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Comparing the Effectiveness of Verbal Feedback Versus Acoustical Feedback Within a Behavior Skills Training Package When Teaching Beginning Yoga Postures to Novice Yoga Practitioners

Molly Rauschl
molly.rauschl@cwu.edu

COMPARING THE EFFECTIVENESS OF VERBAL FEEDBACK VERSUS ACOUSTICAL FEEDBACK WITHIN A BEHAVIOR SKILLS TRAINING PACKAGE WHEN TEACHING BEGINNING YOGA POSTURES TO NOVICE PRACTITIONERS

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by

Molly Robyn Rauschl

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We hereby approve the thesis of

Molly Robyn Rauschl

Candidate for the degree of Master of Science

APPROVED FOR THE GRADUATE FACULTY

_____ _____
Dr. Richard Marsicano, Committee Chair

_____ _____
Dr. Stephanie Stein

_____ _____
Dr. Brian McGladrey

_____ _____
Dean of Graduate Studies

ABSTRACT

COMPARING THE EFFECTIVENESS OF VERBAL FEEDBACK VERSUS ACOUSTICAL FEEDBACK WITHIN A BEHAVIOR SKILLS TRAINING PACKAGE WHEN TEACHING BEGINNING YOGA POSTURES TO NOVICE PRACTITIONERS

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Behavior skills training (BST), composed of modeling, instructions, rehearsal, and feedback, is an efficient and commonly used training package that has been proven effective in fostering behavior change in a variety of learners and with a multitude of behaviors, including those related to health and fitness. Feedback has been deemed a critical component of BST and there are various ways in which feedback can be administered. This study compared the effectiveness and efficiency of providing verbal feedback versus acoustical feedback within a BST package when teaching beginning yoga postures to participants who have never before practiced yoga. No feedback method proved to be significantly more effective or efficient than the other. Future research should replicate this study with additional participants to gather more substantial findings.

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CHAPTER I

INTRODUCTION

The mental and physical practice of yoga is one that has been utilized for thousands of years in the Hindu culture, and one that has recently grown in popularity in the Western hemisphere. The Sanskrit word 'yoga' is defined as the "union of the mind, body and spirit," and is a discipline intended to bring health and balance to each of these dimensions within the individual (Diamond, 2012, p. 16; Ross & Thomas, 2010). Practicing yoga involves connecting postures (physical movements) and pranayama (breathing exercises) to merge the physical body and mind, moving together as a single unit (Eggleston, 2015). The health benefits for yoga are significant; health professionals are beginning to recommend practicing yoga to their patients for a variety of mental and/or physical ailments (Diamond, 2012; Hayes & Chase, 2010). Typically, yoga classes are taught in a group format with a single yoga instructor who provides verbal instructions, often models the proper postures and provides verbal feedback while the students perform various postures (Downs, Miltenberger, Biedronski, & Witherspoon, 2015). A series of postures is usually presented together, so that the movements made in between the postures create a fluid like "flow."

Health benefits that result from the regular (e.g. daily) practice of yoga are remarkable. Ross and Thomas (2010) performed a scholarly comparative review of studies related to yoga and other forms of exercise (such as aerobic exercises involving running, dancing, and stationary biking), and consistently found that yoga is not only equally as beneficial, but potentially more effective to other forms of exercise in improving various measures relating to health and well-being (Ross & Thomas, 2010).

Their research included evidence that certain yoga techniques result in a biological response that physically reverse the negative impacts that stress has on the body. Additionally, yoga has been found to significantly decrease heart rate and blood pressure levels. These bodily responses can lead to the decline of diseases such as obesity, diabetes, autoimmune disorders, menopause, multiple sclerosis, substance abuse, and cardiovascular disease (Daruna, 2004; Diamond, 2012; Ross & Thomas 2010). Further, yoga helps improve physical pain experienced in the muscles and joints, as the postures utilized in the practice can focus on specific ailments and improve symptoms of pain through stretching (Hayes & Chase, 2010)

In addition to the advantageous effects yoga has for the physical body, yoga is also beneficial for mental wellbeing, as it has been proven to increase positive emotions (Ross & Thomas, 2010). Studies have found that those who practice yoga on a consistent basis have shown "decreas[es] in anxiety and increase[d] feelings of emotional, social, and spiritual well-being" (Hayes & Chase, 2010, p. 4). A study performed by Kerr (2000) found that those in the yoga group compared to a control (no yoga) showed higher levels of life satisfaction, extroversion, and openness, and lower levels of excitability and aggression. Further, research suggests the regular practice of yoga boosts self-esteem and academic performance in younger students in various school settings (Eggleston, 2015). Finally, yoga is effective in relieving symptoms of certain mental illness including anxiety, depression, and OCD (Ross & Thomas, 2010).

Because of the ample benefits yoga has for the mind and body, many health care professionals prescribe yoga to patients in primary care as a technique to aid in stress management (Diamond, 2012). "Between 70 and 80 percent of all disease is strongly

related to, if not associated with, stress" (Seward, 2009 p. xix). Given that yoga can be performed anywhere and by nearly anyone (regardless of age, gender, health, etc.), is relatively inexpensive, and has been proven to reverse the effects of stress on the body, yoga is an efficient and cost-effective method of lowering the statistic of patients experiencing stress related challenges (Diamond, 2012; Ross & Thomas, 2010).

The typical format of a yoga class is composed of a single instructor providing verbal instructions and feedback to a group of students. He or she will sometimes provide a physical model of how to properly execute the postures. The setting of a typical yoga studio has a large mirror on the wall in the front of the room for practitioners to observe themselves perform the postures. Often, the environment (i.e. size of class, volume of instructor's voice, etc.) in which the yoga class is taking place can be challenging for individual students to receive proper instruction on how to accurately perform the postures. With less individualized attention, inadequate instruction and feedback can cause and/or worsen previously acquired injury (Fishman, Saltonstall, and Genis, 2009). Often, practitioners must rely on their knowledge of postures if they are unable to observe the instructor modeling and in times where the only instruction is naming the postures in sequence.

As the discipline of yoga becomes increasingly more popular and widely practiced, it is critical for those who employ instruction and feedback do so in a manner that lowers the possibility of injury and assists the student in a safe practice. The evaluation of procedures performed by behavior analysts to improve a safe and healthy practice is paramount, particularly methods that involve providing feedback to an individual within a group setting.

CHAPTER II

LITERATURE REVIEW

Behavior Skills Training

The behavior skills training (BST) package is a common and effective way of training novel skills or shaping skills already in one's repertoire to a desired level. The package consists of four elements to be used together while promoting skill acquisition: modeling, instructions, rehearsal, and feedback (Miltenberger, 2004; Ward-Horner & Sturmey, 2012). Research has proven this behavior training package to be effective with a wide range of learners, and for teaching a plethora of behaviorally oriented skills, including behaviors involved in health and exercise. This multi-element training package encompasses procedures that foster an overall understanding of the concepts in addition to acquisition of the target skills that are the focus of the program (Hogan, Knez, & Kahng, 2014). Research has proven BST to be successful in training various skills, such as teaching preschool teachers how to run discrete trial training (Sarokoff & Sturmey, 2004), training adults with disabilities on being more responsive to their children (Feldman, Case, Rincover, Towns, & Betel, 1989), training abduction prevention skills to children (Beck & Miltenberger, 2009), and teaching yoga postures to beginning yoga students (Downs, 2015). The components of modeling, instruction, rehearsal, and feedback can be effectively used in a variety of ways.

Modeling. The first step in the BST package, modeling, involves an opportunity for the learner to observe a demonstration of an accurate performance of the target behavior (Miltenberger, 2004). An imitative repertoire of the learner is a necessary prerequisite skill for a model to be effective, as the learner must be able to perform the

behavior after observing it. A model of the desired behavior can be presented either in a live (in-vivo) or symbolic format (i.e. a video model, audiotape, or cartoon). According to social cognitive theory, as one observes an experienced model, the visual system of the observer will selectively pick up relevant cues about proper limb movements and body positions (Baudry, Leroy, & Cholet, 2005). These cues are then "transformed into appropriate motor commands that enable the learner to approximate the skill that has been observed" (Baudry et al., 2005, p. 1060).

