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The Use of Video Modeling plus Video Feedback to Improve Boxing Skills

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The Use of Video Modeling plus Video Feedback to Improve Boxing Skills

by

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ABSTRACT

Video modeling and video feedback are behavioral procedures that have been shown to increase skill acquisition over time in a variety of environments. This study investigated the use of a video modeling and video feedback procedure, via a multiple baseline design to enhance skill acquisition in boxing. This study also incorporated multiple dimensions of analysis by including data based not only on a percentage of performance with a task analysis, but also the duration of each particular target behavior. The target behaviors for the study included three different boxing combinations, which were operationally defined based on component steps via a task analysis. Each step was marked as either correct or incorrect based on participant performance. The two participants in the study had little or no previous boxing instruction. During intervention, participants were shown a video of a professional boxer performing the specific combination being trained. The participant was then recorded performing the combination, which was used to compare to that of the professional model. The results indicated that both participants' skill levels increased upon intervention using video modeling and video feedback. Reaction time also decreased substantially for one participant.

INTRODUCTION

Every day people in society utilize behavioral techniques and principles to improve skills. Research suggests that specific behavioral techniques such as self recording and public posting (McKenzie & Rushall, 1974), behavioral coaching (Allison & Ayllon, 1980), goal setting and performance feedback (Alvero, Bucklin, & Austin, 2001; Locke & Latham, 1990; Smith & Ward, 2006), and video modeling and video feedback (Benitezsantiago & Miltenberger, 2011; Boyer, Miltenberger, Batsche, & Fogel, 2009; Charlop & Milstein, 1989; Emmen, Wesseling, Bootsman, Whiting, & van Wieringen, 1985; Guadagnoli, Holcomb, & Davis, 2002; LeBlanc et al., 2003; Nikopoulos & Keenan, 2004) have shown promising results when utilized under specific environmental conditions. Video modeling and video feedback have been shown to produce effective results in various applications from its initial setting involving those affected by autism to a more novel area involving the athletic community (Benitezsantiago & Miltenberger, 2011; Boyer et al., 2009; Charlop & Milstein, 1989; Guadagnoli et al., 2002; McKenzie & Rushall, 1974; Nikopoulos & Keenan, 2004; Stokes, Luiselli, & Reed, 2010).

While there is some research in support of video modeling and video feedback, it is limited in the world of sports. The most recent research supports the use of video modeling and video feedback and its application with sports including martial arts (Benitezsantiago & Miltenberger, 2011), gymnastics (Boyer et al., 2009), tennis (Emmen et al., 1985), golf (Guadagnoli et al., 2002), and football (Stokes, Luiselli, Reed, & Fleming, 2010). With promising results in an array of sports, one sport that remains uninvestigated is boxing. Similar to gymnastics and other sports, boxing requires a combination of skill sets, understanding,

comprehension, practice and technique. Most important, the fundamentals of boxing are imperative in creating a foundation for any extension of skill and application. In investigating the fundamentals of boxing, basic combinations are performed which include demonstrating various critical factors including body position, weight distribution, and critical pivotal and static movements.

Early research on improving athletic performance began with a study focused on enhancing attendance and participation for swimmers on a competitive swim team (McKenzie & Rushall, 1974). Specifically, this study utilized public self recording to show a reduction in the rates of swimmer's who were absent, late or left early from daily scheduled practices. Further research evaluated the effectiveness of public posting of whether or not members of a college football team met their personal self set goals, supporting evidence of successfully applying behavioral approaches to the athletic community (Ward & Carnes, 2002). Recent research suggests feedback appears to be most effective when it is presented both publicly and privately, when it is used to compare the previous history of an individual rather than comparing performance to another individual, and when it is compared to a standard (Alvero et al., 2001). Additionally, studies suggest goal setting is strengthened when goals are made public and when they emphasize short term immediate outcomes (Locke & Latham, 1990). Smith and Ward (2006) extended research in the field by investigating goal setting and performance feedback as behavioral techniques to improve sports performance. Overall, each intervention showed improvement from the baseline measurements, which supports the notion of goal setting and public posting with verbal feedback as improving performance (Smith & Ward, 2006). Furthermore, several studies have examined the use of behavioral coaching to determine its effectiveness with sports such as football, gymnastics, and tennis (Allison & Ayllon, 1980).

