0.40
Athlete #1	Session #3	0.7	1.8	0.50
Athlete #1	Session #4	0.8	1.9	0.50
Athlete #1	Session #5	0.8	1.9	0.60
Athlete #1	Session #6	0.8	2	0.60
Athlete #1	Post-Test	0.9	2.1	0.60

Graph 1

*Athlete 1 Results: Serving and Setting*





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Graph 2

*Athlete 1 Results: Passing*

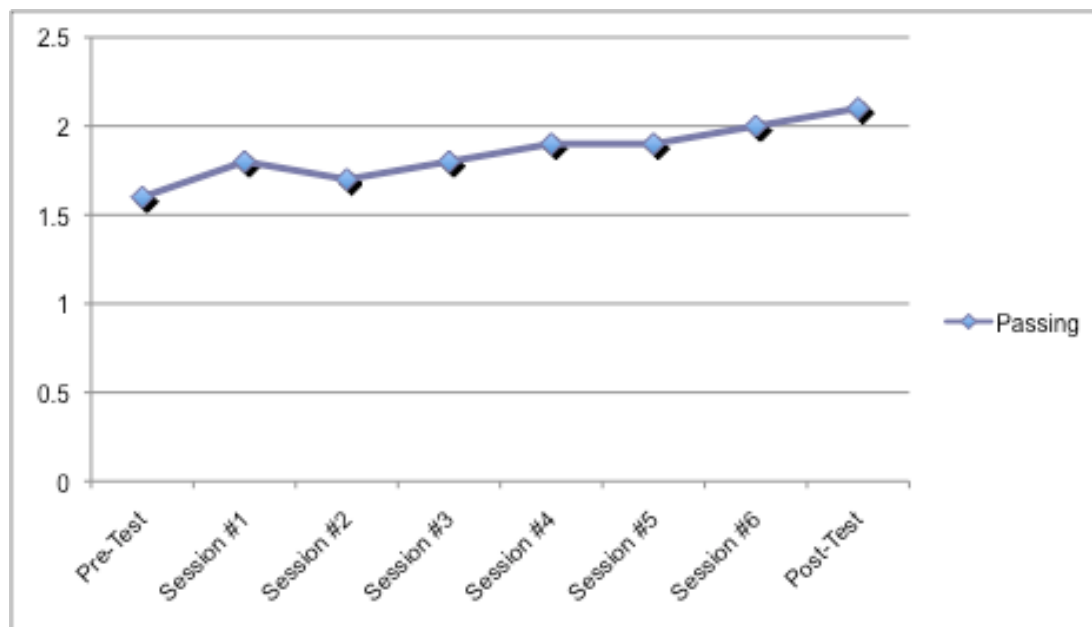


Table 2

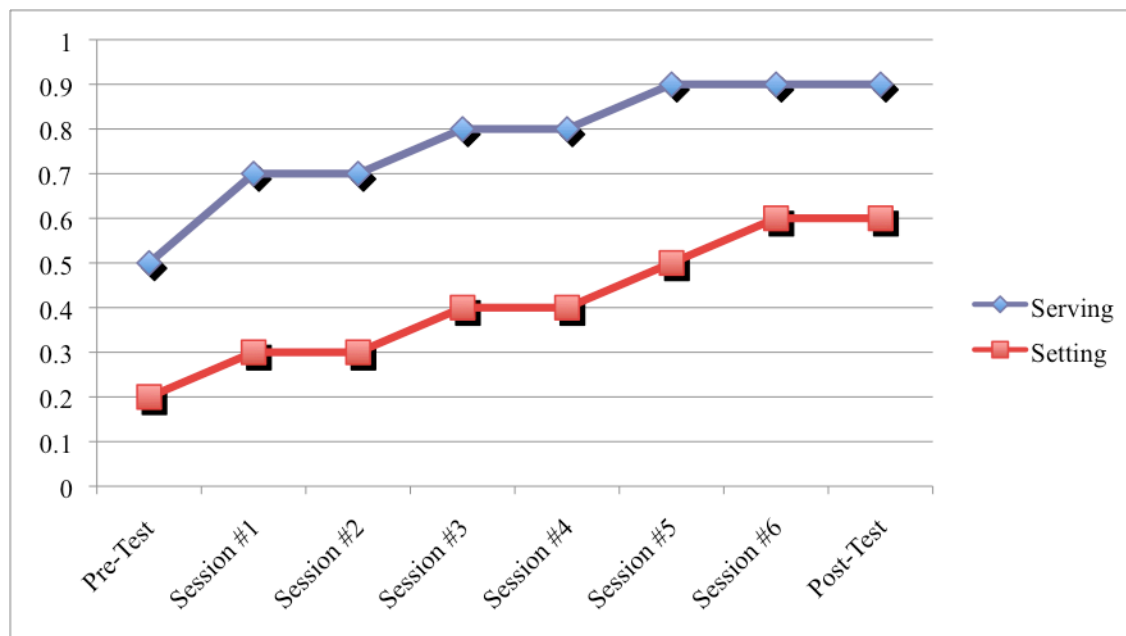
*Data for Athlete 2: Video Feedback*