When using a symbolic model, such as with video modeling, the instructor provides filmed footage of either an expert model performing the target behavior, or uses a self-model of the learner performing the behavior at her current level of responding (Baudry et al., 2005). There are numerous advantages with both model options when using a video format. Using an expert allows the observer to view an accurate and skilled demonstration of the target behavior. Further, the observer is able to tune into details of proper movement patterns that she will be required to perform in later parts of training. The self-modeling option provides an opportunity for the subject to view herself performing the behavior and attain corrective feedback of how she could improve her performance (Miltenberger, 2004). Self-modeling is distinct and beneficial as "it provides a realistic view of the learner actively engaged in the learning process" (Baudry, et al., 2005, p. 1060). Incorporating video modeling as part of a BST package has been effective with teaching caregivers to implement mand-training with their children with autism (Madzharova & Sturmey, 2015), teaching children with autism toileting skills (Drysdale et al., 2015), teaching first aide skills to children (Ergenekon, 2012), and in coaching of sports (Baudry et al., 2005). It has been noted that the higher the prestige of

the expert model, the higher the probability the observer will attend to and imitate the model (Gould & Roberts, 1982; Miltenberger, 2004).

Instructions. Modeling is an important and critical aspect of using BST to train new skills. Studies have proven, however, that the use of a model is ineffective without providing instructions that explain how to successfully perform the target skill (Baudry et al., 2005). Instructions are the second step in the BST package and are included because they provide the learner with a specific and appropriate description of what is expected from her. When using a BST training package, instructions are often based upon a task analysis. A task analysis is comprised of a series of individual, discrete components that are required to complete the targeted behavioral sequence. When teaching a complex behavior, or a sequence of behaviors, a task analysis can provide clarity for the learner as it breaks down the terminal behavior/s into smaller, teachable steps (Cooper, Heron & Heward, 2007). For example, Miles and Wilder (2009) used a task analysis when they explored the effectiveness of training caregivers of noncompliant children how to correctly implement guided compliance. A task analysis that included specific and detailed instructions for all ten targeted behaviors was provided for the participants in the instruction phase of a BST package. The combination of written instructions, expert model, self-model, rehearsal, and vocal feedback proved to be effective as each of the participants showed improvement in their performance of guided compliance.

Instructions and modeling are often utilized in coordination with one another, particularly when the skill is relatively complex. Several studies have shown that supplementing a video model with verbal comments maximizes the impact of the video model, and enhances skill performance (Baudry, et al., 2006; Hagin, Gonzales, &

Groslambert, 2015; Magill & Schoenfelder-Zohdi, 1996). By providing the learner with both instructions and a model demonstration, the instructor has formulated an antecedent strategy that encourages the learner to perform the correct behavior (Miltenberger, 2004).

Rehearsal. Following the model and instruction steps, the learner is provided an opportunity to practice, or rehearse, the behavior after it has been explicitly described and demonstrated for her. The rehearsal phase allows the instructor to observe and evaluate the learner's execution of the target behaviors and provide the learner with appropriate feedback. Role-play scenarios that simulate the actual situations of which the learner is likely to come into contact with in real life are commonly used and effective in generalizing the newly learned skill (Miltenberger, 2012). The inclusion of role-play scenarios for rehearsal was effective in a study that used BST to instruct college students on how to properly conduct clinical interviews (Miltenberger & Fuqua, 1985b). Following instructions and modeling, the subjects were to rehearse conducting an interview with research assistants who simulated clients with behavior problems. Results proved the training to be effective as the subjects learned to ask the right types of questions when performing in the role-play scenario.

The results of various studies have highlighted the importance of rehearsal when learning a new skill; often, it is not enough to simply be told and shown what to do. A study by Beck and Miltenberger (2009) evaluated the effectiveness of a safety training video in teaching abduction prevention skills to children. Following the observation of the modeled skills in the video, the participants were not able to perform the safety skills when they were tested in an environment outside of the training environment (in a role-play scenario). After rehearsing and receiving feedback however, the participants were

successful in using the skills in later assessments. Additionally, in a study performed by Poche, Yoder, and Miltenberger (1988), the rehearsal and feedback phases of the study proved critical for the success of the participants to correctly use the target skills. Similar to the Beck and Miltenberger study (2009), this experiment also looked at the productiveness of a video model alone compared with video model plus rehearsal and feedback for training abduction prevention skills to children. The video contained child actors in a role play scenario and instructions on the skills being trained. One group of children had the opportunity to rehearse the targeted behaviors, and receive praise and feedback depending on performance, while the other group was only exposed to the video model condition. Those in the group that were able to rehearse and obtain feedback learned the abduction prevention skills at a higher rate than those who solely watched the video model. These studies clearly establish the notion that rehearsal and feedback are necessary elements for the trained skills to generalize to real life situations that require the skill to be performed (Miltenberger, 2012).

Feedback. Finally, the learner will receive feedback based on her performance in the rehearsal phase. Feedback is defined as, "information a person receives about a particular aspect of his or her behavior following its completion" and can be provided in a number of ways, depending on the accuracy of the rehearsal (Cooper et al., 2007, p. 262-263). When the behavior is executed correctly, feedback will involve reinforcing consequences that will strengthen the proper behavior in the learner's repertoire, such as delivering praise or other reinforcers. If the behavior is performed incorrectly, corrective feedback is provided through further instructions to improve future behavior. Differential reinforcement, (reinforcing desired behaviors and withholding reinforcement from

unwanted behaviors) is utilized when the behavior is performed with partial accuracy (Miltenberger, 2004).

There are different levels of frequency and intensity in which feedback can be provided to the learner. Feedback can be delivered continuously (after each occurrence of the behavior) or after a fixed or variable number of responses emitted; further, feedback can be presented over fixed or variable intervals of time. Noell et al. (2005) examined the extent to which varying the levels of performance feedback when training teachers on how to implement their students' behavior support plans would affect treatment implementation. The study also assessed the teachers' views of intervention acceptability and effectiveness based on the type of feedback provided. In this study, participants were randomly assigned to one of three feedback conditions that varied in intensity and frequency: weekly (brief follow up with teacher), commitment emphasis (same as weekly condition plus reviewing social influence procedures in attempt to enhance teachers' commitment to implementation), and performance feedback (brief meeting plus review of intervention, providing teacher with graphic representations of student behavior and intervention implementation by the teacher, discussion of missed steps, and problem solving strategies). The 'weekly' and 'commitment emphasis' conditions were employed on a weekly basis and at a lower intensity, where the 'performance feedback' condition was employed daily, and with high intensity. Results showed that the performance feedback condition was superior to the other conditions in improving treatment implementation. Performance levels began at a low level and fell to even lower levels for those receiving feedback at a weekly frequency; this denotes that weekly follow up is not sufficient in maintaining behavior. Further, the lower intensity conditions, merely

meeting and talking about the targeted behaviors, were not sufficient. Feedback of a greater intensity and frequency was more beneficial in obtaining the desired results.

In addition to the variable nature of the frequency of provided feedback, a range of intensities regarding feedback can be administered, as one can use a single method of feedback, or a combination of methods. Several studies have contributed to the research literature of the efficacy of differing the intensity of feedback methods. A study by Casey and McWilliam (2008) explored the efficacy of providing feedback in the form of a graph (of participants' past behaviors) in addition to verbal feedback when training teachers to use incidental teaching. Results of the study indicated that the inclusion of graphical feedback, which increased the intensity of feedback, produced increases in the teachers' use of incidental teaching strategies. Marsicano, Morrison, Moomaw, Fite, and Kluesener (2014) extended this research and focused on comparing two levels of intensity of feedback that was provided for how three preschool teachers' used milieu teaching strategies in math across settings. Like the 2008 study by Casey and McWilliam, verbal and graphic feedback were provided; the frequency and intensity of feedback were varied, however. Results of this study further emphasized the efficacy of providing multiple feedback elements, as the delivery of both graphical and verbal feedback increased the target behaviors for all participants.

Verbal feedback. Verbal comments are the most frequently used method of providing feedback when training new skills using BST. A study performed by Sarokoff and Sturmey (2004) used verbal descriptive feedback within a BST package to train three teachers to correctly implement discrete trial training with a child with autism. Descriptive verbal feedback was first delivered when showing the participants their

graphical performance levels in baseline as they described the average performance level and their performance in relation. Second, verbal feedback was presented immediately following the teachers' rehearsal of the behaviors involved in discrete trial teaching. The types of verbal feedback used were positive comments and praise for target behaviors that were performed accurately and corrective feedback on the behaviors the teachers needed to improve on. The teachers' scores of implementing discrete trial teaching significantly increased following behavior skills training with verbal descriptive feedback.

