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The Effect of Pettlep Imagery in a Pre Shot Routine on Full Swing Golf Shot Accuracy: A Single Subjects Design

Scott Swainston

THE EFFECT OF PETTLEP IMAGERY IN A PRE SHOT ROUTINE ON FULL
SWING GOLF SHOT ACCURACY: A SINGLE SUBJECTS DESIGN

by

SCOTT SWAINSTON

(Under the Direction of Noah Gentner, Ph.D.)

ABSTRACT

Imagery has been shown to be an effective tool for enhancing performance in a variety of
sports. Specifically, imagery has been found to be extremely effective within the sport of
golf (e.g., Nicholls & Polman, 2005; Woolfork, Parish, & Murphy's, 1985). For
example, Ploszay, Gentner, Skinner, and Wrisberg (2006) found imagery to improve
putting performance. The purpose of this study was to investigate the effect that a
PETTLEP imagery intervention implemented into a pre shot routine had on a full swing
golf shot. A single subjects design was used with three conditions: imagery before pre
shot routine, imagery after pre shot routine and a control condition. Participants were
nine undergraduate volunteers with an average age of 19.3 years and an average golf
score of 82.1. Three sets of data were recorded: total score, balls in A1 (the closest area
to the pin in a standardized scoring target grid), and balls in A5 (anything outside of the
grid). It was found that all imagery participants improved from baseline to intervention
in all three aspects, while the control group elicited consistent or decreases in
performance. Imagery had the greatest impact on performance for balls hit in A5.
Implications from this study may benefit golfers of any skill level and sport psychology
consultants working with golfers who want to increase their full swing shot accuracy.

INDEX WORDS: PETTLEP, Imagery, Golf

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B.A., University of Missouri – Kansas City, 2009

A Thesis Submitted to the Graduate Faculty of Georgia Southern University in Partial

Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

STATESBORO, GEORGIA

2011

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Electronic Version Approved:
May 2011

DEDICATION

This project is dedicated to my family who has supported me in every aspect of my life. Mom and Dad, all your help and guidance has led me to this point, I cannot thank you enough. Stephanie you are a great big sister, thank you for being there. Grandma and Papa your love is always felt no matter how far away I am. Jenny, I'm so glad my time at Southern led me to you. I am no doubt a better person with you in my life. I can't wait for everything the world has planned for us! Without all of you I would have never made it this far. I am truly blessed to have you all in my life supporting everything I do.

ACKNOWLEDGMENTS

My thesis would not have been completed without the help of some amazing people at Georgia Southern. Kevin, you are ridiculous, and I love every minute of it sir. Not sure Statesboro would have been tolerable without you. Jackie, you have been awesome since the first night in the 'boro when you cooked me dinner. Thanks for all that you have done for me, which recently has been a whole lot! I really appreciate it. C-lyn, Yupdyke this year has been awesome living just a few steps away from you both, and I've really enjoyed these two years. Blazo, I wish you were here this year, the end. Beth, Ebony, and Jody you all have been there for me regardless of how many questions and problems have come up. I owe each of you so much, thank you thank you thank you.

Tyler, Anya, Michael, and James I can't thank you all enough for your help and support during data collection. This project is a direct result of all your hard work, thank you so much!

Finally, I would like to thank my thesis committee. Dr. Gentner and Dr. Czech it's amazing how much both of you have done for me in my two years here. From class, to thesis, to supervision, to Key West, and even going to the Master's, every minute of it has truly been awesome. Thank you so much. Dr. Joyner thank you for all the hard work you have put in to better this project. It's been a great two years both on and off the golf course! Dr. Carson I can't thank you enough for continuing to help with this project after you moved away. It really means a lot that you would stick with it! You have always been there for me whether it's been this project or talking in your office. Again thank you!

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CHAPTER 1

INTRODUCTION

According to Vealey and Greenleaf (2006) imagery is "the use of all the senses to re-create or create an experience in the mind" (p. 307). Imagery is one of the most popular mental training techniques used by athletes. During the 1984 Olympic Games, 99 percent of the 235 Canadian athletes reported using imagery in some fashion (Orlick & Partington, 1988). Imagery is not only popular with athletes, but it is also one of the most widely studied mental training skills (Morris, Spittle, & Watt, 2005).

The current literature has shown imagery to be an effective tool for enhancing performance in a variety of sports including basketball free throw shooting (Kearns and Crossman, 1992), pitching accuracy (Nelson, Czech, Joyner, Munkasy, & Lachowetz, 2008), and the tennis serve (Coelho, de Campos, da Silva, Okazaki, & Keller, 2007). Additionally, figure skating performance, as a whole, was shown to be positively affected by the use of imagery (Rodgers, Hall, & Buckolz, 1991). Additionally, research suggests that imagery is an appropriate psychological skill for positively influencing golf performance (e.g., Nicholls & Polman, 2005).

One important aspect of imagery research is its focus on effectiveness within closed skilled sports. Closed skills are defined as self paced skill execution in a static environment, such as a golf swing or free style figure skating movements (Arvinen-Barrow et al., 2007. For example, Coelho et al. (2007) investigated the use of imagery on both a closed and open skill within the game of tennis. The tennis serve was chosen as the closed skill task and the service return as the open skill task. Results of the study

found that the imagery group performed significantly better on the closed skill task than the control group. No significant group difference was found on the open skill tasks. These results suggest that closed skill tasks might be more influenced by imagery interventions than open skill tasks. Based on this conclusion, it can be assumed that the golf swing, because it is a closed skill, could be positively influenced by an imagery intervention.

Many elite golfers have testified to the effectiveness of imagery. One of the greatest golfers to play the game, Jack Nicklaus, said this about his use of imagery, "I never hit a shot, not even in practice, without having a very sharp, in-focus picture of it in my head" (1974, p. 79). Another accomplished professional golfer, Fred Couples, said that before every shot he hit he would visualize the best shot he had ever hit with the club in his hand (Rotella, 1995).

In addition to this anecdotal evidence there have been several studies investigating imagery and golf, with the majority of this research done on putting. Woolfork, Parish, and Murphy's (1985) study on positive and negative imagery set a foundation for the effect imagery can have on a simple task like the putt in golf. In their study, the positive imagery group visualized making a putt. The negative imagery group visualized narrowly missing a putt. The control group did not perform imagery; rather, they were informed the test was on repeated practice. Positive imagery participants improved 30.4% from pre to post-test and the negative imagery participants' performance decreased by 21.2% from pre to post-test. This early study demonstrates the power than imagery can have on performance, with positive imagery vastly increasing and negative imagery decreasing performance.

In another study, Ploszay, Gentner, Skinner, and Wrisberg (2006) studied imagery and putting using multisensory imagery in a physical routine. The number of successful putts and the distance from the hole of the misses were recorded. It was found that the number of putts made increased from baseline to post intervention and the distance of putts missed decreased as well. Thomas and Fogarty (1997) also found that putting performance could be enhanced using imagery training.

Research has not only shown that performance can be improved through the use of imagery, but mental obstacles resulting in poor performance can be overcome through the use of imagery as well. Bell, Skinner, and Fisher (2009) examined the effect imagery could have on reducing "the yips" in elite golfers putting. A yip is an interruption in the putting stroke by a jerk or tremor (Smith et al., 2000). Participants played at least four rounds of golf, while the researchers recorded the number of putts hit, the number of putts hit within five feet of the hole, and the presence of any yips. The intervention used Solution Focused Guided Imagery (SFGI) for which the researcher guided the participants through the process of creating vivid images of thinking, feeling, and behaving to rid themselves of the problem, in this case the "yip". Based on the post test data it was shown that after the intervention, all three participants showed no signs of "the yips".

While most studies within golf have focused on putting, a few have looked at other types of golf shots. Nicholls and Polman (2005) investigated imagery's effect on golf shot percentage. Shot percentage was measured by the amount of successful shots divided by the total number of shots taken for a golf scenario that was self-designated by each participant as their weakest shot. For example, one participant chose to evaluate

wedge shots from 60-100 yards from the hole hit to within 15 feet of the hole.

Participants then played five rounds of golf while the researcher counted the number of

times the chosen shot was hit and the number of times the chosen shot was executed well,

based on a predetermined standard. Following the imagery intervention, participants

completed four more rounds of golf while the researchers again collected data. It was

found that every golfer's shot percentage increased from the pre-intervention test to the

post-intervention test.

One of the only studies conducted on a long distance golf shot used a 55 meter

pitch shot (i.e., about a half swing). Brouziyne and Molinaro (2005) investigated how

mental imagery combined with physical practice would affect the performance of

beginner golfers on a pitch shot. The green was divided into four scoring zones, and the

scoring test consisted of each participant hitting 13 shots for which the best 10 were

scored. Participants were then assigned to one of three groups: imagery combined with

physical practice, physical practice only, or the control group. Following the

intervention, participants repeated the scoring test. The researchers found both the

imagery with physical practice and the physical practice only groups performed

significantly better than the control group in terms of the number of balls hit into the zone

closest to the target. Only the imagery with physical practice group performed

significantly better than the control group in terms of balls not hit into the zone furthest

from the target. These findings suggest that imagery could be impactful for eliminating

poor shots more so than improving shots close to the hole.

The previous literature has incorporated various types of imagery; however, the

framework that guided the present study was the PETTLEP model of imagery (Holmes &

Collins, 2001). PETTLEP is an acronym for what Holmes and Collins suggest are the seven core elements to include in an imagery intervention: physical, environment, task, timing, learning, emotion, and perspective. The principle of functional equivalence, which states that the same neurophysiological processes are used during imagery and physical movement, is the concept from which the PETTLEP model is based. This principle is closely followed in the PETTLEP model to attempt to make imagery use as realistic as possible to maximize its effect.

The physical element of the model refers to the physical responses within the sport context. Therefore, this model dictates that a golfer should be holding a golf club while completing the imagery session. The environment element states that the imager should be in the same environment during the imagery use as they would be during the actual completion of the task. Using imagery in a lab with a golfer would not maximize the imagery use under this proposed model. The task element is individual to each person as it focuses on the imaged task and the actual task being as closely matched as possible. In order for this to be possible, each person using imagery will focus on the specific elements of their own golf swing. The timing component consists of the imagery used with the precise timing of the movements. In this case, the golf swing should be imaged in full speed as it would look during a normal golf swing. Another important aspect to the model is adapting the imagery use to the rate of learning that takes place during the intervention. As the participants progress through the study they will learn more about imagery and their golf swing, and it is important that the imagery use is adapted to accommodate for this effect. Emotion has been referred to as "the missing link" in sports performance (Botterill, 1997). All of the emotions that the imager feels

during competition should be included in the imaging process. The final element of the model is perspective. This refers to the perspective that the imager sees the imaged scenario, whether it be a first person view (internal) or a third person view (external).

Research supports the idea that PETTLEP imagery is more effective than "traditional" forms of imagery. Smith, Wright, Allsopp, and Westhead (2007) investigated several aspects of the PETTLEP model through a series of two studies. The first study explored different aspects of PETTLEP compared to traditional imagery on a field hockey penalty flick. It was found that the group using two aspects, physical and environmental, of PETTLEP scored highest followed by the group using one aspect of PETTLEP. Traditional imagery scored third, lower than the PETTLEP groups, but higher than the control. The second study looked at the PETTLEP model as a whole compared to traditional imagery on a gymnastics balance beam task. This study found that the physical practice and the PETTLEP imagery groups improved significantly from pre to post test. The traditional imagery group and the control group did not improve significantly.

The PETTLEP imagery model has also been suggested to be equally effective as physical practice. Wright and Smith (2007) found the PETTLEP imagery group and the physical practice group improved performance significantly from pre to post test of a driving video game protocol, while the traditional imagery and control group did not. On the other hand, there was no significant difference in the magnitude of improvement between the physical practice group and the PETTLEP imagery group. Also, Wright and Smith (2009) found similar results when the same experimental design was applied to strength performance. The PETTLEP imagery group, physical practice group, and the

combination of the two improved strength, while the traditional imagery and control groups did not. Again, no differences were found between the PETTLEP and physical practice groups.

PETTLEP imagery has also been studied within the game of golf. Smith, Wright, and Cantrell (2008) investigated the effect of PETTLEP imagery on golf bunker shot performance. All groups (i.e., imagery, imagery with physical practice, physical practice and control) improved significantly from pre to post-test, while the imagery plus physical practice group improved significantly more than the imagery group, the physical practice group and the control group.

Despite the abundance of research on imagery, there seem to be several gaps in the literature. First, there is little to no research investigating the effect of imagery on a full swing golf shot. Secondly, there is no literature on the best time to use imagery during a pre shot routine. Both of these gaps in the literature led to the co-purposes of the present study. The first purpose was to investigate the effect a multisensory imagery (i.e., PETTLEP) intervention has on full swing golf shot accuracy. The second purpose was to investigate the appropriate time to use imagery during a pre-shot routine for the full swing golf shot.

It was hypothesized that the use of imagery would enhance performance by increasing the total score on an accuracy test and the number of balls hit into the area closest to the hole, and by decreasing the number of balls hit into the furthest area from the hole. Additionally, it is hypothesized that using imagery after a physical routine will enhance performance more than using no imagery or using imagery before the physical routine.

The imagery after routine group is hypothesized to perform better than the imagery before routine group because of the recency effect in our working memory. The recency effect is the natural tendency of the brain to recall information that is most recently presented (Baddeley, 1999). Most commonly this research has participants recall lists of words, and the words on the end of the list are recall more often that the ones at the beginning or the end. In this study, it hypothesized that this effect will cause participants using imagery after their physical pre-shot routine to have a more powerful image, causing performance to increase more so than the imagery before group.

CHAPTER 2

METHODS

Participants

Participants were nine undergraduate students from a southeastern university. Advertising was done in the University's physical activity classes as well as local golf courses. Participants were between 18 and 22 years old, with an average age of 19.3 years. All participants had an average self-reported golf score between 90 and 73, with an overall average score of 82.1. It was necessary for data collection that the participants consistently hit the ball within the accuracy grid in order have viable data. Therefore, the cutoff was determined at 90 after consulting a panel of expert golf instructors. Participants who did not have a pre shot routine or who used imagery as a part of their pre shot routine were excluded from the study. To gather this screening information, interviews were conducted during participant selection in which the researcher asked each participant to describe what they do before hitting a golf shot.

Experimental Design

An ABA (baseline, intervention, retention) single subject design (SSD) was used in the present study. This type of design is capable of showing changes in the individual's performance rather than group changes, and has proven to be useful in applied sport psychology research (Shambrook & Bull, 1996). Participants were tested in a baseline phase (minimum of three sessions) until data was stabilized. Baseline data was considered stable when 10% or less variation in performance occurs for a single subject (Kearns & Crossman, 1992). Barlow and Hersen (1984) recommend a minimum of three

data points for a baseline, therefore baseline data was checked for stability after the third session (week one). Following baseline, the intervention phase began and lasted between seven and nine sessions over the course of three weeks. Immediately following the intervention phase, data were again measured three times over the course of one week, with the treatment removed to test retention of the intervention.

Instrumentation

Imagery Script. The imagery script (see Appendix D) that was used as a part of this intervention was developed based on the PETTLEP model. Each participant was present at the same place on the driving range where testing was conducted for the imagery session with the proper club in hand (physical and environment). Participants imaged their golf swing exactly as it naturally occurs (task). In order to increase the participant's awareness of what they go through in their swing the researcher used response training. In the response training each participant was given a notebook to write down as much as they could about how their golf swing looked and felt as they made the full swing necessary for the 120 yard shot used in testing. This exercise was designed to increase both the participants' visual and kinesthetic awareness of their full swing used in testing. The participants were instructed to image their golf swing and ball flight in real time and from either an internal or external perspective (timing and perspective). It was encouraged to all participants that as their awareness of their golf swing increased and their comfort with imagery increased that they could adapt their script in their notebook (learning). Finally, any emotions that the athletes mentioned during the response training or interviews were added as a part of the script for each participant (emotion).

Accuracy Grid. To measure the accuracy of the shots hit, an accuracy grid was constructed (see figure 1). Shivetts, Joyner, Czech, and Zwald (2007) used a similar method for measuring driving accuracy. The grid used in this study was adapted from Brouziyne and Molinaro's (2005) investigation of imagery use on a 55 meter shot. The grid was divided into five areas. A1 measured 10 feet and closer and was worth five points. A2 measured from 10 to 20 feet and was worth 4 points. A3 measured from 20 to 30 feet and was worth 3 points. A4 was from 30 to 40 feet and was worth 2 points. Anything hit outside of 40 feet was deemed to be in A5 and worth 1 point. Instruments used to construct the grid were a Bushnell Laser device to measure the yardage to the target, and a basic tape measure used to measure the grids on the target green.

Procedures

Once the participants were selected they were randomly assigned to one of the three conditions: imagery before routine, imagery after routine, or the no imagery condition.

