AUDITORY & VISUALIZATION INTERVENTIONS ON VERTICAL JUMP IN COLLEGIATE VOLLEYBALL PLAYERS

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MVSC 580

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# CHAPTER ONE

## Introduction

There are many different styles of coaching these days. Most coaches try and motivate their athletes before practices and competitions with an auditory stimulus, but what good does that really give their athletes? The present study will examine the differences between verbal encouragement and visualization techniques to achieve maximal performance in collegiate volleyball players. Currently, little research has examined the effects of imagery and visualization among competitive athletes and how each relates or improves performance.

Our brain is capable of many things, and within the brain is a group of visuomotor neurons that help make up the motor resonance system. It has four main functions: to understand the action, to understand the intention, to enable imitation, and to understand behavioral state (Ives, 2014). Imagery can be used for two main purposes, skill acquisition, which involves the learner modeling the motor skill in their mind over and over again. This then leads to the second purpose, performance preparation. Imagery without physical practice is only half as successful, whereas imagery with physical practice is generally better than physical practice alone (Anwar, Tomi, & Ito, 2011; McEwen, Huijbregts, Ryan, & Polatajko, 2009).

Three main characteristics exist in the imagery process: perspective (internal and external), viewing angle, and the dominant sensory modality. The internal perspective is when someone views himself or herself in the first person as they would in real life. This technique will be used in the study through the visualization intervention set by the researcher. The viewing angle is the picture they visualize of doing the actual skill. This particular characteristic seems to be dependent on the motor skill that is being imagined. The last characteristic, dominant sensory modality, tends to emphasize visual and/or kinesthetic information. Research has shown that even thinking about movements causes a spinal cord facilitatory effect on muscle activation. With this knowledge, imagery scripts must have contextual and detailed information with the intent for the most effectiveness in the outcome (Ives, 2014).

In sport psychology, Holmes and Calmels believe that motor imagery is a valid intervention to compare with observation of movement (2008). Researching to see if this intervention is in fact valid should further the understanding of how visualization and imagery techniques in sports improve athletic performance.

## Problem Statement

The purpose of this quasi-experimental study is to examine the effect of two different training techniques on vertical jump height over time in women collegiate volleyball players.

## Sub-Problems

1. What is the effect of a visualization technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time?
2. What is the effect of an auditory motivation technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time?

## Hypotheses

1. No difference exists by visualization technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time.
2. No difference exists by auditory motivation on a vertical jump in collegiate volleyball players as measured by a Vertec device over time.

# Assumptions

1. Volleyball players will comprehend the instructional directions.
2. The Vertec is an accurate measure of vertical jump
3. Vertical jump test is the best assessment of differences between auditory visualization.

## Delimitations

1. This study is limited to collegiate volleyball players at a single university.
2. The researcher will have a scripted visualization technique that will be presented to the volleyball players that will be customized for those specific athletes.
3. The researcher will have a script for verbal encouragement that will be presented to the volleyball players that will be customized for those specific athletes.

## Limitations

1. The results from this study are limited to only volleyball players at this specific university.
2. Data will be taken after subjects have previously exercised for one hour.
3. The results will not apply to other collegiate athletic programs.

## Definition of Terms

Visualization—the ability to imagine a specific skill that will later be performed.

Vertical jump—maximum height reached from a standing position jump without a step.

Imagery—perception that is absent of any external stimulus.

Cognitive imagery—the ability to picture images and skill sets in one’s mind.

Collegiate volleyball player—competitive volleyball player at a Division I university in Idaho.

## Significance of Study

The importance of this quasi-experimental study is to examine the effect of different training techniques on jump height. If it can be found that different training techniques improve height then athletes and coaches could help improve sport specific skills, such as a vertical jump in volleyball. Visualization may help improve performance. If the hypotheses are incorrect, the findings will support visualization as a coaching practice. Few studies currently exist utilizing a visualization technique in training for any sport, let alone volleyball. If the results support visualization as a training technique, coaches, athletes, athletic trainers, and the general public could benefit in maximizing performance.

Visualization could also be used for rehabilitation to help encourage athletes to do their best and push them within their limits of their injury. Coaches would also be able to use this technique during practices and help their athletes by giving cues based on the visualization technique practice in a game-like situation.