Acoustical feedback. The use of an acoustical stimulus, such as the sound a clicker produces, is an alternative way of providing feedback to a learner when training a new skill. Using acoustical feedback when training novel behaviors and/or shaping already existing behaviors is a common and effective strategy. This type of training utilizes positive reinforcement in the form of a conditioned auditory stimulus (i.e. a "click" sound); the auditory stimulus is presented when a behavior is performed correctly (or an appropriate successive approximation of the behavior) (Persicke, Jackson, & Adams, 2013). "The clicker communicates in a way that is language- and judgement-free" (Levy et al., 2016, p. 945). This type of feedback has many advantages. To begin, using an acoustical stimulus increases the amount of positive reinforcement provided by the instructor or the coach top the learner (Quinn, Miltenberger, & Fogel, 2015). Often (particularly in sports) coaching practices utilize punishment or negative reinforcement contingencies; with this strategy, the learner is "likely to change [her] performance because doing so provides escape or avoidance of…disapproval following incorrect movements" (Quinn et al., 2015, p. 11). Instead of using verbal feedback that focuses on what the learner did incorrectly, using acoustical feedback concentrates on providing

positive feedback for correct performance (TAGteach International, 2012). A second advantage is the immediacy of reinforcement that is provided for emitting adequate behavior. Reinforcement that follows behavior within a few seconds has the most direct effects on fostering behavior change (Cooper et al., 2007). Therefore, it is critical that reinforcement immediately follow correct behavior, as to increase the future frequency of the proper emission of the learned behavior. Using a clicker to quickly reinforce behavior is a fast and easy way of making the learner cognizant of the correctly performed behavior. A third advantage of using this feedback approach is that it allows the instructor to direct the learner to critical parts of the target behavior that is being performed (Quinn, et al., 2015). For example, acoustical feedback was used in a shooting exercise to provide feedback to the learner about the proper way of holding a gun, which was necessary for the shot to be accurate (Konttinen, Momnonen, Viitasalo, & Mets, 2004).

There are many variations of how acoustical feedback can be provided for a learner when training behaviors. One specific variation is called TAGteach or Teaching with Acoustical Guidance. TAGteach is a brand name method of providing acoustical feedback that incorporates "tag points" which are the specific learning goals that are the focus of the training. The instructor provides an acoustical cue with a clicker or tagger when the tag point is executed correctly, which allows the exact moment of correct performance of behavior to be highlighted for the learner. TAGteach was founded in an effort to "optimize instructions, provide instant and meaningful feedback, and [create] fast track success for [the instructor] and the learner" (TAGteach International, 2012). TAGteach has been successfully used in business management, occupational safety,

sports, teaching animal trainers, working with individuals with autism, and in the field of special education (TAGteach International, 2012).

A study by Levy et. al (2016) compared using the TAGteach approach to the more traditional method of using a demonstration alone in training medical students to perform novel surgical tasks. The focus of the study was on the accuracy of performing the complex tasks, as a result of the training. The subjects in the "test group" who were trained with TAGteach achieved higher precision in executing both of the trained surgical skills than that of the "control" group who received a demonstration alone. The authors of this study believe that operant learning takes place with the use of acoustical feedback as high levels of reinforcement result in properly performed complex behaviors. This is an additional example of the advantageous nature of using acoustical feedback with directing the learner to critical aspects of the target behavior that is the focus of the training. Persicke, Jackson, and Adams (2013) also evaluated the effectiveness of training with an acoustical stimulus as a means of providing feedback. This study compared using correction alone and using correction plus a modified version of TAGteach to decrease toe-walking with a child with autism. The researchers selected TAGteach to use because its use of immediate and consistent reinforcement and the ease of application. Correction with an audible conditioned stimulus proved to be most effective with reducing toe-walking; correction alone produced minimal and inconsistent effects on the behavior.

BST with Health and Fitness Behaviors

The BST package is regularly used with behaviors related to health and fitness and has been the focus of numerous studies. The individual components of modeling, instructions, rehearsal, and feedback that comprise the BST package all have their unique

advantages with the different techniques and combinations of the components that can be used with BST for training fitness behaviors. Behavioral research has been used in a plethora of sports domains to enhance performance; some of the domains studied include: rowing, dance, football, tennis, golf, soccer, tennis, and speed skating (Baudry et al., 2005; Martin et al., 2004; Quinn et al., 2014; Zetou, Tzetzis, Vernadakies, Kioumourtzoglou, 2002).

The use of an expert performing the behaviors in a video model when training behaviors in a behavior skills training package related to sports and fitness has been observed to be an effective facilitator of skill acquisition (Baudry et al., 2005). A study conducted by Baudry, Leroy, and Chollet (2005) investigated whether video modeling could enhance gymnasts' performance on a specific behavior after the gymnasts were provided with instruction. They compared the performance of gymnasts who were exposed to an expert video model and self-model in addition to performance feedback while rehearsing, to a control group that did not receive feedback while they rehearsed the behaviors. Their results indicated that immediate video modeling can improve body alignment while performing specific sports movements. Zetou et. al (2002) evaluated the effect various video procedures had on acquiring and retaining volleyball skills in a study that incorporated elements of a BST package. The study compared a group whose members watched expert model videos and received verbal cues from instructors, to a group whose members received verbal feedback while watching their own behaviors. Members of the group exposed to an expert model showed higher skill acquisition that those exposed to self-modeling videos.

Feedback procedures within a behavior skills training package have been compared in multiple studies that focus on health and fitness related behaviors. Downs (2015) evaluated the effects of video self-evaluation and video feedback procedures on enhancing the accuracy of yoga postures in a multiple baseline design across behaviors. The participants received written instructions on how to perform the behaviors via a task analysis and were given the opportunity to rehearse prior to receiving feedback. The self-evaluation phase involved the participants watching their own performance of the postures on film and scoring the task analysis provided for them for each posture. In the video feedback phase, both the researcher and participants scored the task analyses for each posture together both when practicing and when individually performing. Results showed enhanced accuracy of all postures for all participants following the introduction of the self-evaluation phase. Additionally, video feedback further increased the accuracy on one pose for one participant.

A study by Guadagnoli, Holcomb, and Davis (2002) compared the effectiveness of verbal feedback, video feedback, and self-guided feedback in a study that incorporated the elements of behavior skills training for a golf swing in a randomized group design. The participants were split into three groups: a self-guided group (practiced golf swing on their own), a verbal feedback group (trained with expert and given verbal feedback on swing), and a video feedback group (paired with an expert and provided verbal and video feedback throughout training sessions). Post-test results indicated that the implementation of video feedback fostered the greatest effect on the accuracy and distance of the golf swing.

An additional study that analyzed video feedback as an element in the BST package was performed by Benitezsantiago and Miltenberger (2016). This study examined two video feedback procedures for enhancing martial arts skills involved in capoeira (Afro-Brazilian martial arts that uses acrobatic movements) in a multiple baseline design across behaviors. The intervention included a video feedback phase in which the participants were filmed attempting a movement and immediately viewed their performance; verbal feedback was provided from the instructor. In the second video feedback (video feedback plus practice) phase, the participants were provided with an opportunity to rehearse the movements with live feedback before being filmed again. Results demonstrate an increase in performance over baseline levels after introducing video feedback.

Using acoustical feedback, and specifically TAGteach, has been effectively used to train a variety of novel behaviors involved in sports and fitness. A study by Fogel, Weil, and Burris (2010) assessed the effectiveness of TAGteach as a stand-alone procedure in training the proper mechanics involved in swinging a golf club to a woman who had never before played golf. The complex task of swinging a golf club was broken into five discrete skills, with a sequential implementation of TAGteach for each skill. Results of this study proved acoustical feedback to be successful in improving four of the five skill sets. A second study that evaluated the impact of using TAGteach to train a novel skill was performed by Andrews (2014) and involved training beginning yoga postures to a novice practitioner. Each yoga posture was broken down by a task analysis and each step was tagged individually and was assessed in a multiple baseline design across behaviors with four participants. All targeted yoga postures improved following

the implementation of acoustical feedback for all participants. The learned postures were maintained after reinforcement was no longer provided, and all postures generalized into a yoga class setting. The results of these studies demonstrate acoustical feedback can be used effectively to teach novel athletic skills.

In addition to the proven efficiency in training new skills, acoustical feedback is also effective in enhancing sports behaviors that are already present to a desirable level. TAGteach was incorporated as a component in a behavioral coaching package to improve football blocking techniques with high school varsity football players (Stokes, Luiselli, Reed, & Fleming, 2010). This study compared the effectiveness of using descriptive feedback with and without video feedback and TAGteach. Evaluation through a multiple baseline design proved demonstration alone to be ineffective in improving performance. Blocking skills increased in accuracy following the addition of video feedback, and further increased when TAGteach training was introduced. Following the TAGteach phase, all five football players performed the target blocking skills within the acceptable performance range. Quinn et al (2015) performed a study that analyzed the effectiveness of dance teachers implementing TAGteach to increase fluency in three distinct dance movements in a multiple baseline design across behaviors with four students of dance participating. The targeted dance movements improved for all four participants after the introduction of the TAGteach intervention. In addition to its efficiency with shaping dance behavior, the TAGteach intervention received high social validity from all the students and teachers involved. The participants had positive remarks regarding the intervention and expressed a desire to use the acoustical feedback methods used in this intervention in the future.