With each of the sports, three specific aspects were identified to increase skill level. Similar findings among all three sports indicated that the behavioral procedure showed greater effectiveness in increasing skill acquisition for the three skills assessed than normal instructional methods (Allison & Ayllon, 1980). These studies supported use of behavioral coaching to increase skill acquisition, yet one specific limitation considered the extensive amount of time taken to complete the process.

A more recent behavioral approach to modifying athletic performance incorporates procedures known as video modeling and video feedback. Video modeling involves showing a participant an errorless model of the target behavior via video and then asking the participate to imitate this target (LeBlanc et al., 2003) Researchers initially used this method for teaching perspective-taking skills and social initiations, and maintaining conversational skills to children with autism (Charlop & Milstein, 1989; LeBlanc et al., 2003; Nikopoulos & Keenan, 2004). The research suggests that this process may be effective because the use of video may serve as an effective medium for engaging the children affected by autism. Additionally, with the recorded video, researchers are able to focus in on certain aspects of the training and fade away from less relevant possible distractions (LeBlanc et al., 2003).

Recent studies have also demonstrated the efficacy of video modeling and other behavioral techniques in various fields of athletics including swimming (McKenzie & Rushall, 1974), tennis (Emmen et al., 1985), golf (Guadagnoli et al., 2002), football (Allison & Ayllon, 1980; Smith & Ward, 2006; Stokes, Luiselli, & Reed, 2010; Ward & Carnes, 2002), basketball (Kladopoulos & McComas, 2001), and gymnastics (Allison & Ayllon, 1980; Boyer et al., 2009) These studies indicate video modeling was effective in improving skills among athletes. Often used in conjunction with one another, video feedback involves a process where the athlete views

a videotaped portion of his or her own performance of a particular skill, while video modeling includes the athlete viewing a video clip of an expert performing the skill (Boyer et al., 2009; Hazen, Johnstone, Martin, & Srikameswaran, 1990). Boyer et al. (2009) examined the effectiveness of using video modeling by experts with video feedback on the improvement of three gymnastics skills. The participants included competitive gymnasts, with ages ranging from 7 to 10 years old. In baseline and intervention, the coach continued about his usual coaching procedure that included verbal feedback after the athlete dismounted from the apparatus. In the video modeling by experts with video feedback phase, upon completion of the task, the athlete walked to the computer and received verbal feedback from the computer technician. The athlete viewed the computer on the left that showed an expert performing the skill followed by her own clip on the computer on the right hand side. The athlete then viewed both clips at the same time while the technician paused the routines at several points throughout in order to compare the two processes. The gymnast then watched the expert model alone and her own clip alone one more time before attempting the routine again. The results of this study showed that this procedure improved skill performance more rapidly than the normal method of coaching. Video modeling and video feedback could help reduce the number of practice sessions necessary for athletes to acquire a certain skill set thus making these procedures less time consuming than typical coaching procedures (Boyer et al., 2009).

Benitezsantiago and Miltenberger (2011) investigated the use of video feedback to improve three skills in martial arts. These movements were defined in a 15 step process and scored as either correct or incorrect. During intervention, participants were filmed three times after their regular practice routines. After each attempt, the participant watched the film with the instructor using video features such as the pause, slow motion and replay. The instructor also

provided verbal feedback while replaying the video clips. Another condition consisted of video feedback with practice. Results of this study showed that video feedback increased skill performance to levels above baseline. Additionally, this study suggests that video feedback may be more effective than normal instruction in reducing the amount of time necessary to teach a skill based on increases in performance upon initial implementation. However, participants did not consistently reach 100% skill accuracy. Limitations to these findings include the level of difficulty of each step that made up the three target behaviors. It was suggested that certain portions of the movements may have been too difficult on a physical level for participants to perform considering their novel experience in the sport.

Additional findings have supported the use of video for improving pass blocking skills in high school football players(Stokes, Luiselli, Reed, & Fleming, 2010). In this study, blocking was defined in a 10 step task analysis. The dependent variable was the percentage of correct steps during a practice pass blocking drill. The coach observed each participant during the drill and recorded a plus or minus as to whether or not he competed that step correctly. The study included a baseline phase, descriptive feedback phase, and descriptive feedback plus video feedback phase. Four of the five participants also received TAG training. This refers to an audible noise being sounded when the participant has correctly performed a particular task on the skill set which he was previously having difficulty performing. In the descriptive feedback phase, baseline coaching procedure remained in effect but the coach showed the completed 10 step task analysis to the player following the drill. The coach would then review the steps that the participant did correctly and provide praise when pertinent. Incorrect task performance was elaborated upon by using instruction, modeling, and physical prompting to demonstrate the correct procedure. In the descriptive feedback plus video feedback phase, descriptive feedback