At the testing site the researcher reviewed the accuracy test describing how the grid was set up and how the scoring system works (outlined in the instrumentation section). It was explained that where the ball first lands is what would be counted for data collection. For example, if a ball landed in A1 and then rolled to A3 and stopped, the ball was counted as A1. Participants' baseline data was then collected during week one. The format for data collection was as follows: 20 shots taken from 120 yards from the hole, with all shots were charted by the researcher, and only the best 15 shots being counted toward the study results.
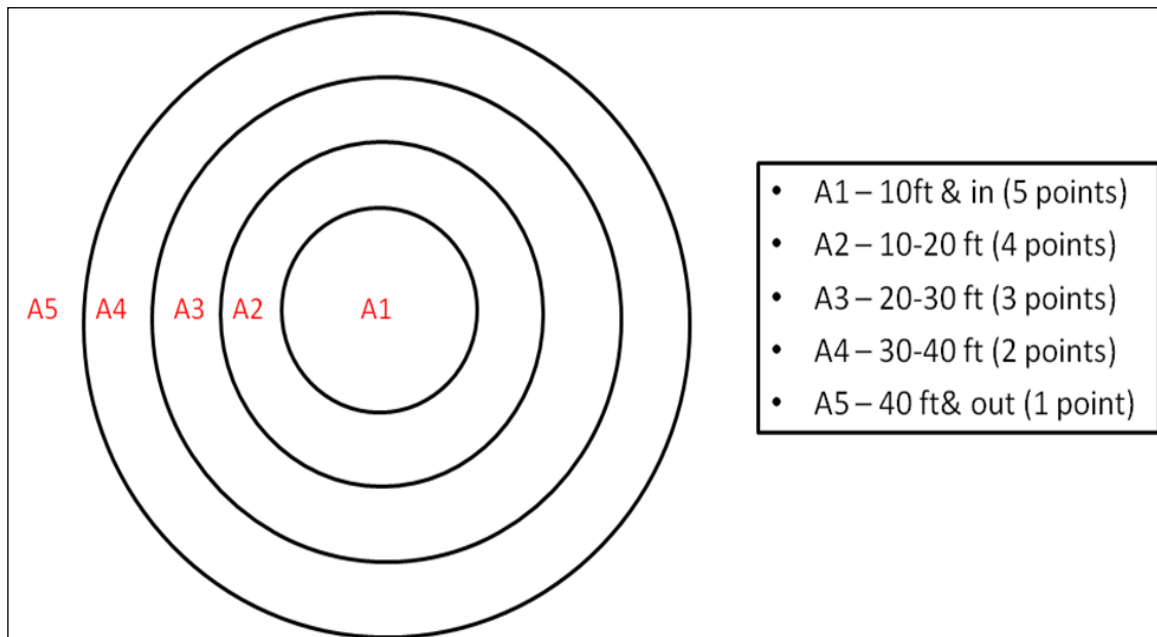
Figure 1. Accuracy Grid with Areas Defined

Once the participants' baseline data was shown to be stable, the intervention stage began. During the intervention phase, participants had an introduction session followed by nine data collection sessions over the course of three weeks. Three meetings per week have been suggested to be the most effective implementation of PETTLEP imagery (Wakefield & Smith, 2009). Also, the time of this intervention was short; however, similar timeframes have been used successfully in past research (Brouziyne & Molinaro, 2005; Nelson et al., 2008; Ploszay et al., 2006; Shivetts et al., 2007; Woolfork et al., 1985).

During the first introduction meeting the participants using imagery (imagery before routine and imagery after routine conditions) were given a basic introduction to imagery and its use. They were then guided through the imagery script and any questions about the script were answered. Following the meeting the participants were given time

on the range to use the imagery as a part of their pre shot routine condition. The

researcher was present to answer any questions the participants had. Before leaving the

first session, the participants were given a written imagery script. It has been suggested

in previous research that audio and video scripts can enhance performance more so than a

written script (Smith & Holmes, 2004). For the purposes of this study those types of

scripts were not practical for use on the golf course. Participants were instructed to go

over the script for at least 20 minutes per day outside the meetings.

Following the introduction session, the rest of the sessions in the intervention

phase consisted of data collection. All sessions started with the participants reviewing

the imagery routine. During week one (meetings one, two, and three) the researcher

reviewed the script several times with each participant, ensuring that they understood the

imagery process. During the second week, (meetings four, five, and six) the researcher

reviewed the script once with each participant then the rest of the time the participants

had to practice using imagery without the script. During week three, (meetings seven,

eight, and nine) the participants were given the entire session to review the imagery

individually. Following the review and prior to data collection the participants were

given a 15 minute warm up session on the range.

During the time of the intervention, control participants met for the same amount

of time as the imagery participants. During the introduction session the control group

was given a golf article about pre shot routines that included nothing on the use of

imagery. Following the meeting control participants were allowed to practice on the

range for the same amount of time that the intervention group was given. Upon leaving

the first meeting they were given a written copy of the article. They were asked to review

the article for 20 minutes per day. The remainder of the sessions following the introduction meeting consisted of data collection as well. During week one of the intervention (meetings one, two, and three) the researcher reviewed the pre shot routine article. During week two of the intervention (meetings four, five, and six) the researcher reviewed the article once and allowed the participants the rest of the time to review the article individually. During week three (meetings seven, eight, and nine) the control participants were given the entire session to review the article individually. Following the review and prior to data collection, control participants were allowed a 15 minute warm up session on the range.

The post-test was administered the week following the intervention phase of the study. The same format as baseline collection was used. Each participant had 20 shots from 120 yards from the pin. Each shot was charted, and the best 15 were counted towards data collection. The post-test was conducted three times over the course of seven days.

Data Analysis

For each participant, the dependent variables were graphed and analyzed individually using ocular statistics. This method is suggested as appropriate for single subject designs (Hrycaiko & Martin, 1996). Hrycaiko and Martin suggest effects may be present the sooner the effect occurs following the start of the treatment, the fewer overlapping data points between baseline and treatment, the larger the effect when compared to baseline, and a large number of effects across participants.

CHAPTER 3

RESULTS

The purpose of this study was to investigate the impact of PETTLEP imagery on full swing golf shots. An additional purpose was to determine if imagery is more effective when used before or after a pre shot routine. A single subjects design was used in this study. This type of design uses visual analysis of graphed data and mean comparisons for data analysis. Each participant was coded using their group name and then a number (i.e. C1 meaning control participant 1, IA1 meaning imagery after participant 1, IB1 meaning imagery before participant 1). Sessions in graphs are noted with a letter representing the type of session (i.e. B for baseline, I for intervention, R for retention) and then the number of the session.

The following tables summarize the results found in this study. The tables include the following : the participant's means from baseline (B), intervention (I), and retention (R), the participant's average 18 hole golf score (avg. score), the session that the initial effect was seen (initial effect), the number of overlapping data points (see definitions), and the percent change from baseline to intervention (% change). The conclusion portion is determining if a meaningful change occurred for that participant (y/n). In order for a meaningful change to be determined the participant had to have two of the following three: an initial effect in session I3 or sooner, 4 or fewer overlapping data points, or a 25% change or larger from baseline to intervention.

Table 1

All participants' total score summary

	B Mean	I Mean	R Mean	Avg. Score	Initial Effect	# of overlaps (under/even)	% change	Conclusion
C1	27	25.4	23.3	90	none	8	-6	N
C2	40.7	32.9	44.3	87	none	all	-19	N
IA1	53.3	61.1	55	73	I1	1	15	Y
IA2	24.7	35.4	30.0	90	I1	0	43	Y
IA3	40.7	45	51.7	75	I6	3/1	11	N
IB1	49.0	54.7	56.3	75	none	5	12	N
IB2	52.0	55.0	50.0	76	none	7	6	N
IB3	45.7	49.5	46.7	88	none	3	8	N
IB4	32.7	40.3	46.7	85	I2	1	23	Y

Table 2

All participants' balls hit in A1 summary

	B Mean	I Mean	R Mean	Avg. Score	Initial Effect	# of overlaps (under/even)	% change	Conclusion
C1	0.3	0.6	0.3	90	None	6/2	100	N
C2	1.3	0.3	1.3	87	none	all	-77	N
IA1	2.3	4.1	1.3	73	I1	1/2	78	Y
IA2	0.3	0.5	0	90	none	4/4	66	N
IA3	1.0	2.0	3.3	75	I6	5	100	N
IB1	2.5	3.1	2.7	75	None	4/2	25	N
IB2	1.7	3.0	1.3	76	None	5	76	N
IB3	1.0	1.8	1.0	88	I2	2	80	Y
IB4	0	0.6	1.0	85	I2	3	60	Y

Table 3

All participants' balls hit in A5 summary

	B Mean	I Mean	R Mean	Avg. Score	Initial Effect	# of overlaps (under/even)	% change	Conclusion
C1	10.0	9.0	10.7	90	none	8	-10	N
C2	3.0	4.8	1.7	87	none	all	60	N
IA1	0	0	0	73	None	0	0	n/a
IA2	9.7	4.1	6.0	90	I1	0	-58	Y
IA3	2.7	1.8	0	75	I6	4	-33	Y
IB1	1.5	0	0	75	I1	0	-150	Y
IB2	0	0	0	76	None	0	0	n/a
IB3	2.0	0	1.0	88	I1	0	-200	Y
IB4	4.7	1.8	0.3	85	I2	1	-62	Y

Control Group

Through visual analysis of the data (see Figure 2) participant C1's total score displayed some fluctuation between sessions, but overall appeared to show a small decrease in performance throughout the study. With the exception of session I4, where his score spiked dramatically, his scores throughout the intervention sessions were slightly lower than his baseline scores. When comparing means, the intervention phase (M=25.4) saw a small decrease in total score from baseline (27.0), and retention

(M=23.3) saw a small decrease from intervention. While these changes are relatively

small they do show that his scores decreased throughout the study.

Participant C2 showed interesting fluctuations in total score as seen in Figure 3.

His total score decreased from baseline (M=40.7) to intervention (M=32.9), but then rose

again in the retention phase (M=44.3). Initially, his intervention scores were similar to

his lowest baseline scores; however, starting in I4 his scores began to decrease and

bottomed out during the last three sessions of the intervention. Interestingly, his scores

immediately rose to baseline levels during the retention phase and eventually surpassed

his baseline scores.

When looking at both control participants, overall scores seemed to decrease

throughout the intervention portion of the study. C1 decreased in total score by one and a

half points during the intervention while C2 decreased by eight points. Retention scores

were inconsistent between the two participants with one continuing to decrease and one

increasing beyond baseline levels.

When looking data regarding the number of balls hit into A1 (see Figure 4),

participant C1 showed consistent mean scores throughout all three phases. His

intervention score was influenced by a spike in session I4. However, after session I4 he

returned to hitting 0 or 1 balls into A1. Furthermore, if session I4 was removed, his

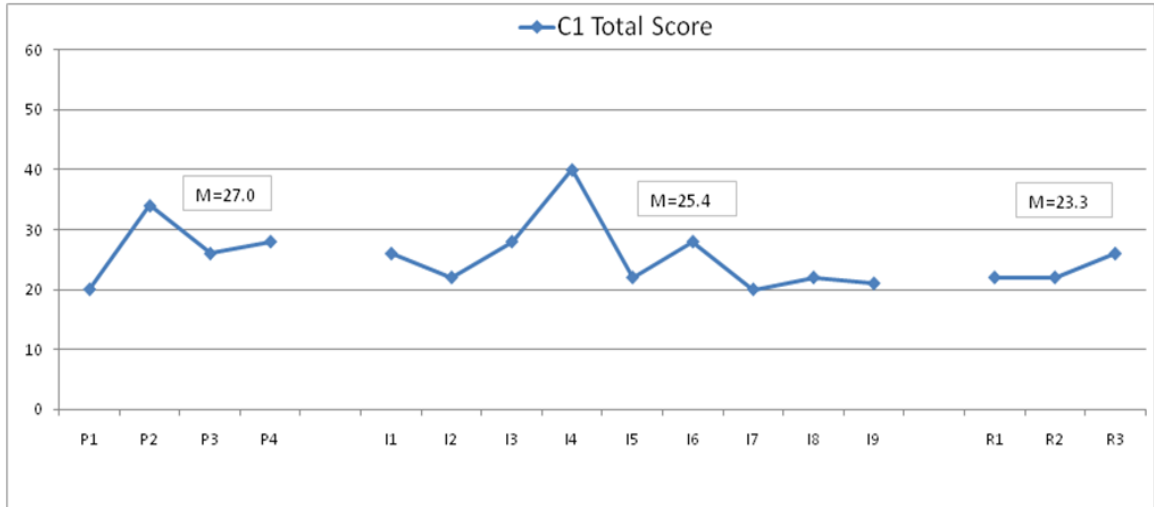intervention mean falls to 0.25, which is very similar to the baseline and retention means.

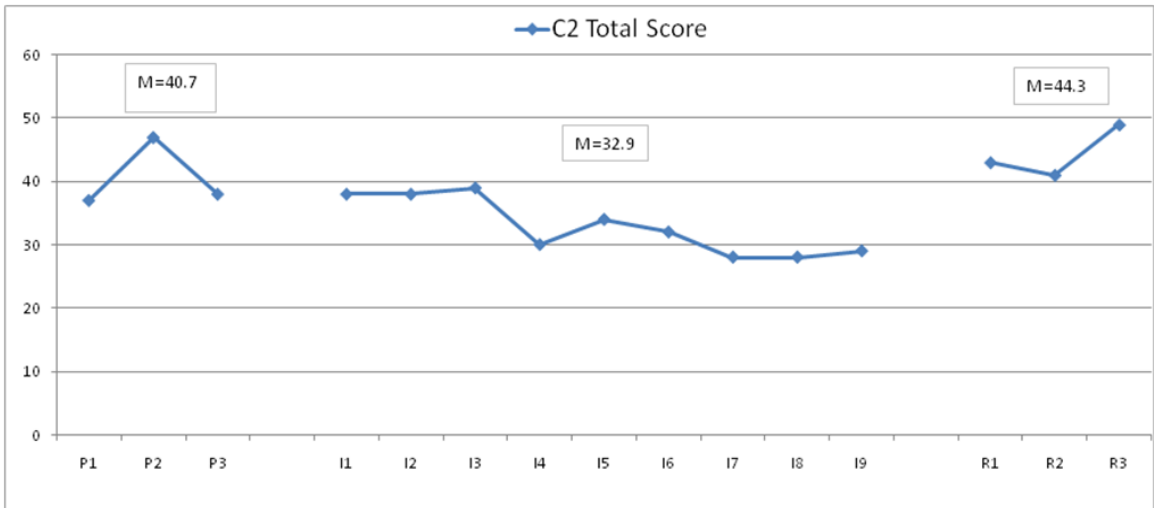*Figure 2*. Participant C1 Total Score

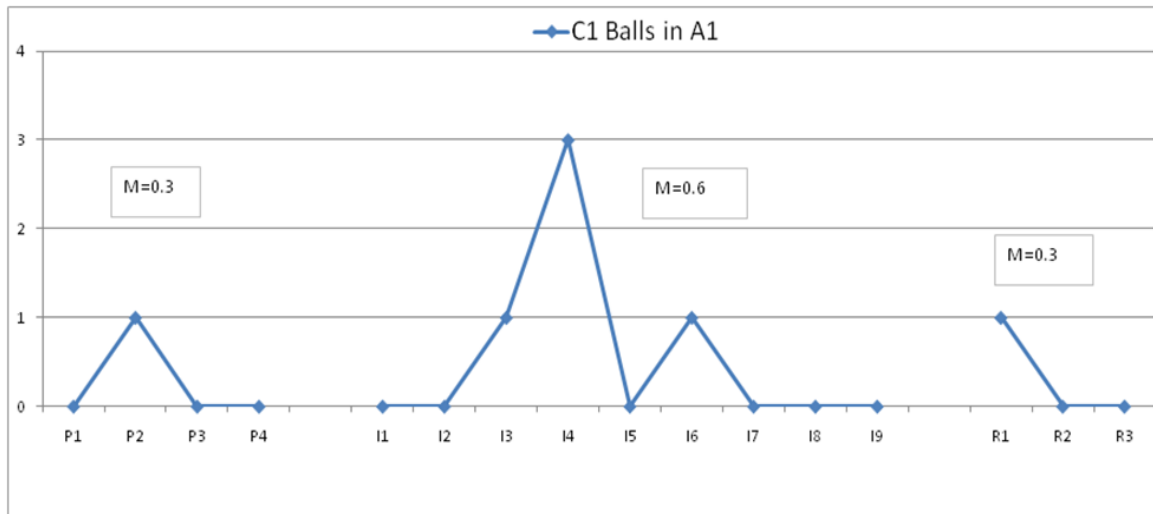*Figure 3*. Participant C2 Total Score

Figure 4. Participant C1 Balls Hit in A1

Participant C2, in Figure 5, saw a minor decrease in balls hit into A1 during the intervention portion of the study. The data seems to have some fluctuation throughout baseline, intervention, and retention. Retention scores show a steady increase throughout the three sessions. Looking at the mean scores, they were exactly the same for the baseline and retention stages, with a decrease during the intervention.