Components Analysis of BST.

Because BST utilizes four separate components within a training package, it is important to distinguish which individual variables within the package are effective and necessary. Ward-Horner and Sturmey (2012) conducted a component analysis of the BST package to delineate the active components for training teachers to conduct functional analyses with their students with autism. The results of their study found that feedback was consistently the most effective component in increasing participants' performance to mastery levels. The implementation of video model training also proved to be advantageous for some of the participants. Written instructions and rehearsal training proved to be ineffective. Feldman et al. (1989) found modeling, rehearsal, and feedback to be the active components in the BST package in a study that evaluated the individual components of BST in teaching parents with disabilities to be more responsive to their children. When provided with verbal instructions alone, only a slight impact on responsiveness was observed in participants; however, there was substantial increases in responsiveness when participants were exposed to modeling, rehearsal, and feedback.

A study by Hogan, Knez, and Kahn (2015) evaluated the use of BST to improve the implementation by staff in a nonpublic school setting of student's individualized behavior intervention plans (BIP). Further, this study systematically evaluated the components involved in the BST package to determine which parts of the package are the most effective by splitting the study into two phases: instructions (written and verbal), and modeling + rehearsal + verbal feedback. Results proved BST to be an effective and efficient method in training typically developing adults to utilize BIPs. Further, results determined that the modeling + rehearsal + feedback phase of training was more effective

than instructions alone. Hudson (1982) compared different types of instructions alone and BST for teaching parents to work with their child with developmental disabilities. A higher level of mastery was found for the parents in the BST group than instruction groups alone, concluding that modeling, rehearsal, and feedback are necessary aspects of the training. Further, Starke (1987) found that using BST was more beneficial than a discussion group for improving social behavior, suggesting that instructions alone are not as effective as rehearsal and feedback.

These studies indicate that instructions alone are an ineffective component within the BST package. Learning a new skill requires the opportunity for the learner to rehearse and receive feedback; simply being told or shown what to do is not enough. Receiving feedback, both positive and constructive, allows the learner to correct any errors made in rehearsal, and receive positive reinforcement for performing the correct behavior following feedback.

Present Study

Because of the increase in popularity among those who practice yoga, and the format in which yoga is typically taught, it is critical for behavior analysts to evaluate feedback mechanisms for instructors to use when they are the sole teacher in a large class to encompass the individual learning styles of all the students. It is essential for the yoga instructor to provide feedback to her students in a manner that reduces the possibility of injury and assists the students with a safe practice. Research has proven that using an expert video model alongside instructions is effective and beneficial for portraying complex behaviors in a training scenario. Additionally, research suggests that high quality feedback is a critical element for a BST package to effectively produce behavior

change. The purpose of this study is to compare the effectiveness and the efficiency of providing verbal feedback versus acoustical feedback (involving a clicker) when teaching novice yoga practitioners the proper body mechanics that are involved in beginning yoga postures.

CHAPTER III

METHOD

Participants

To participate in this study, one was required to be between the ages of 18 and 30, qualify as a novice yoga practitioner, be able to perform the two transitional postures that were to be used in between targeted postures following training (See Appendix A), not have any current injuries or be especially prone to injury that could result from engaging in beginning yoga postures, and not currently be pregnant. A novice yoga practitioner was defined as one who had zero to little experience (one yoga class or less) and who performed less than 50% of the behaviors correctly during baseline assessment (i.e., before being trained). Information regarding participant's experience and level of injury was provided via a self-report questionnaire (See Appendix A). Each participant received an Amazon gift card upon completion of the study.

Participant 1 was a 25-year-old male who had taken one yoga class five years prior to participating in the study (as reported in the self-report questionnaire). Participant 2 was a 24-year old female who had never before taken a yoga class. Both participants reached mastery criteria (100%) of transitional postures within two trials of training and fell below the 50% criteria during baseline for both series tested.

Setting and Materials

The experimental procedures in this study were held in the yoga studio on the premises of Bailey Farm Apartments. The yoga studio was 350 square feet in size and remained empty except for the materials that were used in the experiment.

The materials used in this study included a yoga mat, a watch, a clicker, and a MacBook laptop (equipped with a webcam and QuickTime Player). The yoga mat was included for the participant to perform the postures on for the duration of the study. The webcam on the MacBook laptop was used to film the participant performing the targeted postures during training and testing sessions. All videos were encrypted to protect the participants' privacy. Additionally, videos of participants only included the pseudonym of the participant (i.e. P1) when stored. The filmed postures were reviewed via QuickTime Player on the MacBook laptop so that the postures could be analyzed and scored when collecting Inter-observer agreement (IOA) data. QuickTime Player software has the capability of replaying videos in slow motion and can also freeze individual frames which will assist in accurate scoring and serve to dispute any possible discrepancies in different scores given by multiple viewers. The watch was used to time sessions. The clicker was used in the acoustical feedback condition to signal to the participant when they correctly performed the posture and were to move on to the next postures.

Dependent Measures

Terminology used within the methods section of this study must first be defined before dependent measures can be described. A "series" includes three targeted yoga postures and one transitional posture that will be performed before and after each targeted posture. A "posture" is the anatomical alignment of certain body parts in a specific position to enhance bodily functions. Each posture is comprised of multiple discrete behaviors. A "trial" involves the training or testing of the postures involved within a series.

The primary dependent measure involved the effectiveness of treatment, or the participant's accuracy in engaging in the six targeted beginner level postures. This was reported as the percentage of discrete behaviors demonstrated per trial. Each posture was broken down into its discrete behaviors to facilitate appropriate training and assessment. Postures that were included in Series I were urdhva hastasana (upward standing salute), anuvittasana (standing back bend), and uttasana (standing forward bend). Tadasana, or mountain posture, where one stands up straight with one's arms hanging down besides his or her torso served as the transitional posture of this series that was comprised of all standing postures (See Appendix B). Postures that were included in Series II were marjaryasana (cat pose), bitilasana (cow pose), and balasana (child's pose). Bharmanasana, or table top posture where one comes to the floor on one's hands and knees with a flat back and looks down to the floor, was used as the transitional posture for this series comprised of kneeling postures (See Appendix C). Transitional postures served as start points and end points for each targeted posture and were not included in the scoring of postures. These postures served as a safety measure to assure that the participant properly moves in and out of the targeted postures without injury. Additionally, these postures were included to mimic the natural "flow" of postures that are typically taught in a yoga class format.

The task analyses that were used to train and score postures were evaluated by a certified yoga instructor. This was done via a questionnaire that included a five-point Likert scale regarding the appropriateness of the components which comprised each posture, as well as an open-ended question to allow for suggestions on modifying the task analyses (See Appendix F). The certified yoga instructor provided an average rating of

4.5 for the 12 statements included in the questionnaire. The range of all the instructor's ratings was from 4 to 5. A score of '4' corresponds with "agree" and a score of '5' corresponds with "strongly agree" with the statements provided. This suggests that the task analyses used were a valid representation of beginner level yoga postures. The task analyses were then modified based on feedback provided by the yoga instructor to ensure the discrete behaviors within postures were appropriate and safe.

Whereas the primary dependent variable was used to assess the effectiveness of treatments under study, the secondary dependent variable was used to assess the efficiency of treatments under study. Efficiency was recorded as the total training time for reaching mastery of targeted postures. Training time includes the time (number of seconds) it took for each participant to reach mastery during the training phase. Additionally, if re-training trials were necessary for the participant to reach mastery in the testing phase, each re-training trial was timed (number of seconds) and was included in the total time.

Inter-Observer Agreement

Inter-observer agreement (IOA) data were collected for 50% of sessions spread out across both post-training phases of the experiment (i.e., testing, and maintenance) with a trained research assistant to ensure data collection accuracy, well above the 20% standard suggested by Kennedy (2005). The trained research assistant collected IOA data by individually viewing the recorded videos and scoring the performed postures with the respective task analyses. An agreement was defined as both of the observers scoring correct (+) or incorrect (-) for the same step within the task analyses. A disagreement was defined as one observer scoring correct (+) and one observer scoring incorrect (-) for the

same step within the task analysis. IOA percentage was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. The mean IOA across all behaviors collected for both participants was 100%.

Experimental Design

An alternating treatments design was used in this study. This design is a commonly used, internally valid type of single case design that allows for a comparison of effectiveness between two or more interventions (Kazdin, 2011). This comparison was made possible through visual analysis of data paths on a graph, as the participants received equal amounts of contact with each treatment condition, which rapidly alternated within the same time frame (See Figure 1). In this design, the two interventions (i.e., verbal feedback and acoustical feedback) were alternated and balanced across conditions.