continued as it was previously implemented and video feedback supplemented the training. In addition to the descriptive feedback, each player would watch a videotape of the practice drill that he had just completed. The coach and the player would then rate performance based on the videotaped observation of the drill. After review of the videotape, the player would then perform the pass blocking drill by himself. As mentioned, in the TAG phase, an audible noise is sounded to show that a desired behavior had occurred in the process. During this phase, the coach informed each participant that specific steps would be "tagged" as they went through the drill. Upon successful task completion, the coach would sound a bullhorn to signify to the player that he had performed that aspect of the drill correctly. Results to this study showed that the descriptive feedback alone phase showed no improvement in pass blocking. The descriptive feedback and video feedback condition proved to be the most effective procedure showing improvement in all five participants. With TAG, correct blocking continued to increase but due to the short nature of the assessment, it is hard to show specific effects. Relative to the social validity of this study, the players also rated the descriptive feedback and video feedback condition to be their most favorable out of all of the phases. In addition, this study conducted social validity measures which indicated that the football players preferred the use of video modeling and feedback in comparison to other phases of the study that incorporated different procedures (Stokes, Luiselli, Reed, & Fleming, 2010).

Given the success of video modeling and video feedback, in addition to the need for interventions that incorporate technology to both improve skills and decrease the length of time needed to acquire skills, this study extends the use of video modeling and feedback to the sport of boxing. Similar to gymnastics, tennis, golf, and football; boxing is a sport that requires individuals to practice, understand, and focus on certain aspects in order to acquire the basic

fundamentals. This study utilized video modeling and video feedback to help individuals learn three basic combinations in boxing.

METHOD

Participants and Setting

Two typical functioning children at the novice level of boxing participated in the study. Mercy was a 4 year old female who had no previous exposure to boxing instruction. Antonio was a 15 year old male who began training on his own, and had minimal exposure to instruction, only in the form of routine coaching and verbal feedback. The novice level was defined as individuals who have little to no previous exposure to instruction and those identified by a professional as those who may benefit from further instructional methods exceeding the normal routine. Participants were informed of the opportunity to participate in the study by one of the trainers and owner of the gym. The inclusion criteria for the participants were that they were current members of the gym and expressed an interest in learning the sport, with minimal previous exposure to boxing instruction. Despite her age, Mercy was extremely familiar with the sport through regularly accompanying her three older brothers who practiced in the gym everyday and competed in amateur competitions throughout the nation. Antonio began training at the gym on his own over the summer, to facilitate conditioning for the upcoming school year. The study was conducted in a local boxing gym. The gym area contained a professional size ring, free weights, and hanging heavy bags throughout the facility.

Materials

The materials that were used included a digital video camera to record the participants performing the skill. Video recording software, Eagle Eye Proviewer, was also used to compare, replay, and focus on certain aspects of the performances. Features included in thesoftware were

dual display screens to compare two videos, slow motion replay, freeze frame capabilities, and a timer display. A Sony Vaio laptop or an Apple Ipad was used to view and analyze the recorded observations. Expert clips were video recorded at the gym, to facilitate the video modeling aspect of the intervention. Professional boxer and super bantamweight, Jorge "King" Diaz, 17(10)-1-0, of New Brunswick, N.J., performed the three target behaviors, emphasizing each component step to provide relevant content specific to this particular study.

Target Behaviors & Data Collection

The target behaviors included three separate boxing combinations. The combinations are considered elementary and fundamental in learning how to box effectively according to the professionals and coaches interviewed in the field. The overseeing professionals included a trainer who had trained two World Boxing Council (WBC) World Champions, a North American Boxing Federation (NABF) World Champion, 15 International Pro's, as well as 75 Amateur fights with a record of 65-10 and a former world featherweight champion with a record of 213-16. Each trainer was aware of the study and the corresponding combinations being taught to provide consistent opportunities for each of the participants upon presentation of the mitts for each of the combinations. The first combination consisted of the following: Jab, Straight Right, Left Hook. The second combination consisted of the following: Jab, Straight Right, Left Hook, Straight Right. The third and last combination taught included the following: Jab, Straight Right, Left Hook, Left Uppercut. A task analysis was developed that operationally defined each component step of each combination (See appendixes A, B, and C for the three task analyses). The task analysis checklist for each combination was used to score whether a component step was completed accurately. Each component step was scored as either a yes or no on the checklist. A percentage of the target behavior completed correct was calculated for

each trial by counting the number correct and dividing by the number of component steps then multiplied by 100.