Overall, both participants' number of balls hit in A1 fluctuated throughout all three phases. Across participants there were inconsistent results with one participant increasing and the other decreasing during intervention. Also retention scores were inconsistent with one decreasing and the other steadily increasing. No consistent changes were seen within the control group.
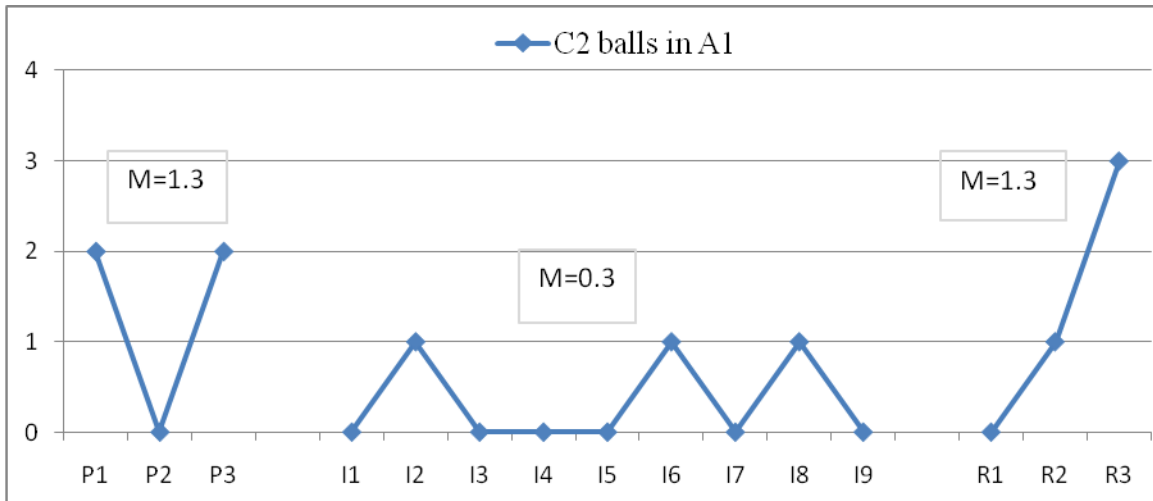
Figure 5. Participant C2 Balls Hit in A1

Looking at Figure 6 for balls in A5, participant C1 showed fluctuations between sessions throughout the entire study. However, despite these fluctuations the overall means for each stage (baseline, intervention, and retention) were very similar. The session with the most drastic changes was I4, which saw a drastic decrease in balls hit into A5, which was similar to the spike shown in balls in A1 and total score for the same session. Without this session the average score would be 9.5, bringing it much closer to the means of both baseline and retention. Overall, despite the changes between sessions, mean scores did stay fairly consistent.

Participant C2 showed an increase in balls hit into A5 from baseline (M=3) to intervention (M=4.8) in Figure 7. This increase started in session I4 and continued throughout the course of the intervention peaking in session I7. However, during the retention test balls in A5 decreased (M=1.7) compared to the baseline and intervention.

Overall, the control group saw large fluctuations in the data in terms of balls hit into A5. There were no consistent trends within the group.
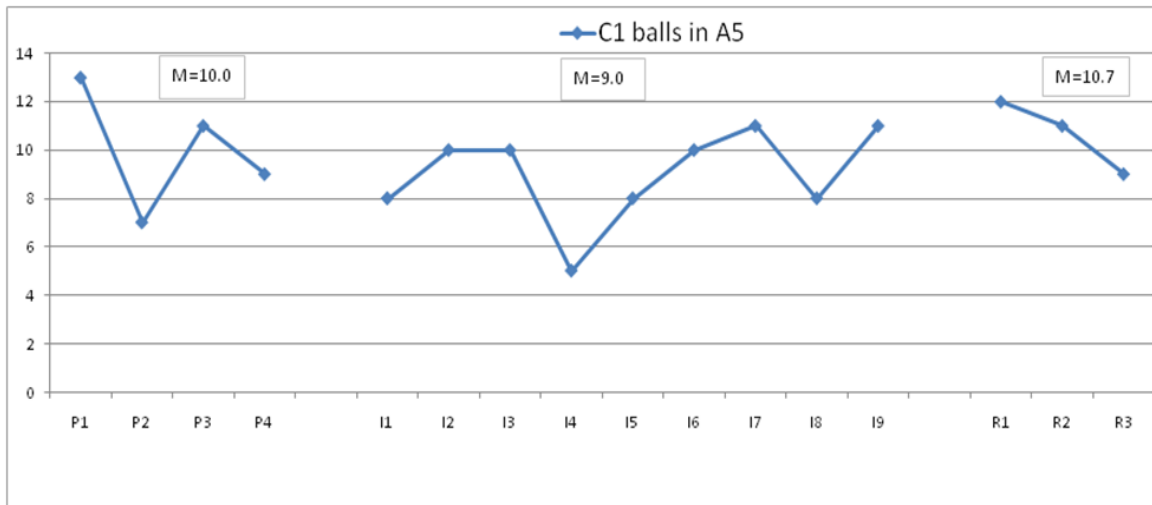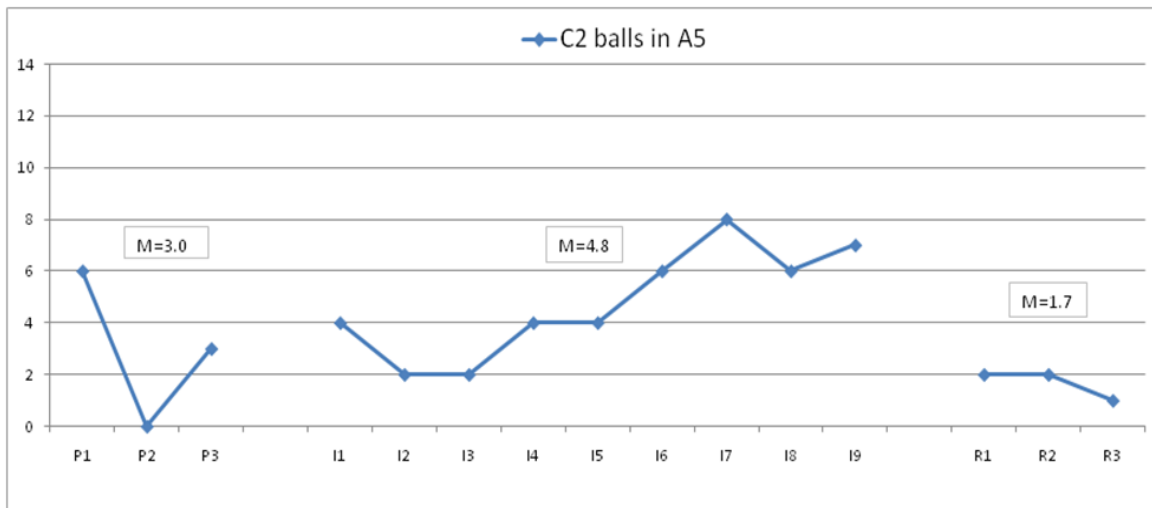
Figure 6. Participant C1 Balls Hit in A5

Figure 7. Participant C2 Balls Hit in A5

Imagery After Group

Related to total score (see Figure 8) participant IA1's performance increased from

baseline to intervention. When looking at the means, there was an increase from baseline

(M=53.3) to intervention (M=61.1). More specifically, only one session, I5, had a score

lower than the highest baseline score. During the retention phase performance regressed

towards baseline. Mean comparison supports this visual trend with baseline (M=53.3) and retention (M=55) means being similar. It was determined that IA1 had a meaningful change from baseline to intervention.

Participant IA2 also showed improvement from baseline to intervention in total score (see Figure 9). In fact, all data points during the intervention were higher than those in the baseline phase. Similar to IA1, mean comparison of IA2's data shows an increase between baseline (M=24.7) and intervention (M=35.4). It was determined that IA2 had a meaningful change from baseline to intervention. Similar to IA1, IA2's performance also dropped off during the retention test (M=30); however, his performance did remain higher than baseline levels (M=24.7).

In Figure 10, participant IA3 showed an increase in total score from baseline (M=40.7) to intervention (M=45). However, it appears that the greatest effect happened from sessions I6 to I9. During the final four intervention sessions all scores were above those in the baseline. Although it was determined that there was no meaningful change for IA3, a late effect may have been present. Overall, the retention average (M=51.7) was higher than both intervention and baseline.
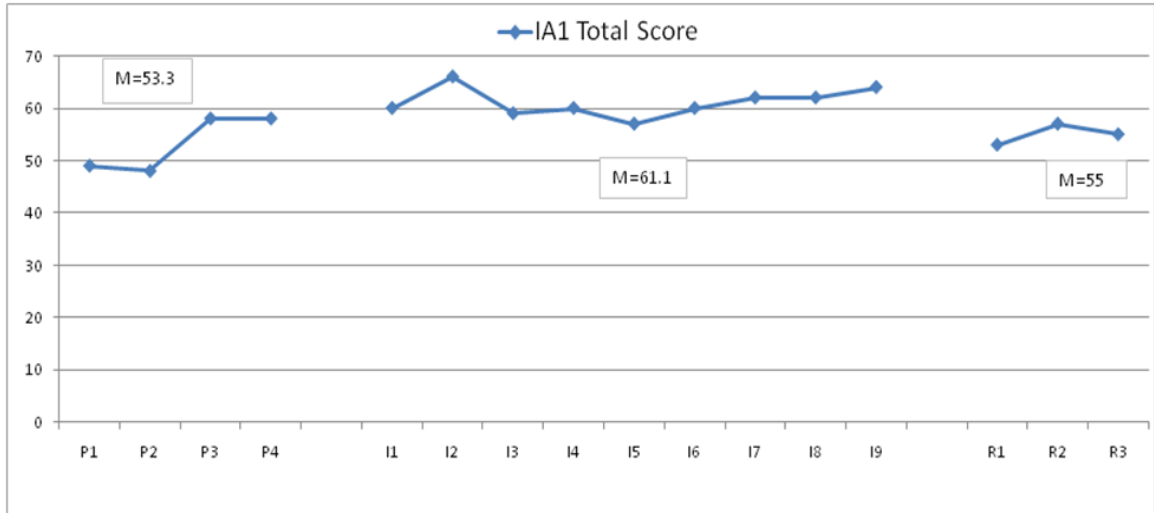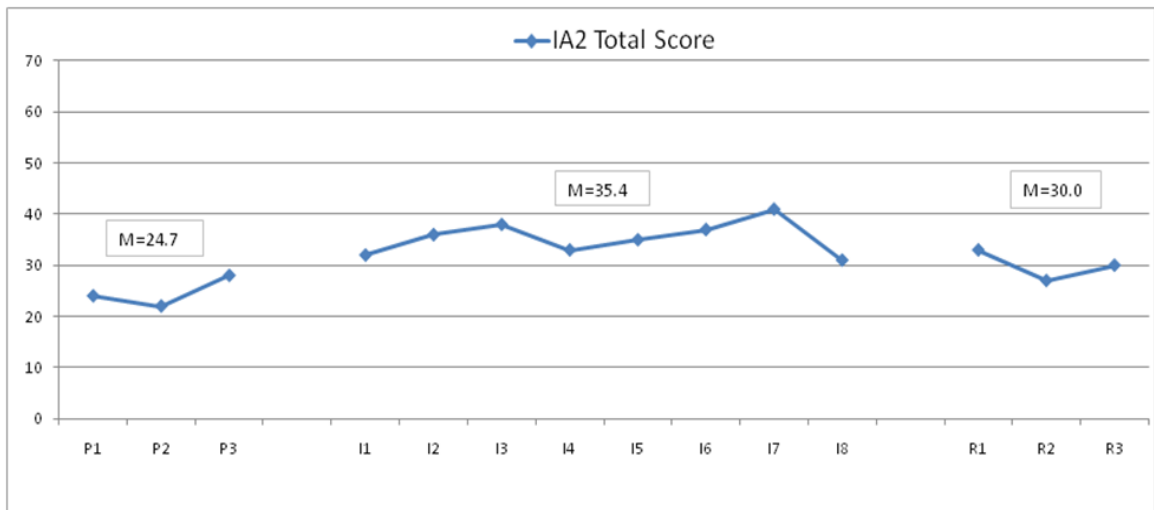
Figure 8. Participant IA1 Total Score

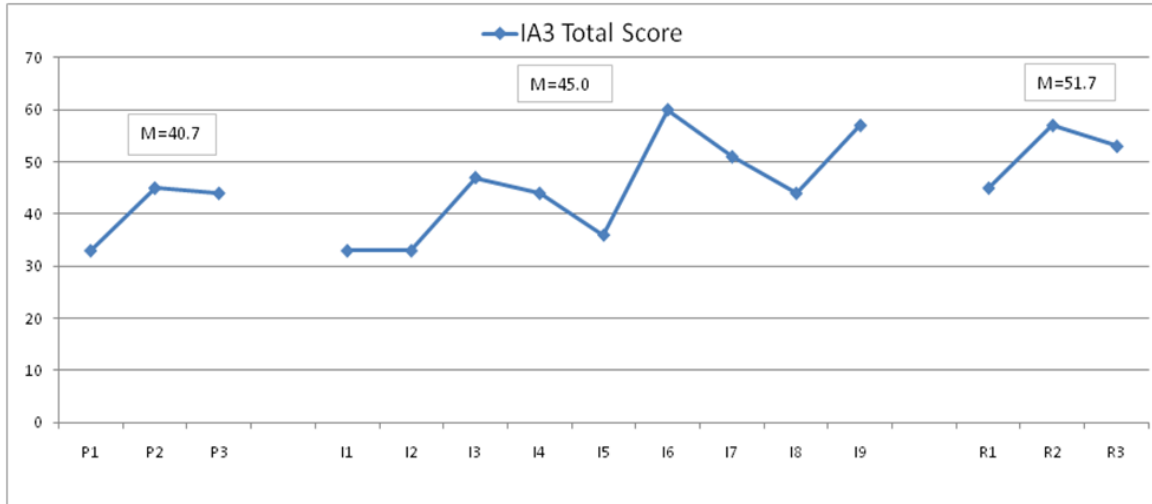*Figure 9*. Participant IA2 Total Score

Figure 10. Participant IA3 Total Score

Overall, the three imagery after participants showed an increase in total score from baseline to intervention. Two out of three participants showed a drop off from intervention to retention while one participant showed an increase from intervention to retention. Participants IA1 and IA2 both showed fairly consistent scores throughout the course of the intervention. Participant IA3 showed more fluctuation; however, the final four intervention and retention scores were more consistent.

Participant IA1 showed an improvement in balls hit into A1 from baseline (M=2.3) to intervention (M=4.1) (see Figure 11). In fact, with the exception of session I5, the number of balls hit into A1 was equal to or better than his highest score in the baseline phase. If I5 was excluded his mean for the intervention phase would increase to 4.5. It was determined that IA1 had a meaningful change for balls hit in A1. Interestingly, his retention scores (M=1.3) decreased largely to a level below his baseline scores.
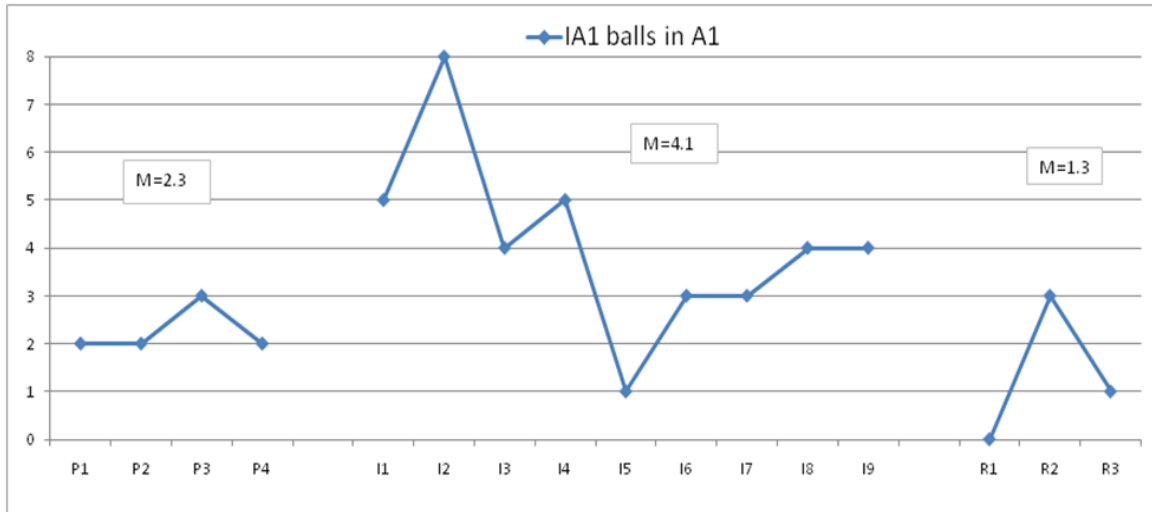
Figure 11. Participant IA1 Balls Hit in A1

Figure 12 shows that participant IA2 had consistent scores throughout testing for balls hit into A1. Mean comparison shows all three phases, baseline (0.3), intervention (0.5), and retention (0.0), were very similar. This participant did not hit more than one ball into A1 in any session.

Participant IA3 saw consistent scores from baseline (M=1.0) through the first five sessions of the intervention as seen in Figure 13. Scores then increased during the last four intervention sessions and stayed consistently high throughout the retention testing. In fact, his average score over the last four intervention sessions was 3.5. Overall, when looking at the means, scores did improve in the intervention (M=2) and retention (M=3.3) phases, which does point to a treatment effect.