Baseline data were collected prior to initiating treatment conditions as a means of addressing the exclusionary criteria. Collecting baseline data was not required as a component within an alternating treatment design for internal validity, but these data allowed the researcher to more confidently make claims of effectiveness that resulted from treatment (Kazdin, 2011).

For Participant 1, Series I was paired with verbal feedback and Series II was paired with acoustical feedback. For Participant 2, the pairings were reversed: Series I was paired with acoustical feedback and Series II was paired with verbal feedback. Switching the treatment-series pairing worked to avoid any behavior changes that could have resulted from multiple treatment interferences, such as sequence or carry over effects (Kazdin, 2011).

Data collected on total time required for the participant to reach mastery criterion while training was collected and reported in a bar graph (See Figure 2). This graph was also visually analyzed and scored to assess the efficiency of treatment conditions.

Procedure

Pre-experimental procedure. The researcher posted flyers to recruit participants in local gyms. The flyers included brief information regarding the study, inclusionary criteria, and the PI's contact information. The researcher followed up with additional information and, to address the exclusion criteria for this study, a self-report questionnaire regarding experience level and injuries to interested participants (See Appendix A).

Potential participants were then trained on transitional postures (i.e. tadasana-mountain posture and bharmanasana-table top posture). Training included the researcher modeling and verbally describing the behaviors involved in the beginner level transitional postures, as described in the task analyses (See Appendix B). The potential participants rehearsed the postures and received verbal feedback. They had three opportunities to master the postures. Mastery criterion was 100%, and reaching this criterion was essential for safety purposes. Both participants reached mastery criteria within three trials.

Baseline. In baseline, the researcher verbally provided the learner with the Sanskrit and English name of the targeted postures and instructed the participants to perform the given posture. Each participant was positioned on a provided yoga mat. The postures were presented within the same order of the series that they would be trained in, including the transitional postures. For example, when collecting baseline data for Series I, the researcher instructed the participant to perform: tadasana or mountain pose, urdhva

hastasana or upward standing salute, tadasana or mountain pose, anuvittasana or standing back bend, tadasana or mountain pose, uttasana, or standing forward bend, and tadasana or mountain pose. No feedback was given to the participants regarding performance other than "Okay" or "Thank you." Data were recorded as the total percentage of correct discrete behaviors observed for each series per baseline trial. Two baseline points were collected for each participant. A stopping criterion was employed if any participant displayed behaviors that could result in injury, or if the participant experienced any physical discomfort of any kind at any time during baseline.

Behavioral Skills Training. Once baseline data collection was completed, each participant proceeded to the BST phase where two different training packages were employed. Each series of yoga postures were paired with a different feedback condition. Both training packages included an opportunity to observe an expert video model, receive written and verbal instructions in the form of task analyses (See Appendices C & D), and an opportunity to rehearse the targeted postures. The instruction and video model components were delivered one time per trial. The final component of the BST package, feedback, was either verbal or acoustical depending on the treatment package (see below). A time-delay procedure was employed to allow the participant an opportunity to independently initiate and perform the given postures prior to implementing feedback (Cooper et. al, 2007). Following the instruction to rehearse a given posture (when provided with both the Sanskrit and English name), the participant had 15 seconds to initiate and perform each individual posture within the series independently before receiving feedback. Following the 15 second time-delay, one package included verbal feedback while the other included acoustical feedback using a clicker. The participants

were required demonstrate mastery (100%) of the series of given postures before moving to the testing phase of the experiment.

Each training trial was timed. The watch recording time began immediately following instruction to perform the first posture within the series and stopped recording time following the final posture within the series. Recording the duration of each trail allowed the PI to determine which treatment was more efficient. Additionally, recording the time allowed the researcher to gage with time-delay window, as well as stay within the time limits for training.

As a typical yoga class lasts one hour in duration, there was a one-hour time limit for training in a given day. Following each training trial, the researcher verbally checked in with the participant, and offered a three-minute break before beginning the next trial. Training trials were to cease if the researcher noticed any observable behaviors evidencing fatigue (i.e. heavy audible breathing, facial expressions that typically accompany discomfort, or audible sounds that express discomfort such as a sigh), unsafe behaviors that could lead to injury, or if the participant verbally expressed discomfort.

Verbal feedback. The verbal feedback condition involved the PI providing the participant with verbal feedback contingent on performance. After the participant was instructed to rehearse the posture, the PI provided verbal feedback to the participant exactly following the verbal feedback script for each posture. Feedback in the form of a verbal script was provided following either correct performance of the posture, or after a 15 -second time delay if there was either incorrect performance or no response (See Appendix F). Verbal feedback included both praise for correct performance (e.g. “Good job performing tadasana, mountain posture”), and corrective feedback for incorrect

performance. If only one behavior was performed incorrectly, a corrective statement was provided that specified which behavior needed to be changed (i.e. “Make sure your arms remain straight, with wrists, elbows, and shoulders directly in a line”). If more than one behavior was performed incorrectly, a comment was provided that directed the subject to closely observe the model in the following trial (See Appendix F). Using a consistent script managed the consistency of time used for providing verbal feedback as a means of eliminating confounds relating to time for the dependent variable of efficiency. One verbal feedback comment was delivered for each targeted posture within the series (i.e. all three discrete behaviors for each posture), totaling three feedback comments per series. Intervention involved training the given series of postures until mastery criterion has been reached.

Acoustical feedback. The acoustical feedback condition began with the researcher explaining what acoustical feedback is and how it would be used, prior to receiving instructions. The explanation of acoustical feedback included the researcher performing a role-play scenario to provide a model in aiding the participant’s understanding of acoustical feedback. After the participant displayed understanding of how acoustical feedback was to be provided (could accurately identify/explain when the clicker should be used within the role-play scenario), the BST training sessions for the acoustical feedback condition commenced. The participant was positioned on the provided yoga mat. No verbal feedback regarding the participants’ performance was delivered. Feedback was provided in the form of a “click” made from the researcher pressing down on her clicker. A “click” signaled to the participant that he or she had performed all three components of the posture accurately and was then verbally

instructed to move onto the transitional posture. All three discrete behaviors involved within each posture were required to be performed accurately in order to receive a "click." In the absence of a "click," the participant was to continue to attempt performing the behaviors involved in the posture for the duration of the 15 seconds until he or she received a "click" or a verbal instruction to perform the next posture. Intervention involved training the given series of postures to mastery criterion.

Testing. Once the participant demonstrated mastery in both training phases for the respective series of yoga postures, the participants were then required to perform the postures absent researcher feedback. Each participant was provided with the English and Sanskrit name of the targeted posture and was instructed to engage in the postures (as in the baseline condition). This phase occurred one week after training was completed. Testing trials alternated between each series-treatment pairing: Participant 1 was tested on Series I trained via verbal feedback and then tested on Series II trained via acoustical feedback. Each participant had 15 seconds to independently perform each instructed posture within the series. Trials were run successively with a three-minute break in between trials until mastery criterion was reached. Mastery criterion was 80% independent correct steps for two successive trials. If the participant were to perform below criterion or fail to perform the posture within 15 seconds, a re-training trial would immediately commence. Additionally, a stopping criterion was employed if any participant displays behaviors that could result in injury, if the researcher noticed any observable behaviors associated with overexertion, or if the participant experienced any physical discomfort of any kind at any time.

Re-training trial. If the participant performed the posture when provided with the Sanskrit and English name with less than 80% accuracy of the discrete behaviors that comprise the three postures within each series, a re-training trial will occur. This additional training procedure was included to serve as a safety mechanism in order to avoid potential injury that could result from performing the targeted postures inaccurately in this study, and so that safe and accurate yoga postures would be generalized to real-life yoga class settings. The re-training trials were to use the same procedures as described in the BST section (e.g., written and verbal instructions, an expert video model, an opportunity to rehearse, and the respective feedback condition for the series that was performed below the criteria line). Data collected during re-training trials was to be graphed using a different marker (e.g., a square) to denote the additional procedure. Behaviors demonstrated during a re-training trial would not count toward the goal of two consecutive trials above 80%. A testing trial would immediately follow a re-training trial. The watch recording time will begin immediately following instruction to perform the first posture within the series and will stop recording time following the final posture within the series. Training time for re-training trials will be included in the total training time for the respective training condition. Re-training trials were not a necessary measure for the participants within this study as both participants scored above mastery criteria in the testing phase.

Maintenance. Maintenance data were collected approximately two weeks following the final testing phase. During maintenance trials, each participant was instructed to perform postures within each series when given the English and Sanskrit name, exactly as in the baseline condition. One datum point was collected for each series

trained for each participant. Maintenance data were used to determine if each participant was able to perform the postures following a period of time without instruction.