# CHAPTER TWO

## Review of Literature

### Imagery and Athletes: Performance

Little research has examined the use of imagery or visualization in athletics and what the outcomes of that strategy are on performance. Imagery means using all of the senses to rehearse actions in the mind (Association for Applied Sport Psychology, 2015). Imagery and visualization are used in athletics because they will help athletes get the most out of training and they help keep athletes in “top form when training is not possible” (Association for Applied Sport Psychology, 2015). Gregg, Hall and Nederhof (2005) believe that people must have the ability to imagine specific tasks in order for it to benefit them. They list five different types of imagery techniques that can be related to performance enhancement. The five types are ‘cognitive general’ in which one must mentally rehearse strategic plans, ‘cognitive specific’ is the actual mental rehearsal of the skill, ‘motivational general-arousal’ which involves imaging the arousal and anxiety associated with performance, ‘motivational general-mastery’ which is the ability to feel in control and feel confident, and ‘motivational specific’ is feeling accomplishment from imaging a goal being met (Gregg, Hall & Nederhof, 2005). Hall mentions that if an individual is a better imager, it will help aid in their performance or skill. It is suggested that ‘cognitive specific’ imagery is positively correlated with performance improvements. The more an athlete can use imagery in sport, the better imagers they will be in the future. Cumming and Hall (2002) have also found that the relevance of imagery is no different between competitive athletes and recreational athletes. The only differences would be that competitive athletes would use imagery to improve performance where recreational athletes for their own personal gain. An interesting point made by Peluso, Ross, Gfeller, and LaVoie (2005) was that many athletes want to gain that “mental edge” over their opponents, which will in turn give them more of an advantage. This is an excellent point to consider because using imagery can enhance the level of one’s concentration, focus, and arousal, and will get them excited. They will think they have more of an advantage over their opponents because they will not think that the competition would use an imagery technique before a game. This is why imagery is becoming more common and popular among athletes and sports teams.

In any kind of athletic setting, athletes develop motor learning skills. The theory behind motor learning has evolved from differing perspectives. As mentioned by Schmidt (1988) in Jarus’ article *Motor Learning and Occupational Therapy: The Organization of Practice* (1994), motor learning is viewed as a ‘schema’ that “serves as the memory representation for a class of movements, rather than for any one action or movement.” In other words, motor learning is taking what we visualize or watch and replicating the movement or action. In volleyball, athletes must have excellent timing in order to block balls and hit balls. Adding imagery or visualization to the repertoire of training could help improve their motor learning therefore improving performance. The difference between motor learning and cognitive learning is that cognition is our ability to process information, reason, remember and relate (Oxford Learning Centres, Inc, 2015).

Another form of imagery that athletes will use is self-talk to help improve their performance. Research has indicated that individuals who engaged in “appropriate” or “relaxing” self-talk made more free throws than an individual who engaged in “inappropriate” or “fast” self-talk (Peluso, Ross, Gfeller, & LaVoie, 2005). With these findings, athletes who are able to incorporate self-talk into their pre-game regimen will benefit from increased levels of awareness, concentration, and performance enhancement.

A study done by Weiss (2008) analyzed self-talk. She examined the effects of self-talk on self-confidence, energy management and stress, and performance pre and post intervention in musicians. Each participant was taught the definition of self-talk and was encouraged to track their thought patterns throughout the day and count their negative thoughts. She had each of the participants write down statements that highlighted their attributes and strengths as musicians. Thought stopping was also taught to the participants to help them refrain from negative thoughts and turn them into positive thoughts. Participants were asked to develop cue words or phrases to remind them how to play or sing specific pieces. Each of the participants would memorize the words or phrases and repeat them silently before actually playing or singing the piece. Weiss instructed each of the musicians to practice and apply the strategies on a daily basis. Her results were not supported by her data to enhance a musicians’ ability to perform well under pressure. However, her results supported musicians’ ability to reduce cognitive and somatic anxiety. Although self-talk did not improve the musicians’ ability to perform, “the review of sport research demonstrated self-talk to be effective for enhancing competitive performance” (Weiss, 2008).