Figure 12. Participant IA2 Balls Hit in A1
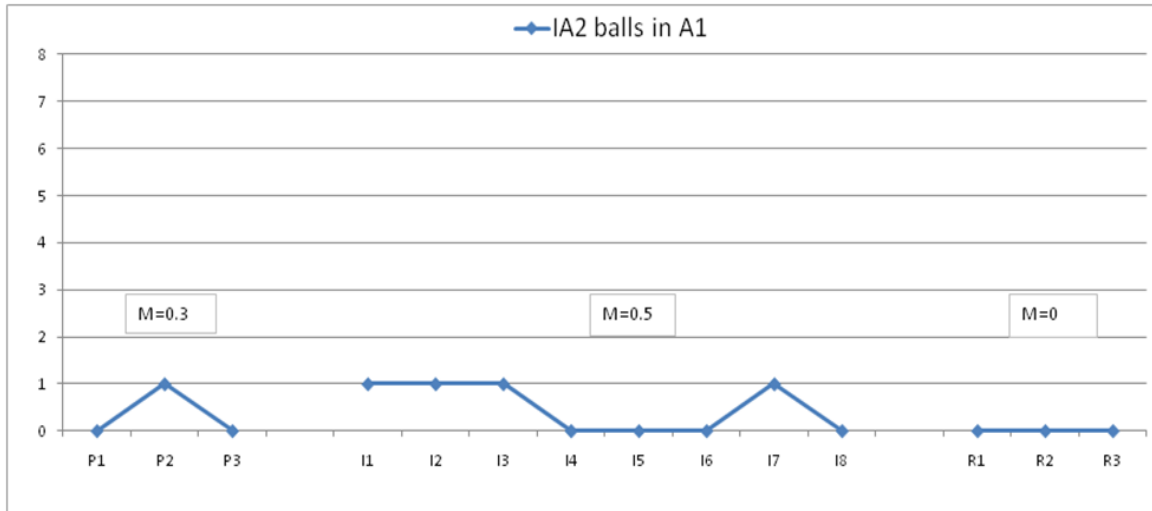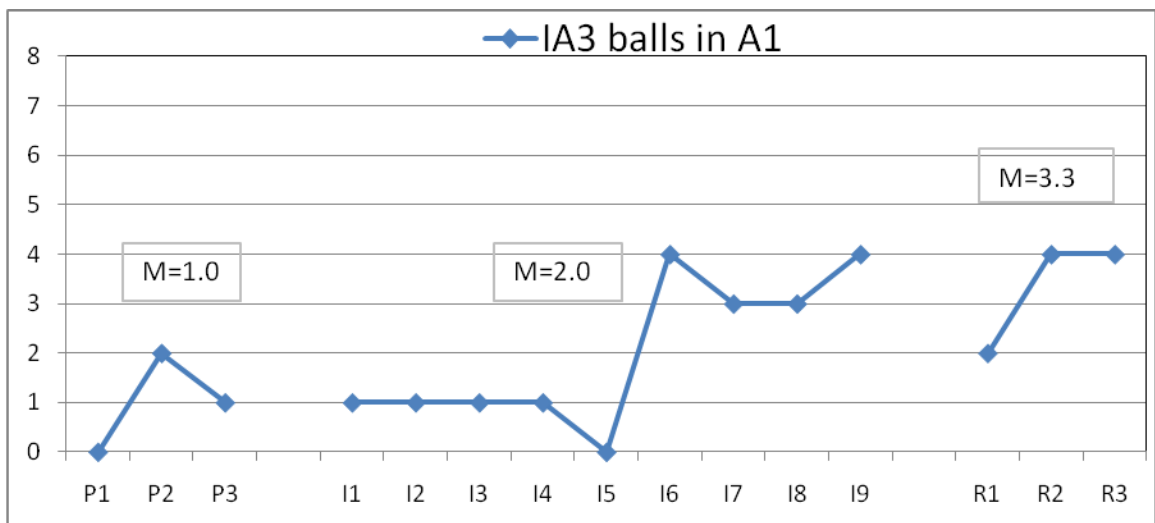

Figure 13. Participant IA3 Balls Hit in A1

Overall, there were some increases in balls hit into A1 across the imagery after participants. Two out of the three participants saw their means double from baseline to intervention: however, only IA1 was determined to have a meaningful change. The retention phase saw discrepancies across participants. IA1 decreased in balls in A1 to

levels lower than baseline, IA2 stayed consistent throughout the three phases when comparing means, and IA3 saw an increase from intervention to retention.

Participant IA1 did not hit any balls into A5 throughout the course of the study as shown in Figure 14.

Participant IA2 (see Figure 15) shows a large decrease in balls hit into A5 from baseline (M=9.7) to intervention (M=4.1). The mean decreased by five balls in A5 out of the 15 recorded shots, and it was determined that he had a meaningful change from baseline to intervention. The data shows a steady decrease throughout the intervention phase until the last session, where balls in A5 increased. During the retention test (M=6) balls in A5 increased over the intervention phase, but were still lower than baseline.

Participant IA3 showed a small decrease in balls in A5 when comparing the means of baseline (M=2.7) and intervention (M=1.8) phases as seen in Figure 16. When looking at the graphs, it can be seen that the data fluctuated early during the intervention; however, during the last four intervention sessions and the retention test only one ball total was hit into A5. This suggests a late effect for the intervention for this participant, but was still determined meaningful.

Overall, the two imagery after participants with viable data saw a decrease in balls hit into A5 throughout the testing. Although one participant saw an increase in balls hit in A5 at the end of the intervention phase, mean comparison saw a large drop from baseline to intervention. The other participant saw a consistent decrease with the exception of one session, which saw an increase in balls in A5. However, the data then continued to decrease following that spike. Both participants had meaningful changes in their data.
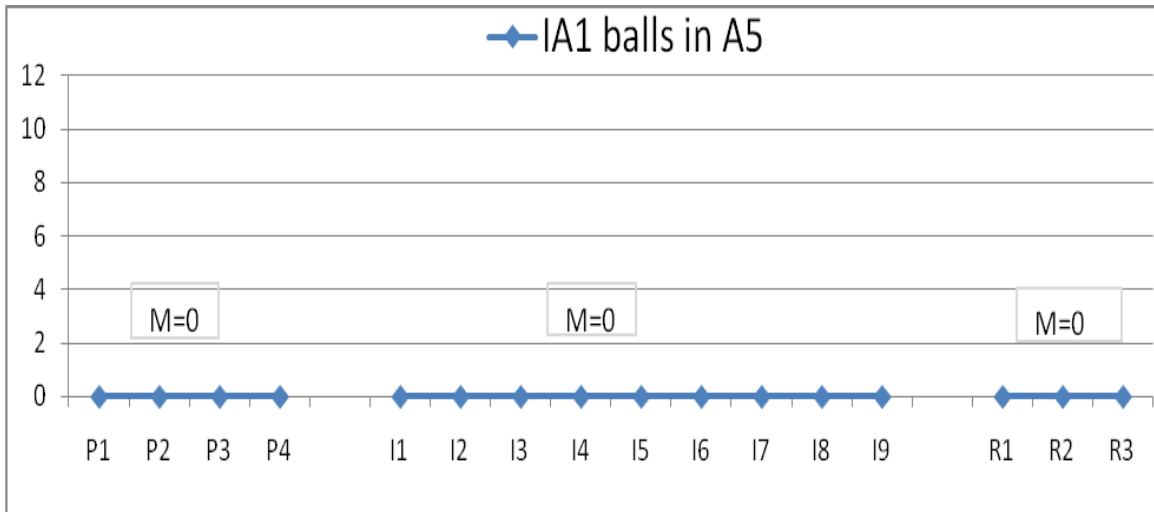
Figure 14. Participant IA1 Balls Hit in A5
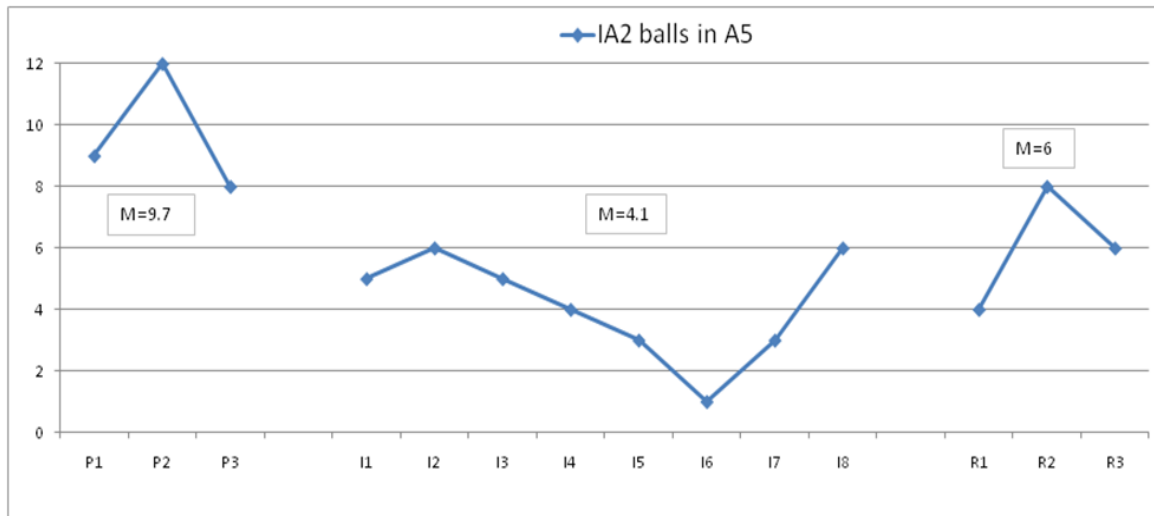
Figure 15. Participant IA2 Balls Hit in A5
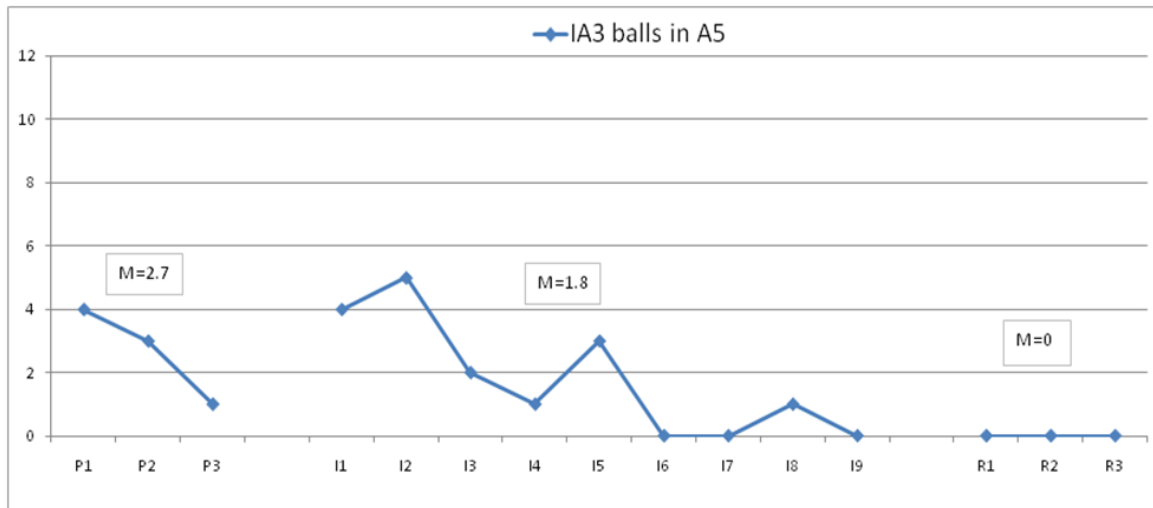
Figure 16. Participant IA3 Balls Hit in A5

Imagery Before Group

Participant IB1 showed a small increase in total score from baseline (M=49) to intervention (M=54.7) (see Figure 17). Within the intervention phase, session I2 saw a large increase in total score. All other intervention sessions are similar to baseline scores. Furthermore, if I2 was removed, the mean would be 52.5, which is much closer to the baseline. Retention scores (M= 56.3) were similar to those of the intervention. Overall, this participant showed small increase in total score throughout the study.

Participant IB2 also showed, in Figure 18, a small increase from baseline (M=52) to intervention (M=55) when comparing means. When visually inspecting the graph, the data appears to peak early in the intervention phase and then stay fairly consistent, even through the retention phase. Mean comparison shows that the retention scores (M=50) decreased slightly from the intervention and baseline phases. Although the intervention phase sees a higher mean score, an increase of three points does not seem meaningful.
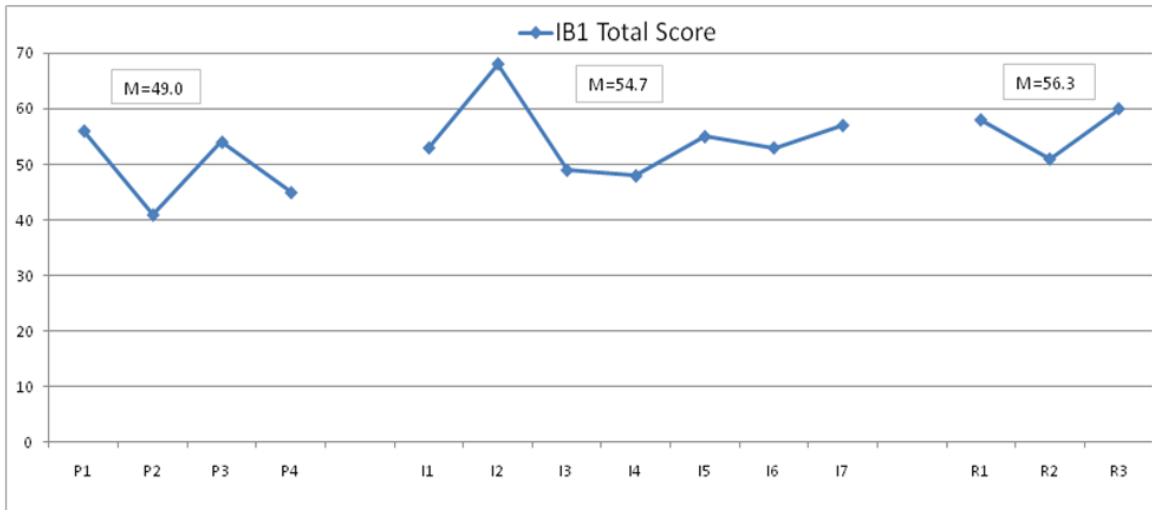
Figure 17. Participant IB1 Total Score
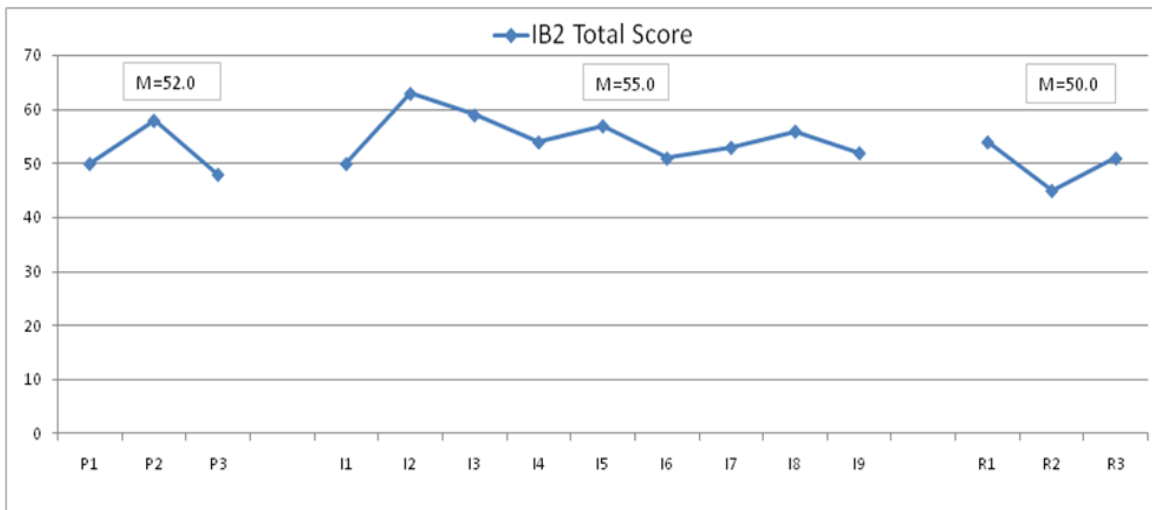
Figure 18. Participant IB2 Total Score

Participant IB3 showed, in Figure 19, very similar trends to participant IB2. There was a small increase in means from baseline (M=45.7) to intervention (M=49.5). When looking at the data it can be observed that scores peaked early in the intervention and then dipped to levels similar to baseline. This trend continued through the retention phase, which shows a mean total score of 46.7.

In Figure 20, Participant IB4 showed an increase in scores from baseline (M=32.7) to intervention (M=40.3). His scores stayed consistent with baseline through the initial intervention testing and then increased during session five. Scores then decreased, but remained higher than the early intervention scores. It was determined that IB4 had a meaningful change. The retention scores (M=46.7) were higher than baseline and intervention and show a continued increase from the intervention phase.