Treatment Adherence

One checklist for each condition was employed to ensure that the researcher followed all steps in this study with high fidelity (See Appendices F & G). The researcher completed the checklist as she employed all training and re-training trials with both participants. The research assistant completed the same checklist for 23% of trials as she observed the videos filmed during the training phase across both participants. Similar to the calculation of IOA described earlier, treatment adherence was calculated by dividing the number of agreements (i.e., both observers either did or did not use/see a specific training step) by the number of agreements plus disagreements and multiplying that value by 100. Treatment adherence collected by the PI during every training trial was 100%. Treatment adherence agreement collected by the trained research assistant for 23% of trials was 100%.

Social Validity

Social validity data were collected following completion of the study. A survey was provided to the participants that explored their experiences with the different feedback methods. A five-point Likert scale and an open-ended question were included in the survey for the participants to rate the acceptability and ease of participation for each of the conditions (See Appendix H). Further, the open-ended question allowed the participants to make suggestions for improvements for the methodology.

Data Analysis

Visual analysis of the graphical data allowed the researcher to conclude whether a functional relationship between the individual feedback treatment conditions was demonstrated. The researcher was able to conclude if a treatment condition was effective if there is a positive trend (direction of data pattern) of data following the initiation of treatment. Additionally, if there was an immediacy of change in participant responding after introduction of the treatment following baseline, the treatment could be deemed effective. Following the training phase, effectiveness of treatment was observed if there was a high level (relative value of data) of data with minimal variability (similarity of data) during testing (Lane & Gast, 2007). With an alternating treatment design, a confident functional relationship can be determined by the distance observed between the two data paths; the larger the distance, the stronger the functional relationship between the more effective treatment condition. A percent of nonoverlapping data point metric (PND) was incorporated into the graphs to serve as an additional aide for calculating the effectiveness of the treatments through visual analysis of the data. A PND involves comparing the degree of nonoverlapping data between experimental phases. Using PND assisted the researcher in observing changes in the data in any direction, and in making a claim that one training condition was superior to the other (Kazdin, 2011).

Total training time required for each participant to reach mastery criterion was collected and documented in a bar graph. Total time was recorded in minutes. The treatment condition that required less time for the participant to reach mastery criterion was deemed the more efficient treatment condition.

CHAPTER IV

RESULTS

There were two dependent measures assessed within this study. The primary dependent measure involved the effectiveness of treatment, or each participant's accuracy in engaging in the six targeted beginner level postures, as reported by the percentage of accurate discrete behaviors demonstrated per trial. The BST package that resulted in mastery criteria for its respective series with less trials would be deemed more effective. The secondary dependent variable assessed the efficiency of treatment, or which training package required less overall training time to reach mastery criteria.

Effectiveness

Results showing effectiveness of treatment, or the participant's accuracy in engaging in the six targeted beginner level postures (as reported as the percentage of discrete behaviors demonstrated per trial) are displayed in Figure 1 and Figure 2.

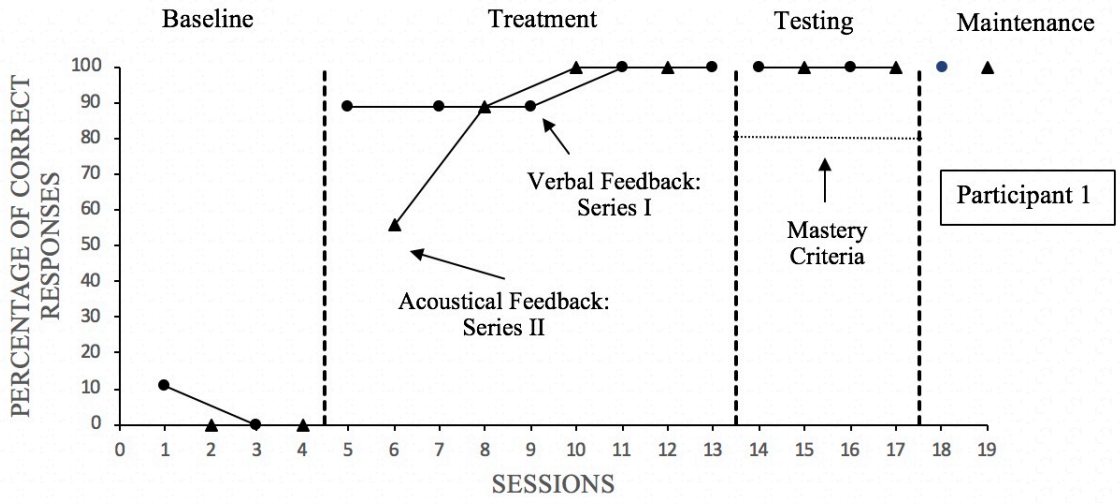

Figure 1 Percentage of Correct Responses Across all Phases for Series I and Series II Postures for Participant 1.

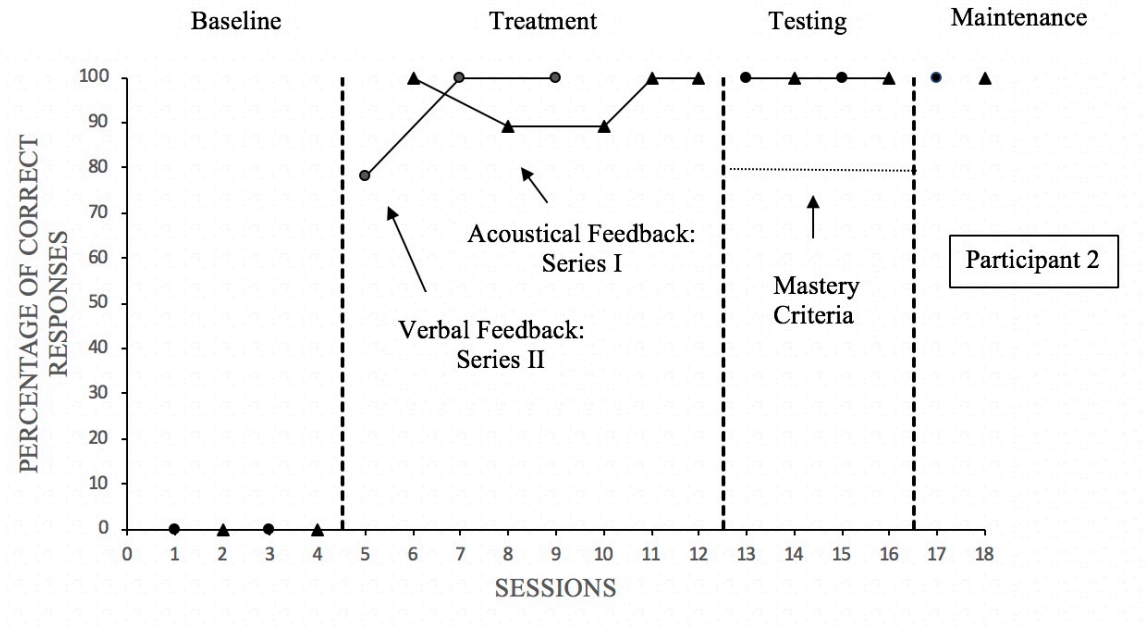

Figure 2 Percentage of Correct Responses Across all Phases for Series I and Series II Postures for Participant 2.

Introducing the BST package was proven to be effective for both participants who had little (e.g. one class) to no experience performing beginner level yoga postures, as evidenced by the immediate and significant change in level from the baseline to treatment phases. Two baseline data points were collected for each participant prior to training to ensure that the participants did not have learning histories which would interfere with treatment conditions. Participant 1 scored a mean baseline score of 5.5% for Series I and 0% for Series II. Participant 2 scored a mean baseline score of 0% for Series I and 0% for Series II. Upon introduction of the first three elements of the BST package (e.g. instructions, video expert model, and rehearsal), Participant 1 scored 89% for the first trial of Series I and scored 56% for the first trial of Series II; Participant 2 scored 100% for Series I and 78% for Series II. A PND metric was used to assist in the visual analysis of the effectiveness of the treatment. There were no overlapping data points from the first baseline phase to the treatment phase, resulting in a score 100% of nonoverlapping data.

Feedback, which is the focus of this study, however, does not account for the immediacy of change within the first trial as feedback was delivered following rehearsal and scoring of participant performance. Feedback affects the trials following the delivery of feedback. Following initiation of treatment conditions, there was an overall positive trend of data for all series trained for both participants with the exception of Series I trained with acoustical feedback for Participant 2. A positive trend (direction of data path) of data suggests effectiveness of treatment. After the first training trials where feedback was provided (both verbal and acoustical) were implemented, there was minimal variability within participant performance for both participants in both conditions. Additionally, the data remained at a high level (78% or higher) throughout the duration of the training phases for both participants in both conditions.