### Auditory Motivation and Performance

A common method, used by coaches in most athletic events, is the use of verbal encouragement or auditory motivation. There are many different kinds of coaching styles, and some may not include a lot of verbal encouragement, but in order to achieve a greater level of performance, positive encouragement is needed. A study done by Andreacci, LeMura, Cohen, Urbansky, Chelland and Duvillary (2002) researched the effects of verbal encouragement while performing a maximal exercise test. They split 28 individuals into two groups and had them both perform a VO2 max test. The pre-test did not include any verbal encouragement for either of the two groups, but during the second test, the control group received no verbal encouragement and the test group received verbal encouragement every 20, 60, and 180 seconds. The main finding was that verbal encouragement during maximal exercise testing alters several metabolic and cardiovascular variables. The results showed that there were increases in responses every 20 and 60 seconds, but at 180 seconds there was not much of an effect. With these results, verbal encouragement has shown that it is beneficial during performance. There would also be a difference in the type of verbal encouragement one would give their athletes. In a study done by Andreacci et al. (2002), only positive encouragement statements were used. They stated that the “positive reinforcers might be considered response contingent reinforcers that helped maintain the running response.” Another study by McNair, Depledge, Brettkelly, and Stanley researched the effects of verbal encouragement on voluntary muscle action. In this study, participants were performing an isometric exercise of the elbow flexors and researchers would use words like “come on, you can do it,” as encouragement. Participants were also attached to an electromyograph (EMG) to measure muscle activity of the biceps brachii. The researchers concluded that there was a 5% increase in peak force when given verbal encouragement. An interesting find, though, was that there was no change in EMG activity (1996). Research appears to be limited on this subject, but from the little research accomplished, there seems to be a positive correlation between verbal encouragement/auditory motivation and performance.

### Science behind Imagery

The brain is a very powerful tool that athletes use in competition. Many athletes might not even consciously realize they are using their brain to compete. When athletes do think about what their brain is capable of during a competition, the possibilities of reaching a higher potential is much greater. If an athlete is able to visualize or use imagery as an extra tool for competition, they might be able to improve their performance.

Imagery takes place in the primary visual cortex of the brain. Evidence shows that the supplementary motor area and the primary premotor cortex are active during movement-based imagery (Holmes & Calmels, 2008). The cerebellum is also a contributing factor to imagery and visualization. During motor imagery, the cerebellum is responsible for somatosensory feedback of movement as well as spatial and temporal control of the movement (Holmes & Calmels, 2008). This means that the cerebellum contributes in the fine motor movements and the ability to subconsciously feel when an individual imagines a specific motor skill. In accordance with imagery, these areas of the brain are also used in performance. Some of the neural associations between imagery and physically executed behavior can be seen in athletics. For instance, if one can visualize a free throw shot before actually executing it, when the time actually comes to perform this task, they can refer to their image in their head of shooting a free throw and apply that to reality. If they imagine the shot going in, the likelihood of the shot being successful will be greater. Imagery and visualization are multidimensional based on the research of the areas of the brain that are the most responsible for this task.

### \* Imagery and Athletes: Rehabilitation

The emphasis of imagery in athletics has become more common because of the “visuomotor-based nature of the behavior and the implicit association of motor imagery with the kinesthetic component of the imagery process” (Holmes & Calmels, 2008). In other words, imagery is popular because people are able to visualize doing a specific motor movement in hopes of replicating it in reality. Visualization is common for a few other reasons as well. Some use imagery for goal setting, to enhance mental toughness, to manage pain, and to help maintain concentration and keep a positive attitude (Driediger, Hall & Callow, 2006). In a study by Driediger, Hall and Callow, they used imagery to deal with expected pain from an injury, as a distraction, as a way to imagine the pain being dispersed, and also block plain. They used these techniques on injured athletes to help facilitate rehabilitation of their injury (2006).

# CHAPTER THREE

## Methodology

*Problem Statement*: The purpose of this experimental study is to assess the differences between auditory motivation and taking time to visualize motor skills to achieve maximal performance in a vertical jump among collegiate volleyball players.

## Subjects

Participants were recruited for this study from a small Division I university in Idaho. These participants competed on the university’s NCAA collegiate volleyball team for the 2014-2015 school year. They were between the ages of 18 to 22.