<b><u>Participant</u></b>	<b><u>Session</u></b>	<b><u>Serving</u></b>	<b><u>Passing</u></b>	<b><u>Setting</u></b>
Athlete #2	Pre-Test	0.5	1.5	0.20
Athlete #2	Session #1	0.7	1.6	0.30
Athlete #2	Session #2	0.7	1.6	0.30
Athlete #2	Session #3	0.8	1.7	0.40
Athlete #2	Session #4	0.8	1.8	0.40
Athlete #2	Session #5	0.9	1.9	0.50
Athlete #2	Session #6	0.9	2	0.60
Athlete #2	Post-Test	0.9	2	0.60

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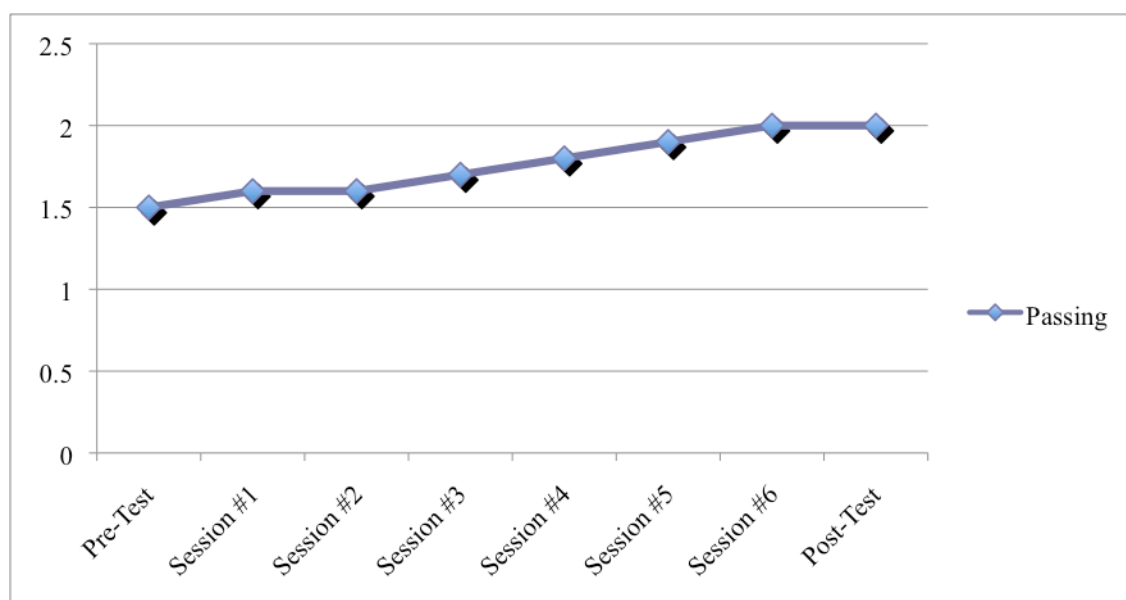
Graph 1