Assessments in all phases were conducted before the normal practice routines and occurred 2 - 3 times per week for each participant. All sessions were videotaped. In each phase, the participant attempted each combination at least three times. For intervention, the first attempt at each combination was not scored but was used only as a comparison for the video feedback portion.

Additionally, reaction time was recorded using a stopwatch feature of the video analysis software to evaluate the fluency of each combination as the study progressed. While viewing video footage of each participant performing the skill sets, trained observers recorded the length of time that passed from presentation of the mitt each time it was presented by the trainer, to the completion of the particular combination by the participant. In baseline, reaction time was recorded for each attempt at each combination. During intervention, reaction time was also recorded for each attempt at each completion of each combination.

Experimental Design and Procedure

A multiple baseline design across participants was used to evaluate the effects of video modeling and video feedback on advancing skill acquisition for boxing combinations for each participant. For Mercy, a hybrid design that included multiple baselines across behaviors was also incorporated.

Baseline. Baseline data was recorded for the three combinations under normal practicing conditions. Assessments were conducted prior to typical practice conditions. Before practice, a professional and the researcher called the participant over and said, for example, “Mercy, come here I want to see you do combination I: a jab, straight right, left hook.” The participant then

walked to the researcher and performed combination I: a jab, straight right, left hook. Mercy was then asked to repeat this combination two more times. Immediately following completion of combination I, the researcher delivered the same instructions for combinations II and III. The participant then repeated each combination multiple times consecutively. Participant performance was video recorded and scored based on accurate completion of component steps. Upon completion of all three combinations, the participant was told to return to his/her practice routine. Normal practice conditions included instruction in the form of modeling the designated movement, rehearsal and providing verbal feedback. During all phases, the trainer was asked to not provide verbal or gestural prompts that direct punches toward each mitt, so as not to interfere with the effects of video feedback and video modeling.

Video Modeling by Professionals with Video Feedback. Similar to baseline, all assessments were conducted before the normal practice routine. During initial implementation of intervention for combination I, for example, a professional and the researcher said "Mercy, come here I want to see you do combination I: a jab, straight right, left hook." Mercy then walked to the researcher and performed combination I: a jab, straight right, left hook. Upon completion of the combination, the participant walked to the researcher and reviewed the video of herself with the trainer who additionally provided positive and corrective verbal feedback on her performance. This video performance was then compared with that of the professional via video analysis software using features such as pause, freeze frame, fast forward, and replay. The participant was able to view the side by side comparison on a computer screen.

The participant was then asked to attempt the target behavior with the trainer 8-10 times. After completion of combination I, the participant was asked to perform combination II and combination III. During initial implementation of treatment for combination I, no feedback for

combination II and combination III was provided. Feedback for combination I consisted of verbal feedback in the form of verbal compliments, as well as video feedback that included utilizing video software features such as side by side comparison and slow motion.

For Mercy, after intervention for combination I showed an increase in skill level, intervention for combination III, was implemented where the same instructions were applied. The participant was provided feedback via video modeling and video feedback on combination III, as well as on the previously trained combination I. The participant was then asked to complete combination II after combination I and combination III had been concluded.

For Antonio, considering his level of skill reflected in the baseline measures, his initial treatment phase consisted of implementation of intervention for combination III. These conditions were the same as those applied to Mercy during her initial treatment phase. All sessions were recorded and scored for performance based on the task analysis for each particular combination.

Interobserver Agreement

Interobserver agreement (IOA) was evaluated based on the results from the task analysis of each target behavior across phases. Each target behavior consisted of a number of steps that were marked as either correct or incorrect based on video that was recorded for 33% of the participants' scored attempts throughout phases. Independent observers were asked to score each step as either correct or incorrect based on recorded video of each of the participant's performance. A percent of agreement was calculated by dividing the number of agreements for each of the component steps by the number of steps which made up the task analysis for each target behavior, multiplied by 100. For Mercy, a mean percentage of agreement of 93%, 96%,

and 96% was recorded across each phase, respectively. For Antonio, a mean percentage of agreement was recorded at 95% for the baseline phase and 96% across the intervention phase.