## Protecting Participants

Institutional review board approval (15-633) was sought and all participants signed an informed consent form that also listed any possible risks. Participation in the study was not mandatory and they could resign from the study at any time.

## Procedures

This is a pre-test intervention post-test design with a convenience sample; subjects were placed into two separate groups. After consent, group 1 was given an auditory motivation stimulus to jump as high as they can from a two-feet standing position and measurements will be taken with a Vertec device. Group 2 used a visualization technique and then they will do a vertical jump measured by the Vertec. The subjects performed three jumps based on their intervention and the highest jump was recorded, and the process was repeated twice weekly for three weeks. At the end of the three weeks, all subjects will participate in the opposite protocol for three weeks and data will be collected twice weekly.

## Instruments

### Vertec Device

The *Vertec* is a tool that is used to test leg power in a vertical jump. It is composed of a steel frame with horizontal vanes. As the subject jumps they will hit the vanes to indicate the height reached. Each vane is in half-inch increments. The heights of the vanes are also adjustable determined by the height of each subject.

### Auditory Protocol Script

“You are the outside hitter (or middle blocker) and going up against a 6’5” right side hitter (or middle blocker) for the best team in the nation. It is your job to block this hitter! Visualize yourself at the net and this girl is about to take a swing and you need to jump as high as you can in order for you to block her. The game is on the line, if you block her, the game will be over and you will win the game.”

### Visualization Technique Protocol

“Close your eyes. Imagine that the opposing player is coming into her approach. You are reading the kind of set the hitter is about to receive from the setter and you are positioning your feet for the block. The hitter is taking her approach and you are loading into your block. The hitter is in the air and about to swing, as she makes contact with the ball you are jumping as high as you can. Visualize yourself stuffing the block.”

## Data Analysis

Data will be analyzed using a split-plot repeated measures ANOVA with the alpha level set at 0.05. Tukey’s post-hoc procedure will be used to examine differences by level where appropriate. The dependent variable is the training technique. The independent variable is vertical jump height.

# CHAPTER FOUR

## Results

*Problem Statement:* The purpose of this quasi-experimental study is to examine the effect of two different training techniques on vertical jump height over time in women collegiate volleyball players.

## Statistical Sub-Problem

### Statistical sub-problem one.

Statistical sub-problem one stated: what is the effect of a visualization technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time? A significant difference was found by visual technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time Wilks Lambda F (6, 30) = 3.17, p = .016. In the tests of within subjects contrasts, a significant increase occurred between day 2 (M = 21.8 + 1.9) and day 3 (M= 23.0 + 1.7), while a significant decrease occurred between day 3 (M = 23.0 + 1.7) and Day 4 (21.9 + 2.3). All other time analyses between time periods were not significant.

### Statistical sub-problem two.

Statistical sub-problem two stated: what is the effect of an auditory motivation technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time? No significant difference was found by auditory technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time Wilks Lambda F (6, 18) = 2.1, p = .1.

## Table 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Visual Descriptive Statistics** | | | |
|  | Mean | Std. Deviation | N |
| Baseline | 21.250 | 1.8097 | 6 |
| Int. day 1 | 21.667 | 1.6931 | 6 |
| Int. day 2 | 21.833a | 1.9916 | 6 |
| Int. day 3 | 23.083b | 1.7440 | 6 |
| Int. day 4 | 21.917a | 2.3327 | 6 |
| Int. day 5 | 21.167 | 2.3381 | 6 |
| Int. day 6 | 22.417 | 2.2675 | 6 |

Note 1. Means with different subscripts differ significantly at p <.05.