For Participant 1, acoustical feedback proved to be the more effective feedback condition as mastery criterion was reached within four trials (as opposed to five trials for verbal feedback). Additionally, acoustical feedback resulted in an overall higher level of data than verbal feedback. The opposite results were found for Participant 2, where verbal feedback was more quickly effective for accuracy in responding as three trials were required to reach mastery criterion for this condition (as opposed to five trials for acoustical feedback). Further, verbal feedback had an overall higher level of data than acoustical feedback. While both methods were effective for both participants, data do not demonstrate an overall more effective method of feedback within the context of the present study.

In the testing phase, both participants performed above mastery criterion (80%) when tested on Series I and Series II one week following the training phase. No re-

training trials were required for either participant. The mean scores for both Participant 1 and Participant 2 for Series I and Series II were 100%. These data suggest that both feedback conditions were equally effective in training participants in accurately performing the postures. Additionally, both participants scored 100% for both Series I and Series II in the maintenance phase two weeks following testing. These data suggest both feedback conditions were equally effective in training the postures to be maintained over time without the need for additional training.

Efficiency

Results displaying total training time for assessing the secondary dependent variable regarding the efficiency of treatments under study are shown in Figures 3 and 4. Efficiency was recorded as the total training time for reaching mastery of targeted postures. Training time included the time (number of seconds) it took for each participant to reach mastery during the training phase. No re-training trials were required for either participant during testing, as both participants performed above mastery criteria. Total training time for Participant 1 to reach mastery criteria for Series I trained via verbal feedback was 238 seconds; total training time for Series II trained via acoustical feedback was 156 seconds. Acoustical feedback proved to be more efficient than verbal feedback for this participant. For Participant 2, total training time to reach mastery criteria for Series I trained via acoustical feedback was 165 seconds; total training time for Series II trained via verbal feedback was 97 seconds. Verbal feedback proved to be more efficient than acoustical feedback for Participant 2. Similar to the determination of effectiveness, data do not demonstrate an overall more efficient method of feedback within the context of the present study.

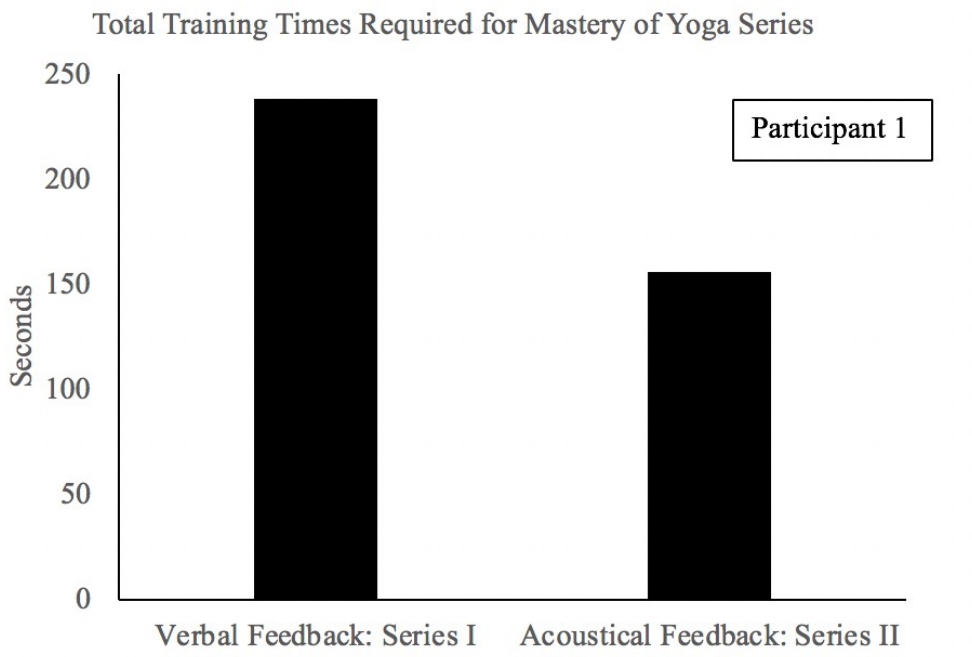

Figure 3 Total Training Time Required for Mastery of Yoga Series for Participant 1. The above bar graph represents the number of seconds required for Participant 1 to reach mastery criterion with each feedback training method.

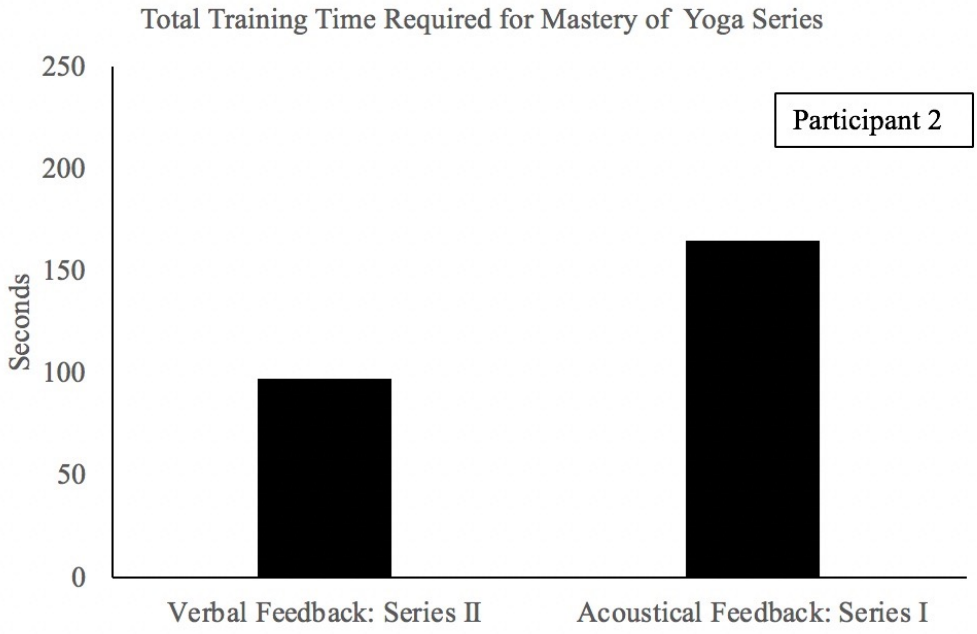

Figure 4 Total Training Time Required for Mastery of Yoga Series for Participant 2. The above bar graph represents the number of seconds required for Participant 2 to reach mastery criterion with each feedback training method.

Social validity data are shown in Tables 1 and 2. Both participants "strongly agreed" that they were both more comfortable performing all six postures after training than they were before participating in the study. Participant 1 "agree[d]" that the verbal feedback condition was more effective than the acoustical feedback condition. Participant 2 "strongly agree[d]" that the verbal feedback condition was more effective than the acoustical feedback condition. Participant 1 "agree[d]" that both the verbal and acoustical feedback conditions were enjoyable. Participant 2 "strongly agree[d]" that the verbal feedback condition was enjoyable and "disagree[d]" with the statement regarding enjoyability of the acoustical feedback condition.

Table 1 Social Validity Rating for Participant 1

Participant 1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am more comfortable performing the postures from Series I than before I participated in this study					**X**
I am more comfortable performing the postures from Series II than before I participated in this study					**X**
I felt the verbal feedback condition was more effective than the acoustical feedback condition				**X**	
I felt the acoustical feedback condition was more effective than the verbal feedback condition			**X**		
The verbal feedback condition was enjoyable				**X**	
The acoustical feedback condition was enjoyable				**X**	

Table 2 Social Validity Rating for Participant 2.

Participant 2	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am more comfortable performing the postures from Series I than before I participated in this study					**X**
I am more comfortable performing the postures from Series II than before I participated in this study					**X**
I felt the verbal feedback condition was more effective than the acoustical feedback condition					**X**
I felt the acoustical feedback condition was more effective than the verbal feedback condition		**X**			
The verbal feedback condition was enjoyable					**X**
The acoustical feedback condition was enjoyable		**X**			
Additional comments: I personally felt like the verbal feedback was more beneficial when learning the different postures					

CHAPTER V

DISCUSSION

As the popularity of practicing yoga continues to increase, the need for behavior analysts to evaluate training mechanisms for instructors to use becomes more critical when there is a large student to teacher ratio, as the single teacher must adhere to the various learning styles of all the students within her class. It is essential for the yoga instructor to deliver effective feedback to her students to ensure a safe practice. This study compared the effectiveness and the efficiency of verbal feedback versus acoustical feedback (involving a clicker) within a behavior skills training package when teaching novice yoga practitioners the proper body mechanics that are involved in beginning yoga postures.