Social Validity

A social validity questionnaire was given to each participant at the end of the study. Participants rated a total of 10 questions on a five point likert scale. Questions consisted of participants rating how much they enjoyed the video modeling and video feedback process, how much time the process took, and how effective the process was in teaching each skill (see Table 1 for the social validity survey).

On the social validity questionnaire, both participants stated that they liked using video modeling and video feedback to learn the combinations. Antonio strongly agreed that he could complete all three combinations and felt comfortable doing each one. Mercy also agreed that she could complete all three combinations. (See Table 1 for results)

RESULTS

Results for the study are presented in figures 1 & 2. Overall, figure 1 shows that video modeling and video feedback increased the average percentage of correct steps for both of the participants upon implementation.

For Mercy, video modeling and video feedback implemented with combination I showed the greatest increase in skill level. In baseline for combination I, Mercy's percentage of steps performed correctly did not exceed above 57%. Upon intervention for combination I, the percentage of steps performed correctly increased to above 80%. With implementation of intervention for combination I, combination II also increased while combination III maintained at baseline levels. Additionally, upon implementation of the intervention for combination I, combination II seemed to show a high degree of variability in the percentage of steps performed correctly. Consequently, when video modeling and video feedback were implemented for combination III, that combination showed increases in the percentage of steps performed correctly; and both combinations I and II remained high and stable. As a result, no implementation of video modeling and video feedback for combination II was necessary to increase rate of performance for this particular skill set.

For Antonio, baseline levels for combination I demonstrate an average of 70% of steps performed correctly under normal practice conditions. Baseline levels for combination II and combination III show an average level of 47% and 29% of steps performed correctly, respectively. Because levels for combination III showed drastically lower levels than either of the other two combinations, intervention was implemented for combination III. Upon

implementation of video modeling and video feedback for combination III, Figure 1 shows an increase in the percentage of steps performed correctly at above 85% for this particular combination. By the end of intervention, means for each of the combinations were above 90% skill acquisition.

Figure 2 shows the duration of each individual attempt at each target behavior in milliseconds. For Mercy, the duration of each combination dramatically decreased upon intervention of video modeling and video feedback and maintained at a level almost three times faster than baseline. For Antonio, baseline levels were extremely low and actually increased slightly in duration for each combination upon implementation of the intervention for combination III.

DISCUSSION

The purpose of this study was to teach three basic combinations in boxing using video modeling and video feedback. This study extends research using video modeling and video feedback to improve skill acquisition in athletics by including the sport of boxing into an area of science where behaviorally motivated methods have been proved effective in improving performance. Similar to findings in Boyer et al., in teaching gymnastics, video modeling and feedback increased each of the participants' skill to levels higher than baseline. This supports the findings that the intervention accelerates learning certain athletic skills when combined with normal practice routines (Boyer et al., 2009.).

This study also evaluated multiple dimensions of behaviorally based interventions by incorporating data based not only on a percentage of performance with a task analysis, but also analyzing the duration of each particular boxing combination.

Results showed that upon implementation of intervention for each of the combinations, skill level also increased to a greater level than observed in baseline. For Mercy, baseline levels of skill performance never exceeded 57%. With the initial intervention for combination I, the percentage of correct steps performed increased to above an average of 80%. As mentioned, each of the task lists that were used contained a specific set of steps that were necessary to fulfill the combination. However, each of the target behaviors was similar in that some of the punches taught in combination I were also used in combination III. Combination III consisted of the most advanced combination of elementary steps. For Mercy, baseline levels were at a level where it was necessary to begin with the implementation of combination I. With this, we also saw a

gradual increase in skill level in combinations II and combination III. Because combination II showed a high level of variability, intervention was implemented for combination III. In this phase, it was also necessary to continue to deliver the intervention with combination I in order to maintain consistency and control in measures across phases. With this, we saw a marked increase in the percentage of performance for combination III, while combination I maintained its increased as with the previous phase. Combination II increased and stabilized at a greater level than that of baseline, without its specific intervention. This may be due to the fact that the specific punches taught in combination I and combination III, were also a portion of the necessary steps for combination II.

For Antonio, baseline levels were higher, than those demonstrated by Mercy. Possible explanations for these results could be related to his age and any previous involvement in sports, which potentially facilitated development of general athletic ability. Based on the high level of skill across combinations in the initial phase of data collection, implementation of intervention began with video modeling and video feedback for combination III.