## Table 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Auditory Descriptive Statistics** | | | |
|  | Mean | Std. Deviation | N |
| Baseline | 20.75 | 2.630 | 4 |
| Int. Day 1 | 21.875 | 1.9311 | 4 |
| Int. Day 2 | 22.250 | 2.1016 | 4 |
| Int. Day 3 | 22.375 | 2.4622 | 4 |
| Int. Day 4 | 22.375 | 1.8428 | 4 |
| Int. Day 5 | 21.750 | 1.9365 | 4 |
| Int. Day 6 | 21.875 | 2.3585 | 4 |

## Discussion of Findings

Interpretations of the statistical results show a significant difference using a visualization technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time when using the Wilks Lambda test. A significance within subjects occurred between day two and three, and day three and four; between days two and three, five out of six subjects increased their vertical jumps; between days three and four, five out of six decreased their vertical jump scores. All other analyses between the time periods were not significant. The subjects exercising for an hour before jumping could have affected these results. Most of the subjects would complain that their workouts on Thursdays are the hardest, especially on their legs. Interestingly enough, day four was on a Thursday, possibly explaining the significant decrease in vertical jump heights.

One of the limitations to this study was the fact that all subjects exercised for at least one hour before jumping. This could have affected the results depending on what kinds of lifts or conditioning they did before jumping. This limitation could have been why the scores were significantly higher between day two and three and also significantly lower between day three and four.

With the little research done on visualization techniques in athletics, it is said that cognitive-specific imagery is positively correlated with performance improvements (Gregg, Hall, & Nederhof, 2005). ‘Cognitive specific’ imagery is the actual mental rehearsal of the skill, which is exactly what the visualization intervention group was asked to do before performing a vertical jump. The participants were asked to close their eyes and visualize themselves reading the ball and setting their feet to load into the block. Then they were asked to visualize themselves stuffing the block. A few of them would talk their way through the process of blocking while still closing their eyes. Once they were about to jump they would say a word that stood out in their mind right before the actual jump. Sometimes saying those cue words would help them and sometimes it would not. This is somewhat like the study done by Weiss on musicians self-talk where she asked her participants to develop cue words or phrases to remind them to play or sing specific pieces (Weiss, 2008). Her results were not supported by her data but the development of the cue words did help reduce cognitive and somatic anxiety. I did not specifically ask my subjects to develop cue words; they did it on their own. Cue words seemed to have helped them through the visualization process and carry it out through their performance. Through observation, the cue words were mainly associated with the specific skill of a vertical jump.

The statistical results also show that there is no significant different using an auditory motivation technique on a vertical jump in collegiate volleyball players as measured by a Vertec device over time using the Wilks Lambda test. This information suggests that using a visualization technique is beneficial in the motor learning process to help improve performance.

Auditory motivation seems to be the technique coaches use in practice and in games. The encouragement they get from them is supposed to motivate the athletes. In this particular intervention group, the motivation was that the game was on the line and if they blocked the ball successfully they would win the game. It was an all or nothing approach. Interestingly enough, these subjects also used cue words, just like the visualization group. The difference between the two groups, however, was the goal they were trying to achieve. While the visualization group focused on using words or phrases such as “ready jump,” or “load and stuff,” the auditory motivation group used words or phrases such as “you’re going down!” or “you better not miss the block,” which had both positive and negative connotations to the meanings of the phrases. These phrases were somewhat similar to Peluso, Ross, Gfeller, and LaVoie (2005) about using self-talk to improve performance. Their data supported the idea of positive self-talk as having better performance than negative or inappropriate self-talk. Referring back to the present study, by observation, positive self-talk would not have been supported. If all my subjects were asked to list cue words, the result might be surprising. Even though this study did not examine, specifically, cue words/phrases and self-talk, they should be incorporated in pre-game rituals to help enhance the potential of better performance.

Research shows that auditory motivation/verbal encouragement is best used during times of performance. The research done by Andreacci, LeMura, Cohen, Urbansky, Chelland, and Duvillary (2002), suggested that verbal encouragement during maximal exercise alters metabolic and cardiovascular variables. This means that verbal encouragement is most beneficial during performance. Another research study that supports Andreacci et al., was done by McNair, Depledge, Brettkelly, and Stanley (1996) on verbal encouragement. Their study also gave verbal encouragement during performance and found that there was a 5% increase in peak force of muscle activity when given verbal encouragement. The motivation, in the present study, occurred before the subjects performed the vertical jump; therefore, supporting the data analysis by not having any significant numbers.

Another possible reason why the auditory motivation intervention group showed no significance was the lack of subjects. There were only four subjects in this group compared to six in the visualization group. The researcher began with five subjects in the auditory group but due to a back injury that subject was disqualified from the study. Ideally, more subjects were needed in each group to have an even ratio. Unfortunately, the study was limited to only nine healthy and eligible individuals at the University of Idaho who fit the criteria.