Overall, the participants in this group increased in total score from baseline to intervention. However, only participant IB4 showed a meaningful increase in total score. Increases in total score, for three of the four participants, seemed to be seen most during the first few sessions with total scores then decreasing back to levels close to baseline. The other participant saw the opposite, with scores similar to baseline early then an increase in total score later in the intervention phase. Retention scores seemed to vary with some increasing over intervention and some decreasing. Overall, this group showed slight increases in total score throughout the intervention stage.
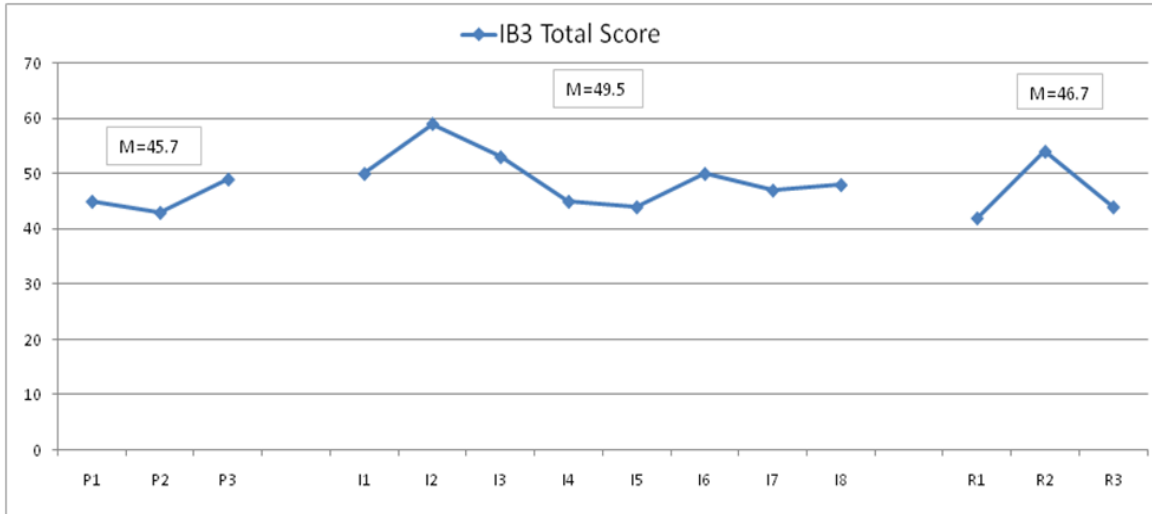
Figure 19. Participant IB3 Total Score
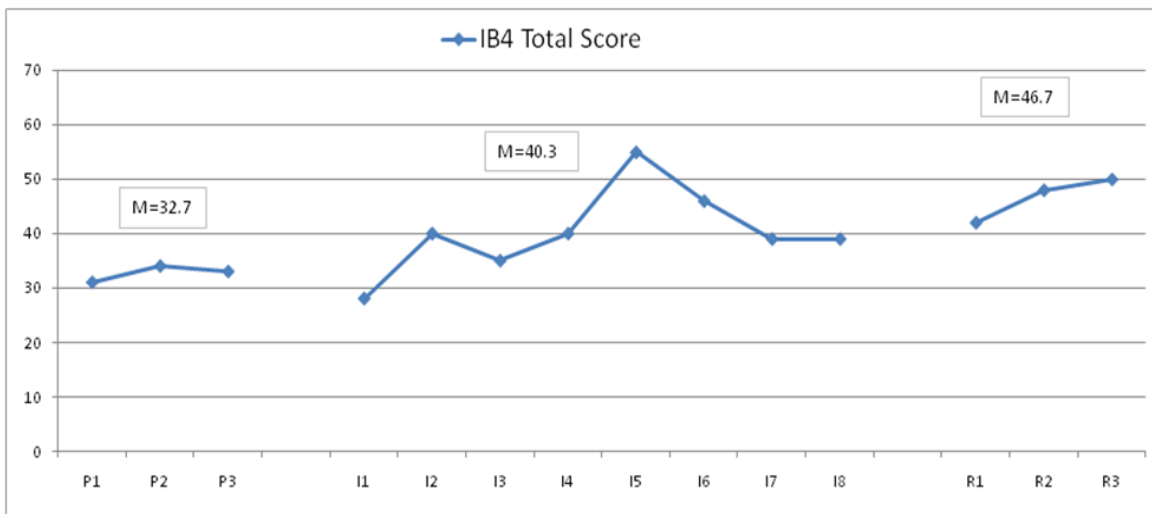
Figure 20. Participant IB4 Total Score

Participant IB1 had large fluctuations in balls hit into A1, as seen in Figure 21. Within the intervention session I2 saw an increase in balls hit into A1. When comparing the means, scores stayed fairly consistent across all three phases of the study despite the fluctuation in the graph. Baseline had a mean of 2.5, intervention had a mean of 3.1, and

retention had a mean of 2.7. Further inspection shows that with the exception of session I2 his scores stayed fairly consistent across the three phases.

Participant IB2 (see Figure 22) also showed fluctuation in the graph of balls hit in A1, although he did show an increase from baseline (M=1.7) to intervention (M=3). However, based on the definition IB2 did not have a meaningful change. In addition, his intervention scores seem to decrease over time and return to levels similar to baseline. The retention test saw a decrease in balls into A1 with the dropping below baseline (M=1.3) levels.

Participant IB3 also had some fluctuation in balls hit into A1, as seen in Figure 23. However, his mean scores show that performance increased slightly during the intervention phase. While his increases were similar to those seen with participant IB2, this participant's intervention scores appear to be more consistent. It was determined that IB2 had a meaningful change from baseline to intervention for balls hit in A1. Overall, baseline had a mean of (M=1.0), intervention had a mean of (M=1.75), and retention had an average of (M=1.0).

Participant IB4's total scores stayed consistent throughout the testing, as seen in Figure 24. Baseline had a mean of 0, intervention had a mean of 0.6, and retention had a mean of 1. However, his scores were increasing during the retention phase where they reached a peak of two balls. Furthermore, while the mean increase appears to be small, it was determined that IB4 had a meaningful change for balls hit in A1.

Figure 21. Participant IB1 Balls Hit in A1

Figure 22. Participant IB2 Balls Hit in A1
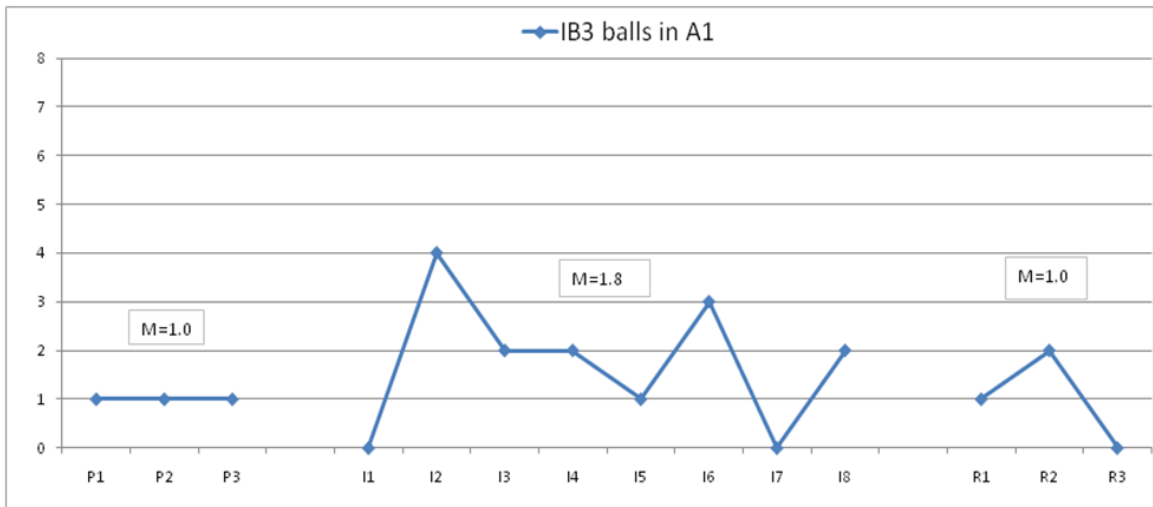
Figure 23. Participant IB3 Balls Hit in A1
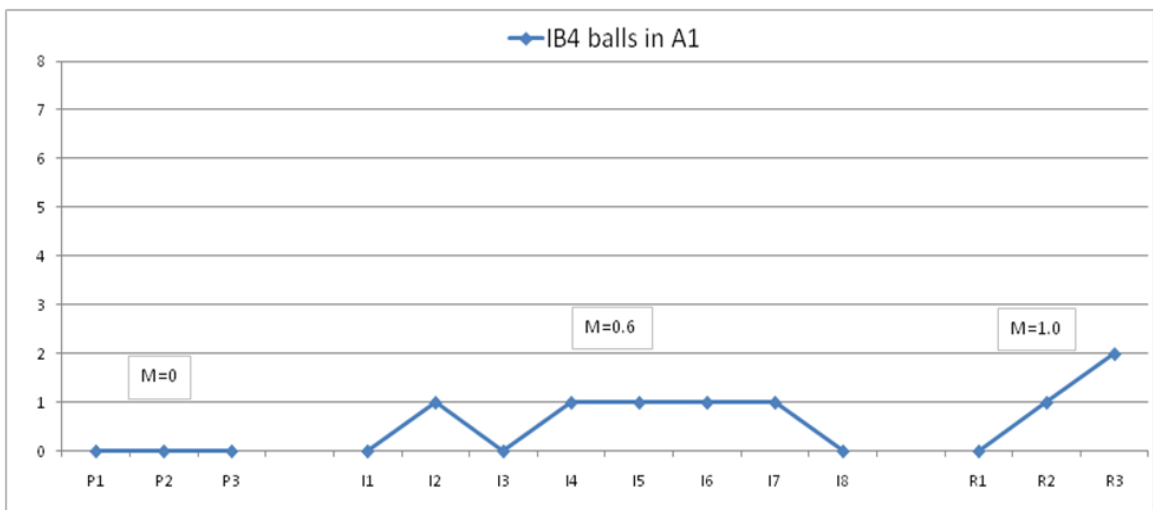
Figure 24. Participant IB4 Balls Hit in A1

Overall there was considerable fluctuation in the graphs for balls hit into A1 for the imagery before group. Despite the fluctuations, mean scores stayed consistent throughout the testing. There were two participants with meaningful changes in balls hit into A1 (i.e., IB3 and IB4).

As seen in Figure 25, participant IB1 had interesting results for balls hit into A5. During the baseline phase he showed fluctuations ranging from zero balls to four with a mean of 1.5. During the intervention and retention tests no balls were hit into A5. This, along with the other criteria, determined a meaningful change in the data.

Participant IB2 did not hit any balls into A5 throughout the course of the testing, as seen in Figure 26.

Participant IB3, in Figure 27, showed similar results to IB1. He had a mean score of 2.0 during baseline testing with some variation. He hit zero balls into A5 during the intervention testing, and aside from the first session of retention testing, he hit zero balls into A5 during retention. Again hitting no balls into A5 during the course of the intervention, along with the other criteria, is a meaningful change.

Participant IB4 stayed consistent during the baseline phase with a mean score of 4.7, as seen in Figure 28. During the first few intervention session his scores fluctuated dramatically. However, starting in session I3 balls in A5 decreased and during the last four intervention sessions only one ball was hit into A5. When comparing the means, the intervention score (M=1.8) decreased from baseline and continued to decrease in the retention testing (M=0.3), with only one ball being hit into A5. It was determined that participant IB4 had a meaningful change for balls hit in A5.
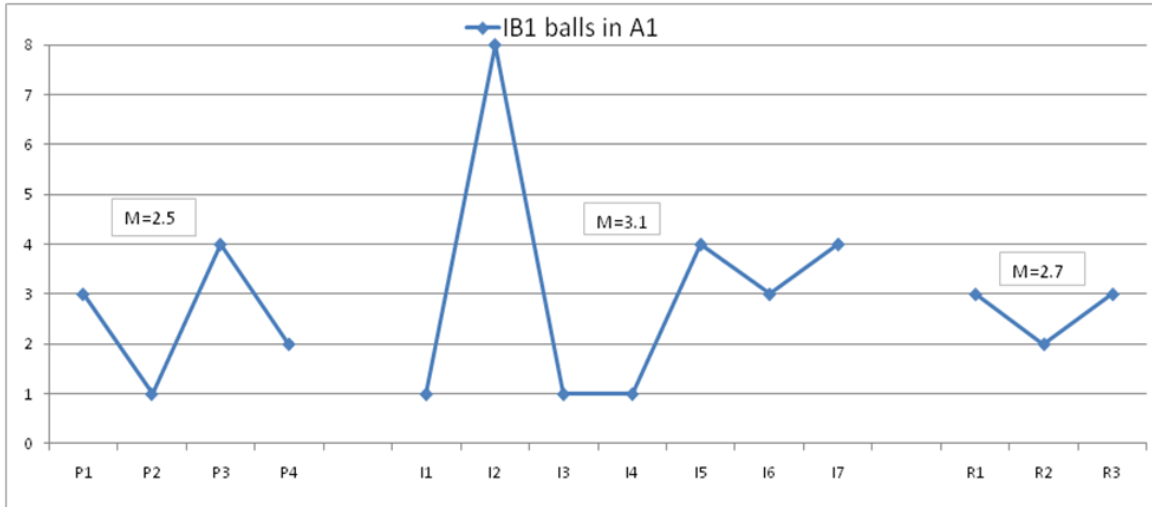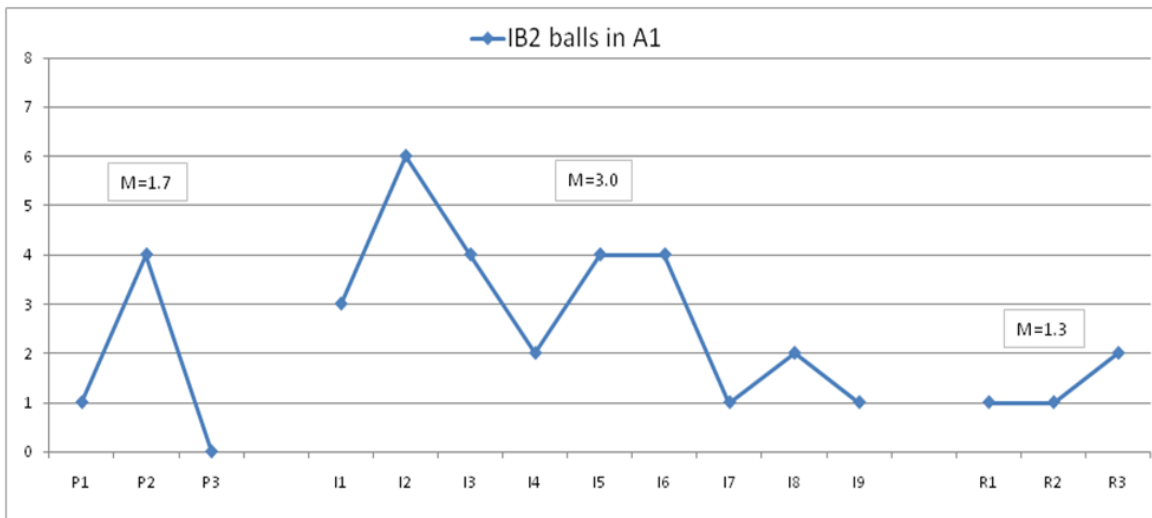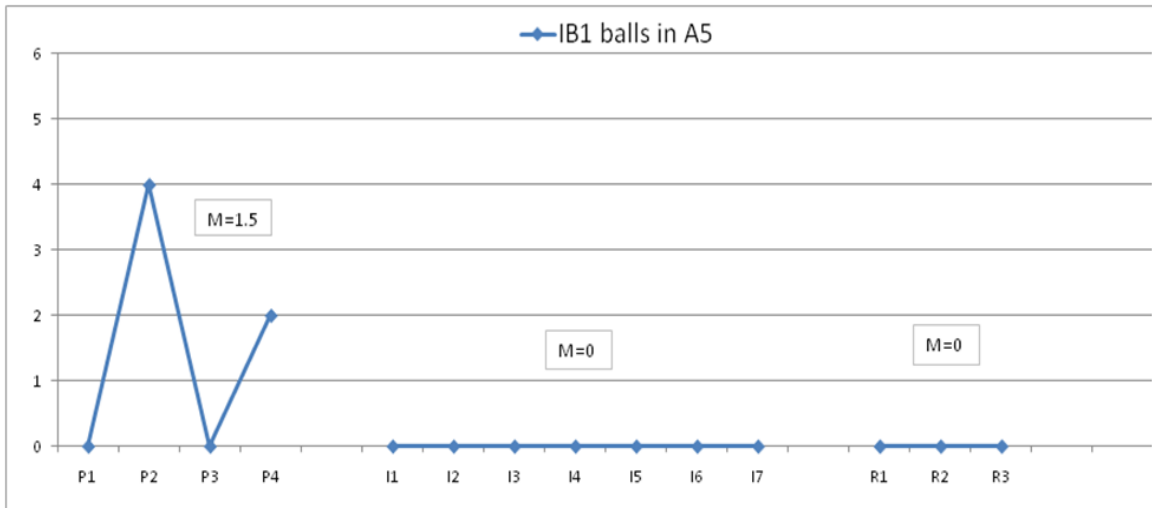
Figure 25. Participant IB1 Balls Hit in A5
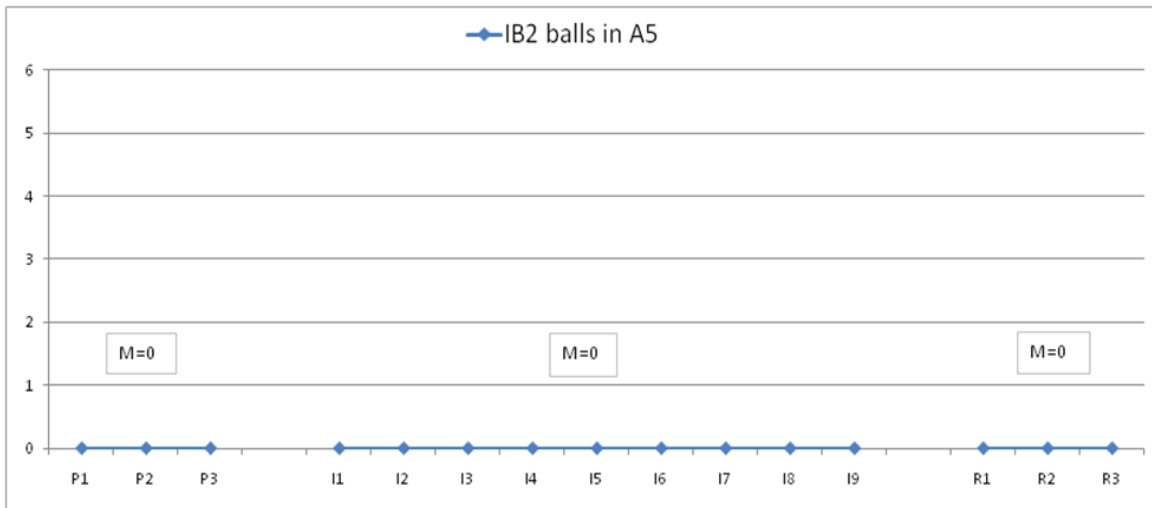
Figure 26. Participant IB2 Balls Hit in A5
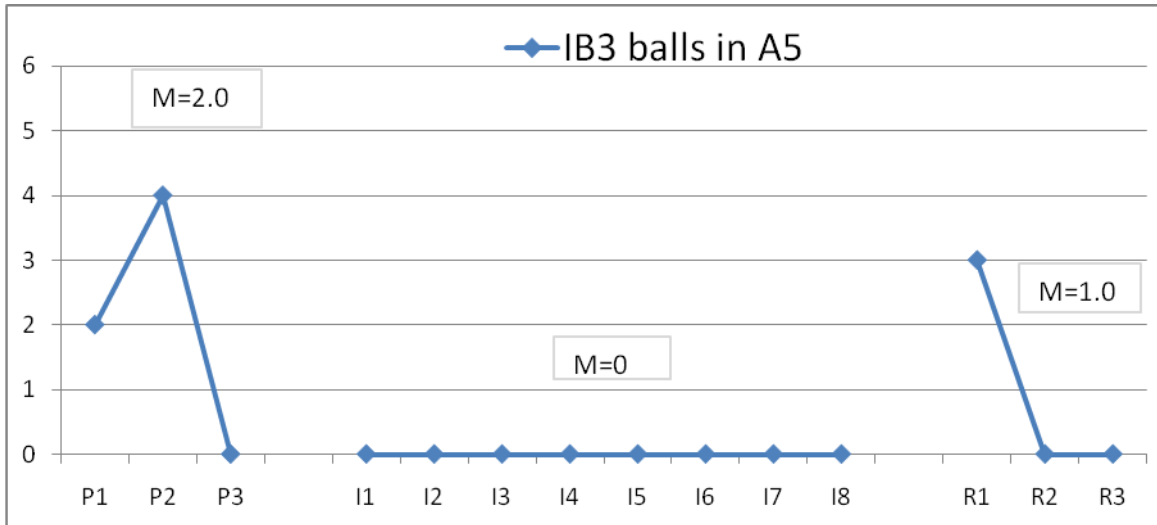
Figure 27. Participant IB3 Balls Hit in A5
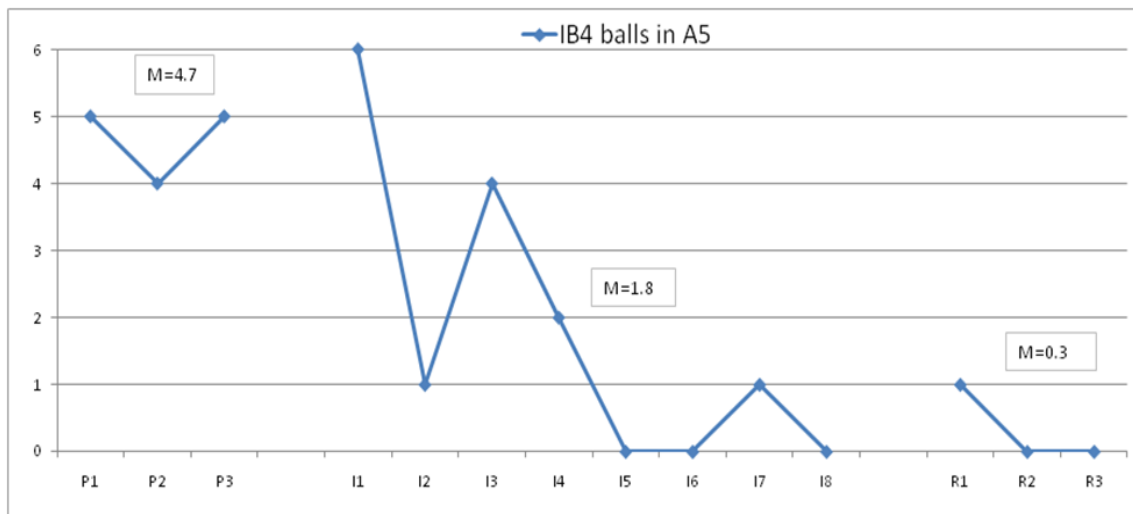
Figure 28. Participant IB4 Balls Hit in A5