As mentioned, combination III served as the most advanced combination of each of the target behaviors. With intervention for combination III, the percentage of correct steps performed increased immediately to a level almost twice that of baseline measures. Additionally, upon implementation of the specific intervention for combination III, both combinations I and combination II also increased to similar levels which maintained throughout the remainder of the study.

In baseline for Antonio, combination II significantly drops from a level of 60% to 30%. During the course of data collection, it should be noted that Antonio began football which compromised his availability to train at the gym and caused a brief pause in data collection. This

interference may have adversely affected baseline measures based on the significant decline in skill level for this particular combination.

An important aspect to consider in looking at the study includes the vast age range in participants selected for intervention. This obvious difference in age made each participant unique in application of intervention. Additionally, the diversity in age range helps to potentially facilitate generalization of similar results to a wider population of individuals. For Mercy, intervention for combination I and combination III were necessary and implementation took longer to reflect any significant change in the level of acquisition. Antonio, however, showed immediate change upon single implementation of combination III which may be reflective of both his age and experience in boxing. Additionally, some of the video recordings were difficult to score for interobserver agreement because of the nature of the recording method and the fluid environment of the gym.

In measuring reaction time, results were recorded in milliseconds, which showed a high degree of variability from one trial to the next. Additionally, Figure 2 shows a slight increase in duration for Antonio upon implementation of intervention. It should be noted that the increase is minimal with a measuring unit as specific as milliseconds. Additionally during baseline, Antonio seemed to be rushing each of the punches without acknowledging key components in accuracy. Upon intervention, Antonio was able to focus more on completion of accurate steps in each combination and was asked to not worry about how fast the punches were delivered.

Social validity measures showed that both participants liked using video modeling and video feedback to learn the combinations. Antonio strongly agreed that he could complete all three combinations and felt comfortable doing each one after video modeling and feedback. Although Mercy was only 4 years old she also rated video modeling high and felt confident about completing the combinations after intervention.

Video recording took place during normal gym hours, where regular clients maintained their normal workout routines. This created some difficulty in delivery of intervention but strengthens the applicable nature of the study in generalizing to the real world. Future research might consider using a video camera that is in a fixed location with a clear and stable view of the particular behavior of interest. With similar results to those shown in the study focusing on martial arts (Benitezsantiago & Miltenberger, 2011), future research may evaluate the need for both video modeling and video feedback in accelerating skill levels, where video feedback or video modeling alone may have created the same results. Future research using video modeling and video feedback should extend to include the adult population and possibly evaluate alternative and more complex sets of combinations than the combinations chosen for this study.

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Table 1

Social Validity Questionnaire

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I liked the procedure.				2	
2.	The procedure took too long.		1	1		
3.	I felt the procedure was helpful in learning the movements.				1	1
4.	I liked using video feedback to learn the movements.				2	
5.	I can do combination II.					2
6.	I feel comfortable doing combination III.			1		1
7.	I can do combination I.					2
8.	I feel comfortable doing combination II .			1		1
9.	I can do combination III.					2
10.	I feel comfortable doing combination I.			1		1