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# APPENDIX A

## Institutional Review Board Approval

University *of* Idaho

**Office of Research Assurances**

**Institutional Review Board**

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|  |  |
| --- | --- |
| To: | Sharon Stoll |
| From: | Jennifer Walker Chair, University of Idaho Institutional Review Board University Research Office Moscow, ID 83844-3010 |
| Date: | 2/23/2015 1:36:17 PM |
| Title: | Auditory & Visualization Interventions on Vertical Jump in Collegiate Volleyball Players |
| Project: | 15-633 |
| Approved: | February 23, 2015 |
| Renewal: | February 22, 2016 |

  On behalf of the Institutional Review Board at the University of Idaho, I am pleased to inform you that the protocol for the above-named research project is approved as offering no significant risk to human subjects.  This study may be conducted according to the protocol described in the application without further review by the IRB. As specific instruments are developed, each should be forwarded to the ORA, in order to allow the IRB to maintain current records. Every effort should be made to ensure that the project is conducted in a manner consistent with the three fundamental principles identified in the Belmont Report: respect for persons; beneficence; and justice.

This IRB approval is not to be construed as authorization to recruit participants or conduct research in schools or other institutions, including on Native Reserved lands or within Native Institutions, which have their own policies that require approvals before Human Participants Research Projects can begin. This authorization must be obtained from the appropriate Tribal Government (or equivalent) and/or Institutional Administration. This may include independent review by a tribal or institutional IRB or equivalent. It is the investigator's responsibility to obtain all such necessary approvals and provide copies of these approvals to ORA, in order to allow the IRB to maintain current records.

As Principal Investigator, you are responsible for ensuring compliance with all applicable FERPA regulations, University of Idaho policies, state and federal regulations.

 This approval is valid until February 22, 2016.  Should there be significant changes in the protocol for this project, it will be necessary for you to submit an amendment to this protocol for review by the Committee using the Portal. If you have any additional questions about this process, please contact me through the portal's messaging system by clicking the ‘Reply’ button at the top of this message.

  Jennifer Walker

# APPENDIX B

## Consent Form

Auditory & Visualization Interventions on Vertical Jump in Collegiate Volleyball Players

Consent Form

University of Idaho

The University of Idaho Institutional Review Board has certified this project as expedited.

The purpose of this study is to examine the effect of two different training techniques on vertical jump height in women collegiate volleyball payers.

You will be asked to participate in each training technique: auditory motivation and visualization. Subjects will be placed into two separate groups; group 1 will be given an auditory motivation stimulus to jump as high as they can from a two-feet standing position and measurements will be taken with a Vertec device. Group 2 will use a visualization technique and then they will do a vertical jump measured by the Vertec. The subjects will perform three jumps based on their intervention, and will repeat twice weekly for three weeks. At the end of the three weeks, all subjects will participate in the opposite protocol for three weeks and data will be collected twice weekly. The study should take approximately 6 hours.

The risks associated with this study are very few, but include possibly injury to the lower extremities while performing a vertical jump.

You will benefit from this project by possibly improving your jumping technique as well as help us examine the effectiveness of each training technique. Coaches, athletes, athletic trainers and the general public may benefit if this project helps maximize performance while training.

If through the course of this project you sustain a lower extremity injury (deemed by the researcher who is also a certified athletic trainer), participants will be asked to discontinue with the study, and you will be treated immediately.

Any confidential information that you provide will be placed in a secure file with access only made available to myself and my faculty sponsor (Dr. Stoll).

If you have questions about the study, you may ask the investigator at a time you feel is appropriate.

Investigator Faculty Sponsor

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Within the course of this research study, you may stop at any time with no penalty.

If you do stop your participation in the study, there will be no penalties associated with your withdrawal. All you need to say to the investigator is that you no longer wish to participate.

I am 18 years old or older and have reviewed this consent form and understand and agree to its contents.

Participant Name: Date: \_\_\_\_\_\_\_\_\_\_\_

Print \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Experimenter Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# APPENDIX C

## NIH Approval