Overall, the participants decreased in terms of balls hit into A5 during the intervention compared to baseline. Three of the four participants hit zero balls into A5 during the intervention. The forth participant saw a large decrease in balls into A5 with only one ball being hit into A5 in the last four intervention sessions. Retention testing

showed that these decreases remained with three participants' retention scores being lower than baseline (the fourth, participant IB2, scored zero throughout).

Summary

In conclusion, the control participants saw much more fluctuation throughout the three facets of data collection (total score, balls in A1, balls in A5) than the two imagery groups. In regards to total score the control group decreased throughout the intervention phase. Meanwhile, both imagery groups improved in total score from baseline to intervention. This increase is seen in the graphs as the majority of data points for imagery participants during intervention are higher than their baseline data points. This change seems to be equal when comparing the two imagery groups. No meaningful differences were found between the imagery before and the imagery after groups in total score.

In terms of balls hit into A1 the control again saw fluctuation across baseline, intervention and retention. The control group also saw inconsistent scores within the group. The two imagery groups also saw fluctuation in the data throughout baseline, intervention, and retention. However, when comparing means, there seems to be an increase in the number of balls hit into A1 from baseline to intervention. Again, there were no differences between the imagery before and the imagery after groups.

When looking at balls hit into A5 the control group again saw fluctuation in the data across the three phases, baseline, intervention and retention. The control group also saw inconsistent results. The imagery groups, meanwhile, saw large decreases in balls hit into A5 from baseline to intervention. By the last few intervention sessions, many

participants were averaging less than one ball in A5 per session. Again, when comparing the imagery after and imagery before groups no differences were found.

For further analysis participants were broken down into two groups: high ability golfers, those with an average score of 76 or under, and low ability golfers, those with an average score of 85 or higher. For balls in A1 participants with high ability seemed increase more so than those with lower ability. With all participants having a meaningful decrease in balls hit in A5 skill level was not observed as having an effect.

CHAPTER 4

DISCUSSION

The purpose of this study was to investigate the impact of using PETTLEP imagery as a part of a pre-shot routine on full swing golf shots. An additional purpose was to determine if imagery is more effective when used before or after a pre shot routine. Through visual analysis of the data and mean comparisons there was evidence supporting the hypothesis that imagery has a positive effect on full swing golf shot accuracy. In fact, imagery appeared to affect the golfers' total score, balls hit into A1 and balls hit into A5. There was little evidence to support the hypothesis that the imagery after group would improve more so than the imagery before group. In fact, the imagery before group and the imagery after group saw similar results. Both groups saw an increase in total score from baseline to intervention, but neither group appeared to improve more than the other. This also holds true for balls hit into A1 and balls hit into A5.

Overall, the control group did not increase in total score from baseline to intervention, in fact mean scores decreased. In terms of balls hit into A1 the control group saw inconsistent results either staying consistent or decreasing from baseline to intervention. When looking at balls hit into A5 the control group stayed consistent or even increased from baseline to intervention. The fluctuation that was seen in the graphs can be explained by the participant's average scores. C1 had an average score of 90 and C2 an average score of 88. Golfer's shooting these scores on average are naturally

inconsistent. Thus the fluctuation in the graphs and the inconsistent performance across all testing is considered "normal".

Meanwhile, across all imagery participants total score means were higher during the intervention phase compared to baseline, mean scores also increased from baseline to intervention in terms of balls hit into A1, and mean scores decreased from baseline to intervention for balls hit into A5. When comparing these findings to the results shown by the no imagery group that performance decreased in total score, balls hit in A1 and balls hit in A5 increased it is unlikely that something other than the intervention can explain the findings. These results suggest that imagery had a positive effect on golf performance. This finding that imagery impacted golf performance is consistent with an abundance of imagery literature (i.e. Brouziyne & Molinaro, 2005; Bell, Skinner, & Fisher, 2009; Smith, Wright, & Cantrell, 2008).

When looking at total score three cases seem to show a meaningful effect, based on the following definition. A meaningful change was determined based on having two of the three following: at least a 25% change from baseline to intervention, four or less overlapping data points, or an initial effect within the first three intervention sessions. Participants' IB4 and IA1 have only one intervention data point lower than their highest baseline data point. Participant IA2 has all intervention data points higher than the highest baseline data point. The rest of the imagery participants did increase in their average score from baseline to intervention; however, when visually inspecting their data it was concluded the increase was not meaningful based on our definition. The results that overall performance was increased using imagery are consistent with past research

(Brouziyne & Molinaro, 2005; Smith, Wright, & Cantrell, 2008). Both these studies found that imagery can improve overall performance in golf.

When looking at balls hit into A1 the degree of increase varied between participants. Three of the seven imagery participants were defined as having a meaningful increase. Participant IA1 only had one data point in the intervention portion lower than the highest baseline point. Participant IA3's last four data points during intervention were all higher than the highest baseline point, although his increase wasn't determined meaningful there was some evidence that there was a late effect. Participants IB3 and IB4 had the majority of their data points in intervention higher than the highest baseline point as well. Again this finding is in line with previous research on pitch shots that balls hit closer to the hole were increased by an imagery intervention (Brouziyne & Molinaro, 2005). It is also consistent with findings from Wright, Smith and Cantrell (2008) that bunker shots were hit closer to the hole following a PETTLEP imagery intervention.

An additional finding suggests that participants with lower average golf scores saw improvement in balls hit into A1 while participants with higher average golf scores saw no increase in balls into A1. In this study low ability golfers were defined as having an average golf score of 85 or higher (participant IA2, IB3, and IB4). High ability golfers were defined as having an average golf score of 76 or lower (participant IA1, IA3, IB1, and IB2). In fact, three of the four participants with average golf scores in the 70s saw their average balls into A1 double from baseline to intervention. Participant IA1, who has an average golf score of 73, improved from an average of 2.3 balls hit into A1 during baseline to 4.1 during intervention. IA3, who has an average score of 75, saw an

increase from 1.0 ball hit into A1 during baseline to 2.0 during intervention. While IB2, who has an average score of 76, increased from 1.7 balls hit into A1 during baseline to 3.0 during the intervention phase.

Meanwhile participants with average scores near 90 did not see the same level of improvement in balls hit into A1. IA2, whose average score is 90, saw average scores stay consistent throughout all three phases (M=0.3, 0.5, 0.3). Participant IB3 (average score of 88) saw fluctuation throughout the intervention phase, but his mean scores show an increase of less than one ball from baseline (M=1.0) to intervention (M=1.75). IB4 showed similar results as IB3 with an increase of less than one ball from baseline (M=0) to intervention (M=0.6). The latter two, IB3 and IB4, were defined as having meaningful changes. However, the magnitude of change was not the same as those in the high ability group.

When looking at this finding it makes sense that golfers with less ability might not improve in balls hit into A1 as much as higher ability players. Golfers with average scores around 90 are less likely to be hitting balls within 10 feet of the hole. When looking at the golfers with average scores in the 70s they did improve in terms of balls hit into the closest area (A1). This suggests that for higher level players' imagery can increase the amount of shots hit closer to the hole. Although there is no specific research investigating the effectiveness of imagery across skill level, this finding expands upon previous research that imagery can improve performance or shot accuracy. Several studies (Woolfork, Parish, & Murphy, 1985; Ploszay et al., 2004; Thomas & Fogarty, 1997) found that putting performance could be increased through the use of imagery. In addition, Brouziyne and Molinaro (2005) suggest that imagery can enhance pitch shots

and Smith, Wright, and Cantrell (2008) show that PETTLEP imagery can enhance bunker shot accuracy. Taken together, the current study, as well as, these previous investigations suggests that imagery can be an effective tool for several types of golf shots.

PETTLEP imagery was developed to create the most realistic imagery process possible. It is likely that high ability golfers are able to create realistic images visualizing the ball landing close to the hole. On the other hand, it is likely that lower ability golfers are unable to create a realistic image visualizing the ball landing close to the hole. Even though these golfers might have seen good golf shots while watching professional golf on TV this is not a realistic experience. As stated in the introduction, emotion is considered the missing link to the imagery process. Watching golf on TV does not develop the same emotional connection to a shot that hitting the shot yourself does. Lower ability golfers are not use to hitting the ball close to the hole as mentioned. This could produce a lower quality image for these participants compared to the higher ability golfers. If this is the case it would be expected that lower ability golfers wouldn't have a large effect for balls hit in A1 during the intervention.

The imagery intervention seemed to increase balls in A1 for the majority of the high ability golfers, but not for the lower ability golfers. However, all imagery participants, across all skill levels decreased balls hit into A5 from baseline to intervention. Balls hit into A5 had a meaningful effect across all participants with viable data (participants IA1 and IB3 did not hit any balls into A5 during baseline, intervention, or retention). Participant IA2 had all data points during intervention below the highest data points during baseline. Participant IA3 only hit one ball into A5 during the last four intervention sessions. Participants IB1 and IB3 did not hit any balls in A5 during the

intervention while they averaged 1.5 and 2 respectively during the baseline. Participant IB4 had all but one intervention data point lower to or equal to the highest baseline point. IB4 also only hit one ball into A5 during the last four intervention sessions. This is compelling evidence that across all imagery participants' imagery had an affect decreasing the amount of balls hit into A5.

This seems to be strong evidence that the imagery intervention decreased balls hit outside of the target area. The increase across all imagery participants in total score seems to be mainly accounted by in the decrease in balls into A5. As discussed above, although imagery might not increase balls hit close to the hole for all skill levels, it may decrease the amount of poor shots hit far away from the hole. Limiting the number of shots hit off line will lead to better golf for players at all levels. This is similar to findings of Ploszay, et al. (2004) that not only saw putts made increase, but also the distance of the putts missed decreased. Brouziyne and Molinaro (2005) found that the imagery plus physical practice group was the only group to improve in terms of not hitting balls into the farthest circle, a finding similar to the current study.

Overall, across all imagery participants an increase in total score was observed, while control participants saw a decrease in total score. Specifically for high ability golfers balls in A1 were increased across both imagery groups. Balls in A5 were drastically decreased across all imagery participants while control participants stayed consistent or increased during the intervention phase. This suggests that imagery, specifically PETTLEP imagery, can have a positive effect on full swing golf shot accuracy. Although there is no previous research with PETTLEP imagery and full swing golf shot accuracy, as stated earlier Smith, Wright, and Cantrell (2008) suggested that

PETTLEP imagery can enhance bunker shot accuracy. In addition PETTLEP imagery has shown to improve sport performance such as: field hockey penalty flicks, gymnastics balance beam tasks, and weight lifting (Smith et al., 2007; Wright & Smith, 2007; Wright & Smith, 2009; Smith, Wright, and Cantrell, 2008). Therefore, it appears that PETTLEP imagery had similar positive effects in this study as previously seen in the literature.

As previously mentioned there were no differences found between the imagery before and imagery after group. This finding does not support the original hypothesis that the imagery after group would improve more than the imagery before group. This hypothesis was based on the recency effect. The last thing the imagery after group did was image the shot, and it was hypothesized that this would cause the image to be more powerful than the imagery before group. The time between the imagery and the actual shot was greater for the imagery before group which would cause the imagery be less powerful. Pre-shot routines are relatively short in nature and it is possible that regardless of when the imagery was done not enough time elapsed between the imaging and the shot to cause a difference between the imagery after and the imagery before. Additional testing should be done to confirm that the time imagery is done does not have an effect on performance.

There are many practical implications from this study. The results of this study suggest that imagery can be an effective tool to increase full shot accuracy for golfers of all abilities. Particularly, for beginning or lower ability golfers using imagery can reduce the amount of poor shots hit. Although for these golfers shots hit closer to the hole might not increase, simply reducing the number of poor shots in a round should lead to lower scores. Also for those working with higher ability golfers this imagery intervention

suggests that accuracy can be improved both by increasing balls hit closer to the hole and reducing shots hit off line.

There were several limitations of this study that could have contributed to the results. First the outdoor conditions of the test caused changes throughout the course of the study. Fluctuations in temperature may have impacted the results as the ball will tend to travel farther on warm days and shorter on cold days. Also during the course of the study the wind direction varied from downwind, into the wind, and some cross winds. In some cases the wind changed the club selection of the participants. Although the shot was 120 yards for each shot, the weather conditions changed the "actual yardage" of the shot from day to day. Weather also caused a few cancellations of testing sessions for participants.