*Athlete 2 Results: Serving and Setting*



Graph 2

*Athlete 2 Results: Passing*



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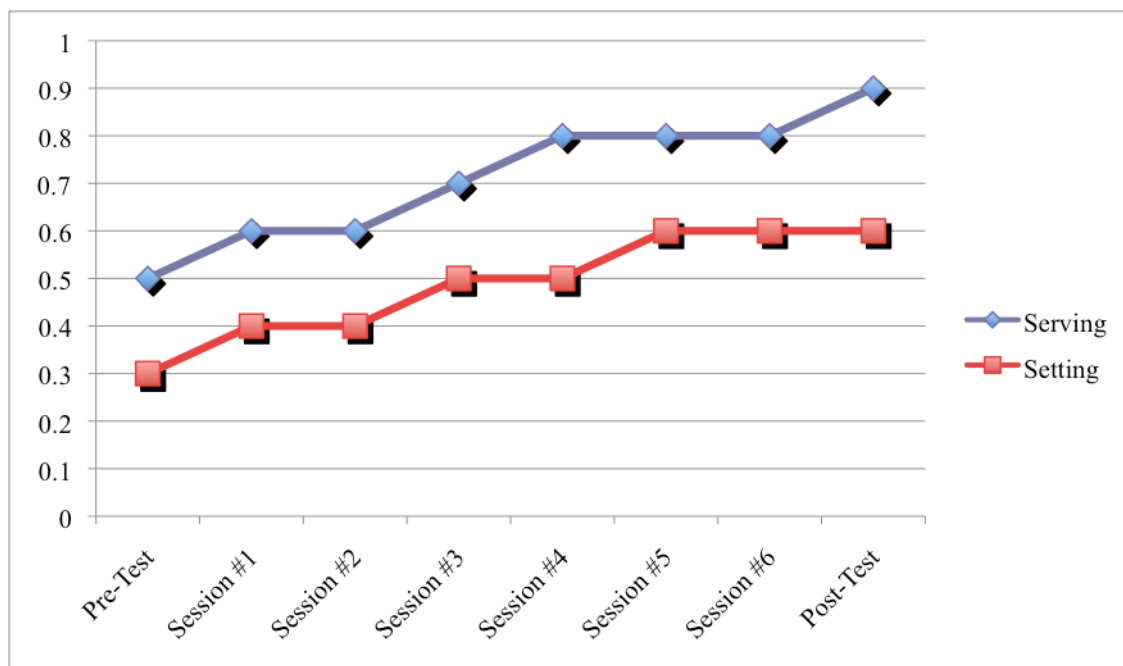
Table 3

*Data for Athlete 3: Mental Imagery Feedback*

<u>Participant</u>	<u>Session</u>	<u>Serving</u>	<u>Passing</u>	<u>Setting</u>
Athlete #3	Pre-Test	0.5	1.7	0.30
Athlete #3	Session #1	0.6	1.8	0.40
Athlete #3	Session #2	0.6	1.7	0.40
Athlete #3	Session #3	0.7	1.9	0.50
Athlete #3	Session #4	0.8	2	0.50
Athlete #3	Session #5	0.8	1.9	0.60
Athlete #3	Session #6	0.8	2	0.60
Athlete #3	Post-Test	0.9	2.1	0.60

Graph 1

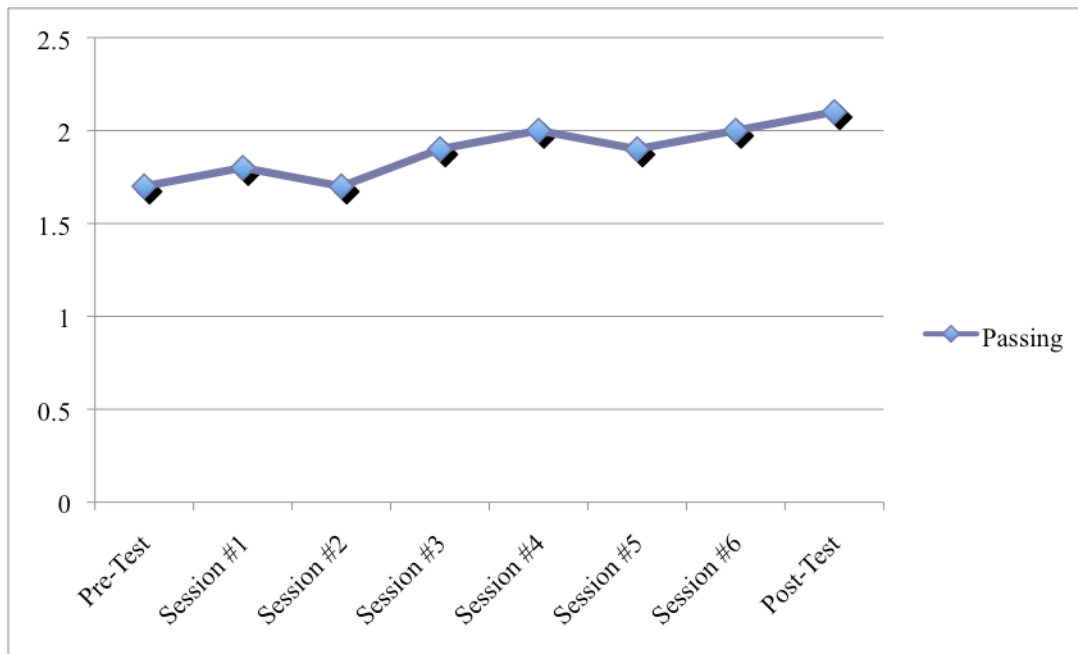
*Athlete 3 Results: Serving and Setting*