Notes. Numbers based on participant responding post intervention

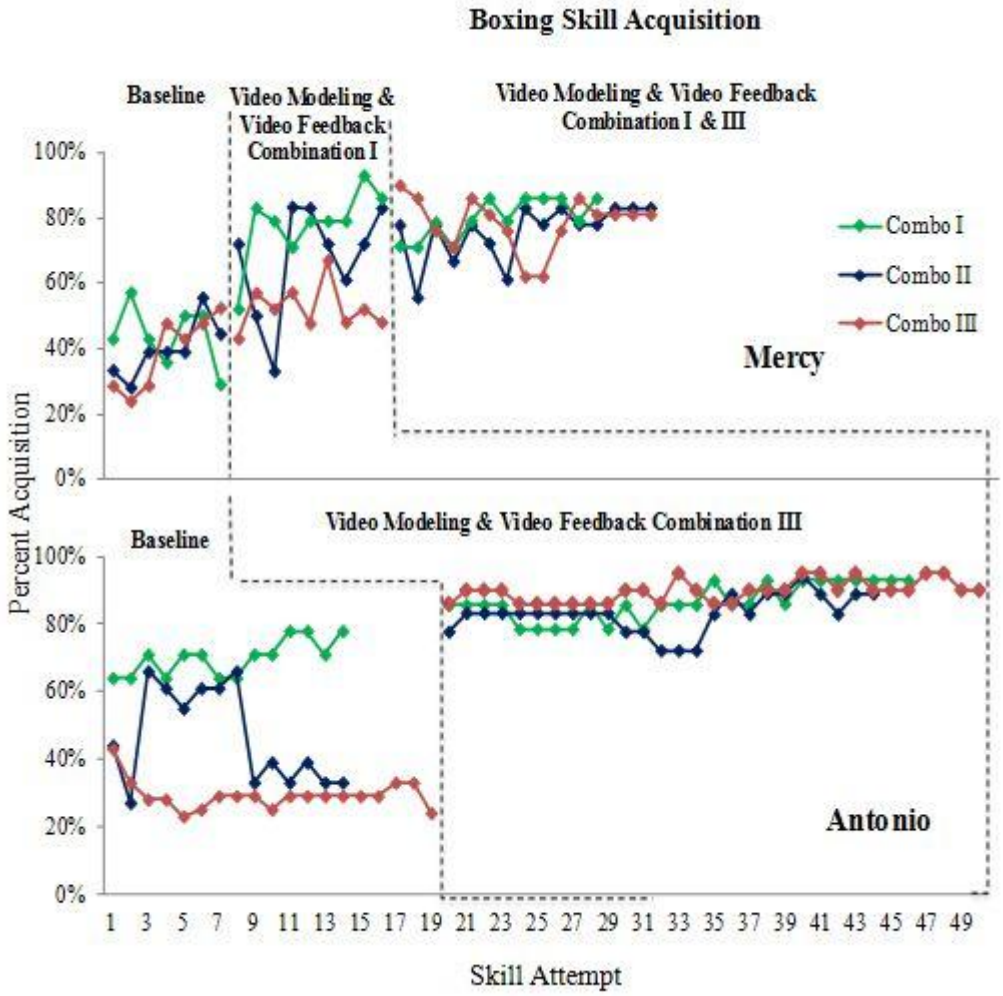
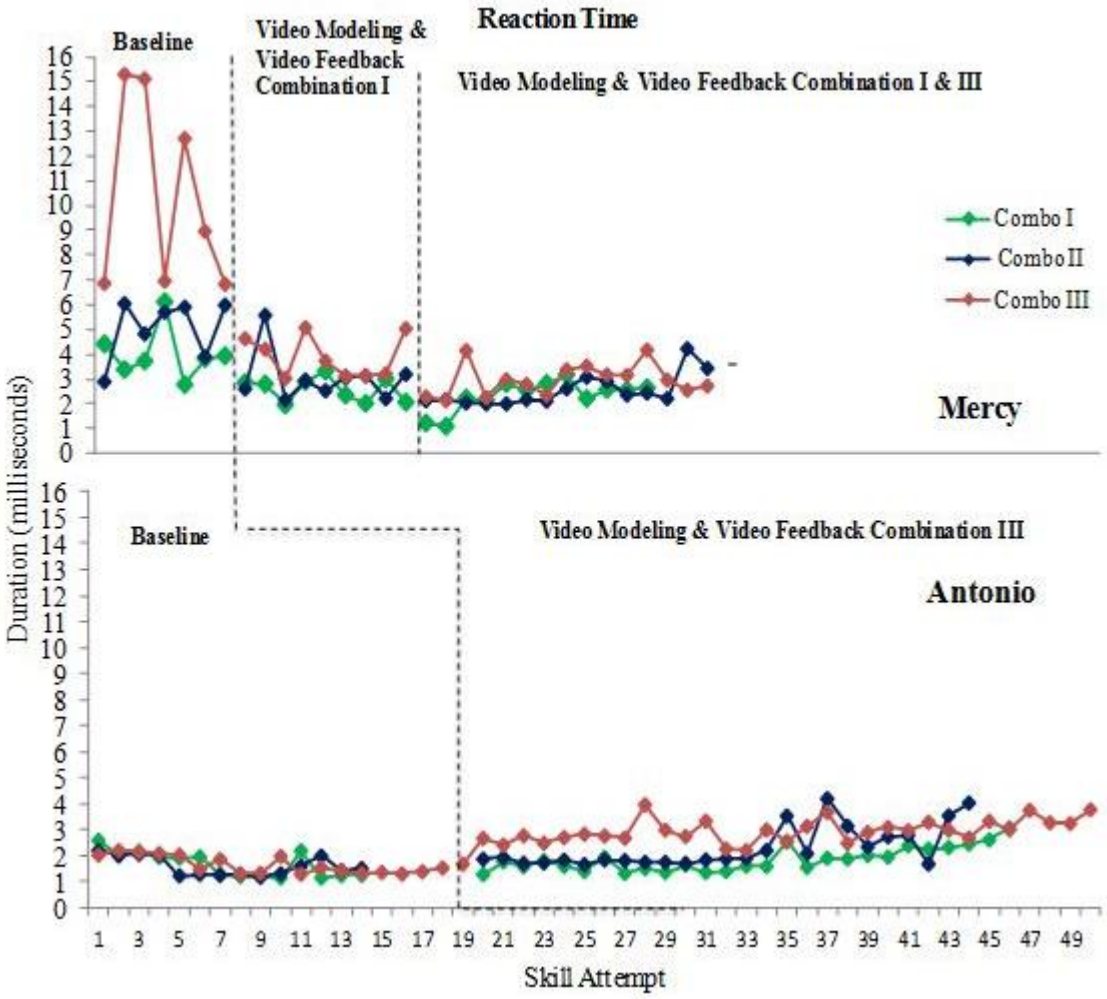