Another limitation of the study was the scheduling of participants. Due to the schedules of the research team, participants, and data collection, facility scheduling was difficult. Participants were given a schedule at the beginning of the study; however, the three groups were all on different schedules. Two of the groups met Monday, Wednesday, Friday, while the other group met Monday, Tuesday, Friday. Also some groups met in the morning, some in the afternoon and some in the evening throughout the course of the week. These different times and days could have caused one group to have better conditions during the testing than the others. A more ideal format would be to have all the groups met at similar times and schedules throughout the week.

Finally, two participants' data were affected by "the shanks". The shanks are a mishit of the golf ball that causes the ball to go straight right. This can be detrimental to the confidence of the golfer and cause extreme poor performance. Participant C2 saw a

larger decrease in total score from baseline to intervention. C2 also saw a dramatic increase in balls in A5 during this time. However, when he came back for retention testing no shanks were present and his total scores increased slightly above baseline levels.

Participant IA3 saw a smaller increase in total score than other participants and "the shanks" could explain those results. As stated in the results section it appears the effect of the imagery had a later effect, but it could also be explained by the "shanks" seen between I1 and I5. The remainder of the intervention saw scores that were much higher, as did the retention phase all with no shanks present.

Future studies should take into account these limitations as well as potentially exploring how imagery ability might affect the results. High or low ability imagers might have produced different results when using imagery with a full swing shot. Additionally imagery interventions should explore different types of shots and distances. For example how imagery could impact driving accuracy. In addition a similar study should be conducted using a longer intervention to see if effects are maintained over a longer period of time.

Despite the limitations outlined above, the results of this study suggest that PETTLEP imagery increases full swing shot accuracy. Specifically this type of imagery decreases the amount of poor shots hit 40 feet or further from the hole. Also, for higher ability golfers the intervention increased balls hit within 10 feet of the hole. With these results future studies should continue to look at how a more complex task, like a full swing golf shot, can be impacted by psychological skills training.

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APPENDIX A

RESEARCH HYPOTHESIS, LIMITATIONS, DELIMITATIONS, ASSUMPTIONS, DEFINITIONS

Research Hypotheses

1)   The two groups using imagery will improve performance more than the control from baseline to intervention in terms of total score on the accuracy test

2)   The two groups using imagery will improve performance more than the control from baseline to intervention terms of balls hit into A1.

3)   The two groups using imagery will improve performance more than the control from baseline to intervention in terms of balls not hit into A5.

4)   The imagery after routine group will improve performance more so than both the control and the imagery before group in terms of total score, balls hit into A1 and balls not hit into A5.

Limitations

1)   Imagery use cannot be directly measured.

2)   Participants might have undetectable differences in imaging ability.

3)   The tests will be outdoors where weather can affect performance.

4)   One's average golf score might not reflect their ability on the full swing.

5)   Imagery use was not assessed during the retention phase

Delimitations

1)   Only golfers with a handicap of 18 or under will be included.

2)   The sample will come from a small local area in the southeastern United

        States.

3)   Only participants who use a pre shot routine will be included.

4)   Only participants who do not use imagery as a part of their pre shot routine

        will be included

5)   Participants must be between the ages of 18 and 25

6)   Participants will be male

Assumptions

1) All participants in the imagery groups will use imagery during the post-test for each shot.

2) All participants will adhere to their pre shot routines for each shot.

3) Participants will not be using imagery during the pretest

4) Eligibility requirements are accurate for defining intermediate golf skill

5) All participants will give maximum effort during each shot in an attempt to hit the ball as close to the hole as possible.

Definitions

Handicap – The USGA's measurement of a player's ability on a course of standard playing difficulty (www.usga.org).

Golf shot accuracy – total score, balls in A1, and balls in A5 on the accuracy test

PETTLEP imagery – a model of imagery that fulfils seven core requirements: physical, environmental, task, timing, learning, emotion and perspective. This model was developed through neuroscience research on the principle of functional equivalence.

Functional Equivalence – imagery enhances performance because the same processes are activated in the brain using imagery as when the actual movement is done.

Full swing golf shot – a golf shot requiring the processes of a full swing, about 100 yards.

Pre shot routine – actions or behaviors that are done before a shot to focus, enhance confidence, and reduce anxiety (Weinberg & Gould, 2003).

Bushnell Laser – a measuring device for yardages, effective within +/- 1 yard (www.busnellgolf.com)

Percent change – change from baseline to intervention based on the means

Overlapping data point – an intervention data point that is below the highest baseline point

Meaningful change – 2 of the following 3: 25% change from baseline to intervention, less than 4 total overlapping data points, initial effect within the first 3 sessions

Low ability golfer - average 18 hole score of 85 or higher

High ability golfer – average 18 hole score of 76 or lower

70

APPPENDIX B

ANNOTATED BIBLIOGRAPHY

Arvinen-Barrow M., Weigand, D. A.,Thomas, S., Hemmings, B.,Walley, M. (2007). Elite

and Novice Athletes' Imagery Use in Open and Closed Sports. *Journal of Applied*

Sport Psychology, 19, 93-104.

The purpose of this study was to examine the influence of competition level and

skill type on athletes' imagery use. There were 83 participants, 39 elite and 44 novice.

There were 40 from open sports such as rugby and martial arts, and 43 from closed-skill

sports such as golf and figure skating. The Sports Imagery Questionnaire was used to

determine the level of imagery use for each athlete with the five types of imagery being:

cognitive specific, cognitive general, motivational specific, motivational general arousal,

and motivational general mastery. Athletes in all sports filled out the questionnaire

within 24 hours of their competition. Athletes were grouped based on skill level and by

type of skill performed. Data from the questionnaires were analyzed and found no

interactions were found between skill type and skill level. It was revealed that elite

athletes used more cognitive specific and cognitive general imagery than novices. Also

open skilled athletes use more motivational general arousal imagery than closed skilled

athletes.

Beauchamp, M.R., Bray, S.R., Albinson, J.G. (2002). Pre-competition imagery, self-

efficacy and performance in collegiate golfers. *Journal of Sports Sciences*, 20,

697-705.

The purpose of this study was to examine the effect of pre-competition imagery use and self efficacy on performance in collegiate golfers. The participants were 51 male varsity collegiate golfers in the United Kingdom. The Sport Imagery Questionnaire was given to the participants an hour before a major golf tournament. A multiple regression analysis was used and found a significant variance in self efficacy and performance in the tournament. It was also found that the use of imagery mediated the relationship between self efficacy and performance. This study is important because of its strong applied nature. The performance variables of the study were not a test administered by the researcher but rather a golf tournament. The results showing that imagery is related to enhanced performance in a real life setting is unique.

Bell, R. J., Skinner, C. H., Fisher, L. A. (2009). Decreasing Putting Yips in Accomplished Golfers via Solution-Focused Guided Imagery: A Single Subjects Research Design. *Journal of Applied Sport Psychology*, 21, 1-14.

The purpose of this study was investigate the effect Solution Focused Guided Imagery (SFGI) had on decreasing yips, a jerk in a putting stroke, in experienced high level golfers. There were three participants in this study whose handicaps were below seven. Each participant played at least four rounds of golf and on every green the researchers recorded data on each putt, putts within 5ft, and the presence of a yip. The participants then went through the SFGI intervention that lasted for five 20 minute sessions. The participants then completed a posttest three weeks after the last SFGI session. The posttest was the same recording of data that took place in the pretest. Each

participants data was then compared from pre to post test. All three participants decreased in yips from pre to post test with a moderate level effect size.

Imagery has been shown to have a positive and negative effect on performance (Woolfork, 1985). This study focuses on using imagery to eliminate a negative result. This idea has been supported by numerous studies conducted by Bell. The idea that solution focused imagery can eliminate a negative act it would seem that you could use the same idea to promote a positive act with a golf swing. This study was reinforcing to me that guided imagery use can have a positive effect with golfers.

Brouziyne, M., Molinaro, C. (2005). Mental Imagery Combined with Physical Practice of

Approach Shots for Golf Beginners. *Perceptual and Motor Skills*, 101, 203-211.

The researcher investigated how mental imagery combined with physical practice would affect performance of beginner golfers on a 55 meter golf shot. Twenty three beginning golfers hit 13 shots from 55 meters to a green. The green was divided into scoring zones, zone 1 two meters and in, zone 2 two to four meters, zone 3 four to six meters, zone 4 six meters and out. Participants were given four points for a ball in zone 1, three points for a ball in zone 2, two points for a ball in zone 3 and one point for a ball in zone 4. Each participant's best 10 shots were measured as the pretest. Participants were then assigned to groups based on their performance. Group 1 was the experimental group who used imagery combined with physical practice. Group 2 was the physical practice only group, and group 3 was the control group who did not practice between the pre and post tests. Groups 1 and 2 had five sessions with their specific condition and then

all three groups were given the posttest. The posttest was the same system as the pretest. The researchers found a significant difference between group 1 and 3 and between group 2 and 3 in terms of the number of balls hit into zone 1. Also a significant difference was found between groups 1 and 3 in terms of balls not hit into zone 4.

This study has a well developed method of collecting data for a longer shot. This information is comparative to other studies reviewed that physical practice and imagery can enhance performance. This study will provide a guide for my study in terms of design and methods. The accuracy grid will be looked at for the measure of accuracy in my study. This study tied in imagery with physical practice whereas in my study I will tie in imagery with the use of a pre-shot routine.

Calmels, Claire, Berthoumieux, Christelle, d'Arripe-Longueville, Fabienne. (2004).

Effects of an Imagery Training Program on Selective Attention of National

Softball Players. *Sport Psychologist*, 18, 272-296.

The purpose of this study was to see how imagery use could be used to enhance softball player's ability to narrow attention. A multiple baseline single subjects design was used, with four participants. Attentional focus was measured using a sport specific version of the Test of Attentional and Interpersonal Style (TAIS). Results showed that the imagery training program enhanced the narrowing of attention. The results of this study showing that imagery can enhance a persons attention should translate to enhanced focus and attention of participants in my study as they use a pre shot routine.

Coelho, Ricardo W., de Campos, Wagner, da Silva, Sergio G., Okazaki, Fabio H. A., Keller, Birgit. (2007). Imagery Intervention in Open and Closed Tennis Motor Skill Performance. *Perceptual & Motor Skills*, 105, 458-469.

The purpose of this study was to investigate the effect of an imagery intervention on an open and closed tennis task. The tennis serve was chosen as the closed task and the service return as the open task. Participants, 48 male tennis players ages 16-18, were divided into two groups, a practice only group (control) and an imagery group with physical practice. Results of the study found that the imagery group performed significantly better on the closed skill task than the control. No significant difference was found on the open skill. Results suggest that closed skill tasks might be more influenced by imagery interventions than open skill. Since the golf swing is a closed skill task this study is important because it suggests the task can be influenced by an imagery intervention.

Evans, Lynne, Jones, Leigh, Mullen, Richard. (2004). An Imagery Intervention During the Competitive Season With an Elite Rugby Union Player. *Sport Psychologist*, 18, 252-271.

The purpose of this study was to both explore uses of imagery at the elite level in rugby but also to investigate the effect of an imagery intervention during the course of a competitive season. The qualitative aspect to the study was done using semi structured

interviews, diaries, and the Sport Imagery Questionnaire. These findings suggested that the participants used cognitive specific and cognitive general imagery. Following the imagery intervention the participants reported greater clarity, detail, control, and structure to their imagery use among others. The importance of this study is the discussion of the importance of individualizing the imagery intervention to each athlete. Since I will be using a single subjects design for my thesis individualizing the imagery will be possible.

Gregg, M., Hall, C. (2006). The relationship of Skill Level and Age to the Use of

Imagery by Golfers. *Journal of Applied Sport Psychology*, 18, 363-375.

This investigation is a correlation study of skill and age on the use of imagery. There were 304 participants with age ranging from 18-87 and handicaps (skill) ranging from 0-63. Five types of imagery were investigated: cognitive specific, cognitive general, motivational specific, motivational general arousal, and motivational general mastery. Handicap was significantly related to all five types of imagery. Age was significantly related to cognitive specific, cognitive general, and motivational general mastery. Also a negative correlation was found between handicap and imagery use, as handicap decreased imagery use increased, and a negative correlation was found between age and imagery use, as age increased imagery use decreased.

This source will be useful in focusing the type of imagery that will be used with the pre-shot routine. This is a unique study for this review of literature because it is correlational. The importance of this study to me is that it provides a foundation for the type of imagery used and explains the relationship between skill and imagery use.

Hall, Craig R., Rodgers, Wendy M., Barr, Kathryn A. (1990). The Use of Imagery by

      Athletes in Selected Sports. *Sport Psychologist,* 4, 1-11.

      This study examined the basic uses of imagery in six different sports: football, ice hockey, soccer, squash, gymnastics and figure skating. A sample of 381 participants completed a 37 item questionnaire about their imagery use in sport. The results of the questionnaire showed that the athletes used imagery more in competition than in practice. No differences were found between athletes using visual and kinesthetic imagery, also no difference was found in the use of an internal imagery perspective compared to an external perspective. It was found that the higher the competitive level the more imagery was used in competition, in practice and in pre game. Finally it was found that imagery use was not a part of a structured or regular training session. The importance of this study is to understand how athletes currently use imagery, and how each level of competition is normally using imagery. It gives a rationale for why imagery should be used with beginners and intermediate populations because this study suggested those groups do not use imagery like elite level athletes do.

Kearns, D.W., Crossman, J. (1992). Effects of a cognitive intervention package on the

      free throw performance of varsity basketball players during practice and

      competition. *Perceptual & Motor Skills*, 75, 1243-1253.

The purpose of this study was to investigate the effects of an imagery intervention on free throwing shooting performance both in practice and in competition. Three university level basketball players were used in a single subjects multiple baseline design. Data was collected during the course of the 14 week season and at 50 practices and 32 games. A comparison of graphed means test was used for data analysis. All participants increased in performance from baseline to intervention during the practice condition. Two of the three subjects showed the same increase in performance during the game condition. Results suggest that an imagery intervention package is useful in enhancing performance of free throw shooting. This is another study that shows how imagery can be used to enhance performance in a simple task. This sets up the rationale for implementing an imagery intervention in a more complex task such as a full golf swing.

McCann, Paul, Lavallee, David, Lavallee, Ruth M. (2001). The Effect of Pre-Shot Routines on Golf Wedge Shot Performance. *European Journal of Sport Science*, 1, 1-10.

The purpose of this study was to investigate the effect a pre shot routine has on wedge shot performance. There were 68 participants who were divided into either a golfer group or a non golfer group. The golfer group was participants who had a golf handicap and the non golfer group having little to no golf experience. Each group was then subdivided into three groups, no practice, physical practice only and a physical practice with cognitive performance routine. A pretest was conducted from 40, 50 and 60 yards. Following the intervention phase the same format was used during the post test.

Results from this study suggest that the performance routine non golfer group enhanced performance significantly from pre to post. The golfer routine group also enhanced performance but it was not found to be significant. This is a study that can be used to look at methods since it is one of few studies that look at a longer distance shot.

Mumford, B., Hall, C. (1985). The effects of internal and external imagery on performing figures in figure skating. *Canadian Journal of Applied Sport Sciences*, 10, 171-177.

The purpose of this study is to examine the effect of internal and external imagery perspectives have on figure skating performance. Ninety five participants were randomly assigned to one of four groups based on their results from a "senior level figure" pre test. The four groups were an internal kinesthetic imagery group, an internal visual imagery group, an external visual imagery group, and a control training group. Each group underwent four training sessions and then were post tested on the same measure as the pre test. The results showed that there were no significant differences between groups. One reason for this might be the small amount of training sessions. This study has shown that I need to allow enough time for my intervention so that results may come to fruition. With only four training sessions it is hard to say that the intervention was ineffective.

Nelson, J., Czech, D. R., Joyner, B. A., Munkasy, B., Lachowetz, T. (2008). The Effects of Video and Cognitive Imagery on Throwing Performance of Baseball Pitchers: A Single Subject Design. *The Sport Journal*, 11, 1-11.

The researchers investigated the effect two types of imagery, cognitive and video, had on throwing accuracy of baseball pitchers. There were four participants in this study who were apart of a high school or college pitching staff. Each participant was tested on throwing accuracy using an Easton 9 square strike zone target five times during the first week of the study. Following the pretest the participants went throw a three week imagery intervention. Participants received either the video or cognitive imagery during the first week of the intervention based on their pretest and then the other type of imagery during the second week. Two of the participants received no intervention and were the control group. An imagery script was prepared for both conditions of imagery. A week after the intervention a posttest was given four times. Data was analyzed by charting the accuracy scores individually. Post intervention scores were then compared to the baseline data. It was found that persons were not affected distinctly by the different types of imagery conditions.

This source is important because it explores different types of imagery. The majority of studies focus on the use of cognitive imagery, this study compares the use of cognitive with the use of video imagery. One question about studying video imagery is how it can be applied during competition. It could be used for preparation but it can't be applied on the field of play. This source was helpful because it explored different types of imagery, which got my mind started what type of imagery I wanted to utilize in my

study. The applicability of the video imagery led me to the idea of developing a

cognitive imagery script using kinetic sense as well.

Nicholls, A. R., Polman, R. (2005). The Effects of Individualized Imagery Interventions

on Golf Performance and Flow States. *Athletic Insight*, 7, 1-24.