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Graph 2

*Athlete 3 Results: Passing*



## CHAPTER V

### DISCUSSION

This study examined the components of motor learning and examined techniques to aid motor learning in teaching volleyball skills. The null hypothesis of no impact of the treatments on performance was rejected, and the alternative hypothesis that the treatments did impact performance was accepted.

#### **Threats to Validity**

Because this study utilized a modified case study methodology using three athletes with three different treatments for each athlete, there are issues associated with both internal and external validity that need to be discussed. External validity is always impacted by the sampling methodology and technique. In this study, the sample was a purposive sample drawn from students in the researcher's athletic program. As such, generalizations beyond the team would be unwise; further, the sample itself is small, and thus generalization beyond these athletes would not be warranted. Even within those limitations, the effects of the treatments on each athlete were noticeable, and the treatments warrant further research and study.

Internal validity in this study is impacted by the nonrandom nature of the sample and the possible interference of one of the research treatments with another and the possibility of the athletes benefitting so much from one treatment that it carried forward into another. Another threat to validity that could affect the data is the isolation of one athlete in the gym. During the testing, there were no other distractions in the gym to interfere with the environment of the testing. Also, the testing was done in a blocked order; the subjects practiced the same skill repeatedly in the same manner. Practicing the same skill over and over can influence the result

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of the tests. There was no contextual interference effect; the subjects in the study performed one skill at a time. The contextual interference effect is practicing different skills in a random order.

Another threat to validity was the outside practice and repetitions the subjects received during the testing period. The subjects were in spring season and were practicing three days a week outside of the testing. The extra repetitions may have affected the results of the research. Another threat to the validity of this study was that the subjects were given feedback by the same coach who coached them during the regular season. The same coach from the regular season, familiar language, and familiar expectations could have influenced the research. Lastly, history could have affected the participants' results. The testing finished in April, and the stress of upcoming finals can affect the participants' attitudes and behaviors.

### **Comparisons to Previous Studies**

As stated in Chapter II, there are multiple strategies for improving motor learning in teaching volleyball skills. The components of motor learning are observational practice, feedback, and self-controlled practice. All three subjects in the study incorporated feedback and self-controlled practice. One of the three subjects incorporated all three components.

This study used positive feedback, video feedback, and mental imagery feedback techniques as attempts to improve motor learning volleyball skills of passing, serving, and setting. Based on the research, positive feedback, video feedback, and mental imagery feedback are all strategies that can improve motor learning. The positive feedback and video feedback were extrinsic types of feedback, and the mental imagery was an intrinsic type of feedback. Overall the use of the positive feedback, video feedback, and mental imagery feedback improved participants' volleyball skills. This suggests that players respond well to the feedback and improvement for learning the volleyball skills.

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### **Suggestions for Future Research**

Future research should include a single subject and multiple feedback techniques for the single subject. This will allow the data to show effects of different feedback techniques for motor learning. By directing the focus on one subject, the researcher can see the different effects. A future study could also use subjects from other collegiate volleyball programs to include athletes from other areas. Athletes from other collegiate programs will increase the sample size of the group. Lastly, the subjects could represent a middle school and high school. The broad range in age group would allow the researcher to test for motor learning for a wide range.

### **Conclusion**

Teaching volleyball skills can be a difficult task for all coaches and athletes. There are different types of athletes, and, individually, all can learn and respond differently to each type of feedback. This study sought to improve motor learning and examine techniques to aid motor learning for volleyball skills. Overall, the data and charts showed an improvement in all volleyball skills.

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