Figure 1. Percentage correct skill performance across subjects.



F*igure 2*. Reaction time in milliseconds per skill attempt.

APPENDICES

APPENDIX A: Combination I Checklist

Individual Punch	Jab, Straight Right, Left Hook: Was this combination completed correctly?	Correct	Incorrect
	1) Feet placed shoulder width apart:		
	2) Front foot pointing forward, back foot at approximate 45 degree angle		
	3) Hands up position		
Jab	4) Extend left hand forward		
	5) Return to hands up position		
Straight right	6) Turn hips in forward motion		
	7) Pivot back foot		
	8) Extend right hand straight forward		
	9) Return to hands up position		
Left hook	10) Shift weight to left side		
	11) Left elbow is brought up so it is almost parallel with the floor (arm should form a hook shape at this stage)		
	12) Turn body in clockwise motion by pivoting back and front foot		
	13) Rotate fist and extend left hand toward mitt		
	14) Return to hands up position		

APPENDIX B: Combination II Checklist

Individual Punch	Jab, Straight Right, Left Hook, Straight Right: Was this combination completed correctly?	Correct	Incorrect
	1) Feet placed shoulder width apart:		
	2) Front foot pointing forward, back foot at approximate 45 degree angle		
	3) Hands up position		
Jab	4) Extend left hand forward		
	5) Return to hands up position		
Straight right	6) Turn hips in forward motion		
	7) Pivot back foot		
	8) Extend right hand straight forward		
	9) Return to hands up position		
Left hook	10) Shift weight to left side		
	11) Left elbow is brought up so it is almost parallel with the floor (arm should form a hook shape at this stage)		
	12) Turn body in clockwise motion by pivoting back and front foot		
	13) Rotate fist and extend left hand toward mitt		
	14) Return to hands up position		
Straight right	15) Turn hips in forward motion		
	16) Pivot back foot		
	17) Extend right hand straight forward		
	18) Return to hands up position		

APPENDIX C: Combination III Checklist

Individual Punch	Jab, Straight Right, Left Hook, Left Uppercut Was this combination completed correctly?	Correct	Incorrect
	1) Feet placed shoulder width apart:		
	2) Front foot pointing forward, back foot at approximate 45 degree angle		
	3) Hands up position		
Jab	4) Extend left hand forward		
	5) Return to hands up position		
Straight right	6) Turn hips in forward motion		
	7) Pivot back foot		
	8) Extend right hand straight forward		
	9) Return to hands up position		
Left hook	10) Shift weight to left side		
	11) Left elbow is brought up so it is almost parallel with the floor (arm should form a hook shape at this stage)		
	12) Turn body in clockwise motion by pivoting back and front foot		
	13) Rotate fist and extend left hand toward mitt		
	14) Return to hands up position		
Left uppercut	15) Keep hands up in hands up position (elbows in , chin down, arms tight)		
	16) Lower your left shoulder to drop the left side of the body in a semi-crouch position by bending the left knee more.		
	17) Now drop your left hand about 4 inches away from your body keeping your thumb up. Transfer your weight to the left leg by bending that knee putting your head almost over your left knee.		

	18) Now pushing on the ball of your left foot rotating the heel out drive up driving your left knee across the front of your body like the hook		
	19) Rotate fist so thumb faces outward and palm faces toward you.		
	20) Extend left fist in upward motion while driving body mass up with legs.		
	21) Return to hands up position		