In this study four high performing amateur golfers were interviewed about what

golf shots they wanted to improve on. Each participant then played five rounds of golf

and those shots were recorded. An imagery intervention was then implemented. The

intervention consisted of an imagery script which was recorded for the participants to

reuse during the intervention week. It also included a performance element tailored to

the participant's golf game. Participants then played four more rounds of golf and their

specific shots were recorded again. Pretest shots were compared to posttest shots for the

data analysis. It was found that every golfers shot percentage increased from pre to post

test.

This study does a great job of tying in the imagery intervention with the

individual. This is one of the most practice and applied research ideas reviewed. When

looking at how imagery interventions can be applied to a real world setting this study is

an excellent framework. It is useful for me in how you can tie in the imagery script to a

physical pre-shot routine that is already established. The data analysis, pretest to posttest,

is similar to what will be done with my study.

Ploszay, A. J., Gentner, N. B., Skinner, C. H., Wrisberg, C. A. (2006). The Effects of

Multisensory Imagery in Conjunction with Physical Movement rehearsal on Golf

Putting Performance. *Journal of Behavior Education*, 15, 249-257.

The researcher investigated how multisensory imagery along with a physical

routine effected putting in golf. There were four participants in this study who played

golf at the Division 1 college level. The pretest consisted of each participant hitting four

putts from 8, 12, 16, 20, and 24 feet. The number of made putts was recorded and the

distance from the hole of the misses was also recorded. Following the pretest an imagery

intervention was implemented over five consecutive days. An imagery script was used

by each participant using both visual and physical senses during the imagery. Following

the intervention a post test was given using the same system as the pretest. Results were

analyzed from pretest to posttest. It was found that the number of putts made increased

from baseline to post intervention and the distance of putts missed decreased as well.

This study follows in line with other studies in how the imagery script was

implemented. It was meaningful in that it was found that performance was increased in

all aspects of putting. This provides a base for my study on how to implement my

intervention. The findings that imagery increased putts made can be compared to my

results about how imagery affected full swing performance. Combining research with

putting and full swing can show just how powerful imagery use is in the game of golf.

Rodgers, W., Hall, C., Buckolz, E. (1991). The effect of an imagery training program on

imagery ability, imagery use, and figure skating performance. *Journal of Applied*

Sport Psychology, 3, 109-125.

This study investigated the effect imagery ability and imagery use had on figure

skating performance, as well as the difference between imagery training and verbalization

training. The participants were divided into two groups, an imagery training group and a

verbalization training group. The specific groups go training in the type of training they

were going to be doing. All participants were given a pre test measuring imagery ability,

imagery use and a skating performance test. Then they went through a 16-week training

program, where each group used the techniques taught. The results showed that the

imagery group improved in all aspects of imagery and were more likely to use imagery in

practice sessions. They were also able to visualize aspects of their skating routines more

so than the verbalization group. However, both groups passed more skating tests in the

post test than normal. This study shows the impact imagery can have on a closed skill

sport. The imagery group was more prepared for practice sessions and improved

performance over the pre test.

Shambrook, C. J., Bull, S.J. (1996). The use of a single-case research design to

investigate the efficacy of imagery training. *Journal of Applied Sport Psychology*,

8, 27-43.

This study used a multiple baseline single subjects design to look at the effect

imagery training had on free throwing shooting. This study had four participants, all

female. The participants went through a total of 26 trials where 20 free throws were

attempted per trial. An imagery routine was given to the participants during the course of

the trails as is the protocol for a multiple baseline design. A diary was used to track the

use of the imagery and a social validation questionnaire was used to see how the imagery

training was received. There was a positive reception of the training program as

suggested by the survey. Results suggested that only one participant consistently

improvement after starting the imagery training program. This study is important in that

the discussion states that a single subject design is useful for measuring individual

differences in sport psychology interventions. My intent is to have my design by a single

subjects design.

Shivetts, M., Joyner, B. A., Czech, D. R., Zwald, D. (2007). The Effects of an Individual

      Goal-Setting Intervention on Goal Orientation, Self-Confidence, and Driving

      Accurracy in Average Golfers: A Quantitative Design. *International Journal of*

      Fitness, 3, 1-13.

      The purpose of this study was to test the effect a goal setting intervention had on

goal orientation, self confidence and driving accuracy. There were 43 participants in this

study, experimental group had 20 and the control group had 23, whose average 18 hole

score of 80-110 over at least 10 rounds. The experimental group (goal setting group) was

given an individual goal setting intervention while the control group was simply told to

perform their best on each task. The driving accuracy was measured using a sixty yard

wide grid at a local driving range. A line was drawn down the center and then more lines

were drawn into scoring zones equally on each side of the center line. Each drive was scored based on the part of the grid it fell in. There was a significant interaction between the experimental group and the control group in terms of driving accuracy.

The design of this study and how the groups were formed is a strength to this study. Imagery interventions tend to lean towards single subject designs, with a more true design with a control group provides more statistical strength to this particular study. The testing of the data collection method is another strength to this study. The researchers were rigorous in their efforts to validate their method of collection. This will be something that will need to be done in my study and Shivetts provides a strong framework. The design is also a strong framework for me to organize my study.

Smith, Dave, Holmes, Paul. (2004). The Effect of Imagery Modality on Golf Putting Performance. *Journal of Sport & Exercise Psychology*, 26, 385-395.

The purpose of this study is to investigate the different types of imagery scripts on putting performance. This study used 40 experience male golfers who were randomly assigned to four groups; a written script group, a video group, an audio group, and a control group. The control group read random golf literature. Each group went through a 15 ball putting task twice a week over the 6 week study. During that time they also spent time doing the task of their assigned group. There was no difference between the groups during the pre test, however during the post test the video and audio groups performed significantly better than the written script and control groups. This study is important to

mine as I develop my imagery script to deliver to my participants. This research suggests

that the way the imagery is delivered has an affect on the outcome of the task.

Smith, D., Wright, C., Allsopp, A., Westhead, H. (2007). It's all in the mind: PETTLEP-

    based imagery and sports performance. *Journal of Applied Sport Psychology, 19,*

    80-92.

    This article reviewed two studies which investigated several aspects of the

PETTLEP model in two different sports. The first study focused on the hockey penalty

flick and the physical and environmental components of PETTLEP. Participants were 48

university varsity field hockey players. They were randomly assigned to one of four

groups: sport-specific imagery (physical and environment), clothing imagery (physical),

traditional imagery, and a control group. Each group completed a pretest followed by the

imagery intervention. The sport-specific imagery group performed their imagery on the

hockey pitch wearing their game uniform. The clothing imagery group wore their game

uniforms, but performed the imagery at home. The traditional imagery group performed

the imagery at home, sitting down, and in normal street clothes. The control group

simply read field hockey literature during the time of the intervention. The intervention

was completed daily, consisting of 10 imaginary penalty flicks, over the course of six

weeks. Following the completion of the intervention a post test was administered using

the same format as the pretest. It was found that the sport-specific imagery group scored

the highest and significantly higher than all the other groups: clothing imagery,

traditional imagery, and the control group. It was also found that the clothing imagery

group had the second highest score and performed significantly higher than the traditional imagery group and the control group. The traditional imagery group did perform significantly better than the control group, but lower overall than the clothing imagery and the sport specific imagery group.

The second study done by Smith et al. (2007) investigated the effect of the PETTLEP model as a whole compared to traditional imagery for a gymnastics skill. Forty female gymnasts, average age 10, were recruited from a gymnastics club. Participants were randomly assigned to one of four groups: physical practice, PETTLEP imagery, stimulus imagery, or a control group. They first completed a pretest which consisted of three attempts on a full turning straight jump on the balance beam. Each jump was scored by an expert coach on a scale of 1-10 and the average of the three jumps was taken. Following the pretest the imagery intervention began. The PETTLEP imagery group was given a script, which was individualized based on their feedback, that included all seven components of the PETTLEP model. The stimulus imagery group was given a script which focused on stimulus details such as the sight of the beam, the gymnasium walls in front of them, and the smell of the gym. The physical practice group was given two practice jumps three times per week, while the control group went through a stretching routine. Once the intervention was complete the participants completed the jump test again and data was collected the same way as the pretest for the post test. It was found that the physical practice and the PETTLEP imagery groups improved significantly from pre to post test. The traditional imagery group and the control group did not improve significantly.

Smith, Dave, Wright, Caroline J., Cantwell, Cara. (2008). Beating the Bunker: The Effect of PETTLEP Imagery on Golf Bunker Shot Performance. *Research Quarterly for Exercise*, 79, 385-392.

The purpose of this study was to investigate the use of a specific type of imagery and physical practice on a bunker shot task. The study used PETTLEP imagery (Holmes & Collins, 2001) which is using physical, environment, task, timing, learning, emotion and perspective as a part of the imagery script. Thirty two elite male golfers were randomly assigned to one of four groups; imagery, physical practice, imagery with physical practice or control group. The imagery group imaged hitting 15 bunker shots using the PETTLEP principles twice a week. The physical practice group performed 15 bunker shots twice a week. The imagery combined with physical practice group performed imagery once per week and performed the shots the other session. Each group went through these tasks over the course of six weeks. A pre and post test was administered using 15 bunker shots and points were awarded based on where the shot ended up from the hole. All groups improved significantly from pre to post test, and the imagery plus physical practice group improved the most. The importance of this study is that another type of golf shot has shown to be enhanced through the use of imagery. Since no study has looked at the effect of full swing, it hasn't yet been suggested through research that it can be enhanced using an imagery intervention.

Ramsey, Richard, Cumming, Jennifer, Brunning, Chris, Williams, Sarah. (2007). A

PETTLEP based imagery intervention with university soccer players. *Journal of*

Sport & Exercise Psychology, 29, 196-199.

The purpose of this study was to investigate the effect of emotion in an imagery

script using a penalty kick in soccer. The imagery script being used is the PETTLEP

model previously reviewed. Immediately before the performance of the penalty task

anxiety and self efficacy was measured. Following the pretest the sample of 33 varsity

level soccer players were randomly assigned to one of three group; imagery without

emotion element, imagery with emotion element and control group. The imagery groups

imaged successfully making ten penalty kicks. The conditions were done four times per

week for the 6 week duration of the study. Results showed that both groups using

imagery enhanced performance more so than the control group. No significant

differences were found in the manipulation of the emotion element of the PETTLEP

model of imagery. This study is important because it adds to research that shows imagery

has a positive effect on performance.

Thomas, P. R., Fogarty, G. J. (1997). Psychological Skills Training in Golf: The Role of

Individual Differences in Cognitive Preferences. *The Sport Psychologist*, 11, 86-

106.

The purpose of this study was to investigate the effects of imagery and self talk on

psychological skills and performance levels of amateur golfers. There was a sample of

32 amateur golfers who took part in four training sessions. As a part of the sessions they completed the Sports Imagery Questionnaire and the Golf Performance Survey both before and after the sessions. Also a golf skills test (putting) was measured pre and post session. The results of the survey and questionnaire were compared from when they took it before the sessions and then again after. Results showed that there was a significant improvement in five areas that the GPS measured from pre to post. Also imagery and self talk increased as a result of the training, as did performance on the golf skills test.

Woolfork, R. L., Parrish, M. W., Murphy, S. M. (1985). The Effects of Positive and Negative imagery on Motor Skill Performance. *Cognitive Therapy and Research*, 9, 335-341.

The researcher investigated the effect of positive and negative imagery on putting in golf. A pretest was given to determine ability on an eight and a half foot putt, 55% made and up were the expert group, 20-55% made were the intermediate group, and 20% and below was the novice group. The expert group then putted from 10ft, intermediate group from 7ft and novice group from 5ft. Participants were tested on 10 putts per day over six days. They were randomly assigned to the three groups: positive imagery, negative imagery and control group (no imagery). Positive imagery group visualized making a putt, negative imagery group visualized narrowly missing a putt and the control group was informed the test was on repeated practice. Data was analyzed across groups and it was found that the positive imagery group was significantly different from the other two groups. Also the negative imagery group was significantly different from the

other two groups. The positive imagery group improved 30.4% from pre to post test and the negative imagery group's performance decreased by 21.2% from pre to post test.

This article is a strong investigation of the uses of imagery. Most articles reviewed had this article cited as a base for their study. One thing that is unique to this study is looking at how negative imagery effects performance. The results to this study are astounding to how much of an effect imagery had on golf performance. With the results being so powerful this research will serve as a framework and rationale for moving the use of imagery from putting to full swing.

Taylor, J. A., Shaw, D. F. (2002). The effects of outcome imagery on golf-putting

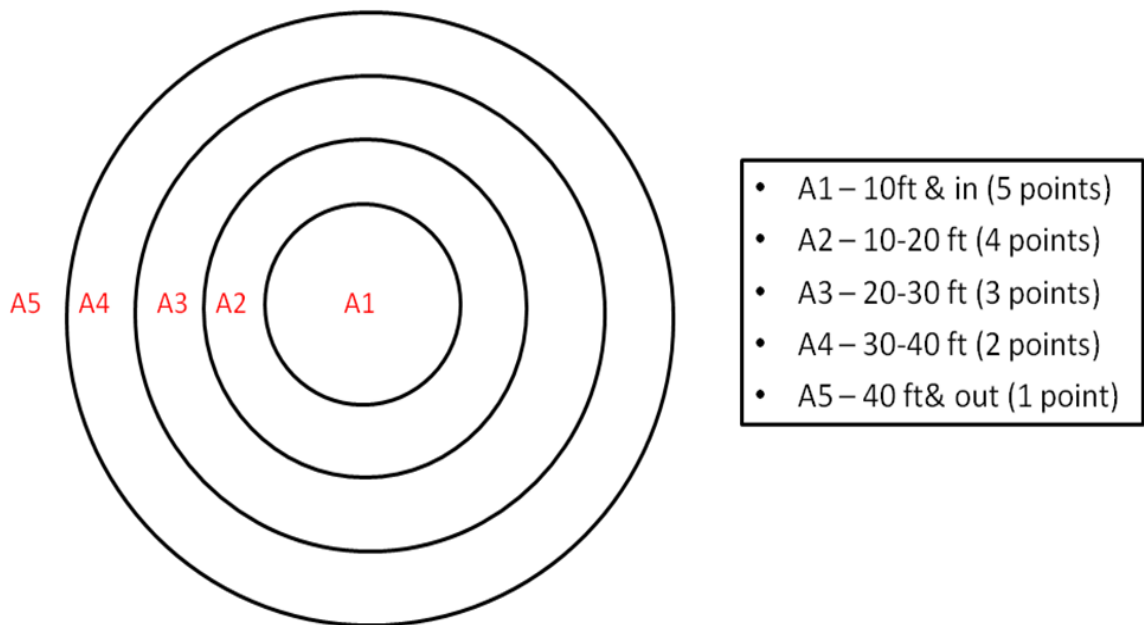performance. *Journal of Sports Science*, 20, 607-614.

This study was a replication of the Woolfork study previously annotated. Taylor used the same groups: positive imagery, negative imagery and a no imagery control group. This study also used a golf putting test in a pre/post test design. One unique thing to this study as compared to the Woolfork study is that they used both high and low ability golfers. This study had different conclusions than previous research as it found that the positive imagery did not enhance performance over the control. However, it did support Woolforks conclusion that negative imagery has a detrimental effect on performance.

Wrisberg, C.A., Anshel, M.H. (1989). The effect of cognitive strategies on the free throw

shooting performance of young athletes. *Sport Psychologist*, 3, 95-104.

This study is an investigation of cognitive strategies on free throw shooting performance. There were forty participants from a summer sports camp who were boys ages 10-12. There were 20 pre test trials in which the participants had 45 second time gaps between shots. Following the pre test the boys received specific instructions based on which of the four groups they were in. The last 15 seconds of the 45 second interval the participant engaged in their cognitive strategy based on their group. Results showed that the imagery combined with arousal adjustment is effective as a pre shot routine strategy. This is important because in my study I am using imagery as a part of a pre shot routine. Also this study shows that imagery is an effective strategy to enhance performance across age groups.

APPENDIX C

INSTRUMENTS

Accuracy Grid

- A1 – 10ft & in (5 points)
- A2 – 10-20 ft (4 points)
- A3 – 20-30 ft (3 points)
- A4 – 30-40 ft (2 points)
- A5 – 40 ft & out (1 point)

Imagery Script

Start by standing on the range where you would hit from with the proper club in hand.

Close your eyes and take several deep breaths. The ball is 120 yards from the hole. Feel

the club in your hands. Notice the texture of the grip and the weight of the club. Image

setting up to the ball, take into account your natural stance, posture, weight distribution,

and feel your arms hanging down holding onto the club. Sense the feeling of confidence

of a solid golf shot about to be stuck. Now image the start to the backswing, feel the

weight of the club, the sensation of your arms moving and your body starting to turn.

(Individualize the rest of the golf swing, backswing, position at the top, downswing,

feeling of impact, and follow through). Visualize the ball leaving the ground and flying

in the air, notice the trajectory of the ball, the curvature of the ball flight (all this will be individualized based on the participants' ball flight and natural curvature). Visualize the ball landing and rolling towards the flag. The ball comes to rest close to the pin. Notice the feeling or emotions that come with hitting a great golf shot (those specific emotions and feelings with be individualized). During the imaging process participants will be encouraged to use whichever perspective they feel comfortable with (internal or external). They will also be allowed throughout the intervention to make minor changes to the script as they learn and become more comfortable with the imaging process. Also changes might be made because the participants become more aware of movements or emotions felt during the golf swing and when good shots are hit.