The BST package proved to be immediately effective in training all six postures involved in this study. The varying feedback conditions used within the BST package, however, did not appear to have any significant differences in more effectively or more efficiently training the different postures within the two series to mastery criteria. For Participant 1, acoustical feedback was more effective in training the postures for its respective series (Series I) as it took fewer trials to reach mastery criterion and there was an overall higher level of data for this series. Additionally, total training time for the series trained via acoustical feedback was 82 seconds less than total training time for verbal feedback. The opposite results were shown for Participant 2. Participant 2 reached mastery criteria in fewer trials for the series trained via verbal feedback (Series I), and total training time for the series trained via verbal feedback was 68 seconds less than the total training time for acoustical feedback.

These inconsistent data could possibly be explained by a varying level of complexities in the series of postures chosen for this study, as both participants mastered Series II with less trials and less training time than Series I (See Figure 5). However, each participant had difficulties with different postures within Series I (See Appendix C). Participant 1 required more trials to master posture two within Series I, anuvittasana (standing backbend), and more specifically with the third behavior involved in the posture (arch spine backwards and keep neck and head in line with the spine). Participant 2 required more trials to master posture three within Series I, uttanasana, more specifically with the second behavior involved in this posture (bring arms and fingertips toward the floor). The possibility of varying levels of complexities explaining the differences in performance may have confounded the evaluation of feedback effectiveness and efficiency. However, the ratings provided by the certified yoga instructor which deemed all postures involved in the study to be within the beginner level.

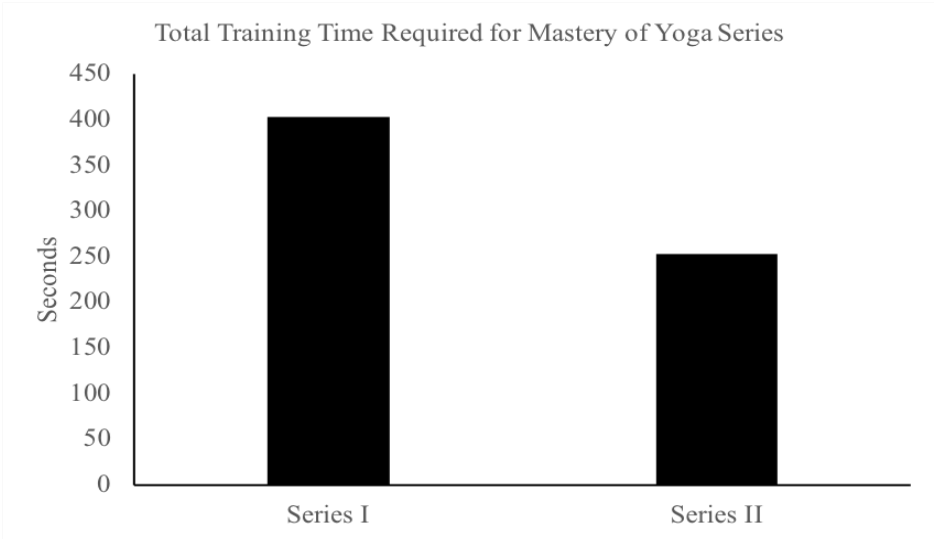

Figure 5 Combined Total Training Time Required for Mastery of Each Series for Both Participants.

A lack of conclusive findings may be due to a variety of limitations. The limited number of participants could impact the nature of the results. Only having two participants does not provide a sufficient amount of data for significant results to confidently deem one treatment to be more effective than the other for results to generalize outside of the scope of this study. A small number of participants serves as an inherent, known weakness of the nature of single case design studies. This weakness is typically addressed through exact replication of procedures used with each study with additional participants. Having a small number of participants, however, serves as an advantage within single case design studies, as it applies to the benefit of the individuals who participated. Additionally, general activity level outside of the scope of practicing yoga was not included as a part of inclusionary criterion. Potentially, being more or less active in one's daily life could impact acquisition rates in learning novel physical activity behaviors, such as learning new yoga postures. Participant 2 overall required significantly less time in mastering both series of postures than Participant 1. Upon verbal dialogue with both participants, it was discovered that Participant 2 engages in exercise/physical activity on a more consistent basis than Participant 1. Future replication of this study should address physical activity outside of the scope of yoga practice in its pre-experimental procedures. An additional limitation of this study is that there were no procedures in place to measure inter-observer reliability for total training time collected for assessing the dependent measure of efficiency. Per Human Subjects Rights Committee regulations, video recordings of training sessions were destroyed following completion of data collection. As there were no measures in place to record treatment adherence for total time training prior to destroying the videos, these data were not

collected. These data could be collected while a trained research assistant observes the video recordings in future replication. Finally, the ease of performance of the beginning level yoga postures included in this study pose as a limitation. With more challenging behaviors to learn (as opposed to beginning level) there is more room for comparing different training techniques.

This study was the first to compare verbal feedback and acoustical feedback within a BST package for training novel yoga postures. Because this research study solely had two participants, future research should replicate this study with additional participants in order to obtain more substantial results. If a feedback condition was differentiated in effectiveness and efficiency, this condition should be isolated in a final condition to reduce the potential for sequence effects. Once substantial results have been found, to test for generality, the condition that had more effective and efficient results can be implemented across similar topographies (e.g. different beginner level yoga postures). Further, future research could focus on comparing differing feedback mechanisms with various complexities of postures once participants demonstrate competency in more basic postures. An additional suggestion involves modifying the sound of the clicker (e.g. the "click" sound) used for the acoustical feedback condition, to observe if any changes are made in participant responding due to the nature of the type of acoustical stimulus used. Finally, future research using this study could compare the feedback mechanisms within the realm of a yoga class using multiple subjects participating within the same trials.

While no feedback method proved to be superior to the other, both proved to be effective in training beginning yoga postures to novice yoga practitioners supporting previous research. Acoustical feedback within a behavior skills training package was

proven to result in successful acquisition of targeted yoga postures, consistent with findings of similar studies that specifically trained yoga postures with acoustical feedback (Andrews, 2014). Additionally, those behaviors trained with verbal feedback resulted in acquisition of all behaviors, comparable to past studies with similar findings (Sarokoff & Sturmey, 2004).

In addition to the data proving effectiveness of training, both participants reported in the social validity rating scale that they were more comfortable performing postures within both series following training. As far as personal preference for specific feedback methods, both participants reported that they felt the verbal feedback method was more effective. Participant 2 reported in the social validity open-ended question that she "personally felt like the verbal feedback was more beneficial when learning the different postures." Additionally, while performing postures during training, Participant 2 verbalized "I can't figure out what I am doing wrong" during the acoustical feedback condition. While Participant 1 reportedly "agree[d]" that both conditions were enjoyable, Participant 2 "strongly agree[d]" that verbal feedback was enjoyable and "strongly disagree[d]" that acoustical feedback was enjoyable.

While data from this study fail to determine a consistently more effective method of feedback within a BST package for training novice yoga practitioners beginning level postures, both training packages proved to be effective in training all behaviors within the postures included in this study. Social validity reports discovered that both participants preferred verbal feedback to acoustical feedback. Since replication is essential to determining any treatment's effectiveness when using single subject design methodology, future researchers are encouraged to replicate these same procedures using more

participants, and also to replicate the majority of these “core” procedures while systematically manipulating variables of interest such as participant activity level, yoga experience, and difficulty of postures.

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APPENDIX A

PARTICIPANT SELF-REPORT QUESTIONNAIRE

Name: _____ Date: _____

Age: _____ Gender: _____

1. Have you ever taken a yoga class? _____

   If yes, how many? _____

2. Do you have any current physical bodily injuries, or have you ever had surgery on your ankles, knees, hips, shoulders, wrists, and/or hands that would be affected by performing beginning yoga postures? _____

   _____

If yes, please explain: _____

_____

3. Are you easily susceptible to injury? _____

4. Are you currently pregnant, or trying to become pregnant? _____

APPENDIX B

TASK ANALYSES FOR REQUIRED PREREQUISITE PERFORMANCE OF TRANSITIONAL POSTURES

Participant #: _____ Researcher:_____

Date:_____

Scoring: (+) = Correct(-) = Incorrect

	Attempt 1	Attempt 2	Attempt 3
Transitional Posture 1: Tadasana (Mountain Posture)			
1. Stand up straight with the bases of big toes touching and heels slightly apart			
2. Press shoulders back and hang arms beside torso			
3. Center head and position the bottom of the chin to be parallel with the floor			
Transitional Posture 2: Bharmanasana (Table Pose)			
1. Come to floor on hands and knees with the palms directly under shoulders and knees directly under hips with the feet behind the knees			
2. Gaze is down between palms			
3. Back remains flat			
SCORE:	/6	/6	/6

Participant #_____ accurately performed each step involved in tadasana (mountain posture) and bharmanasana (table posture), therefore she/he qualifies to participate in the study.

APPENDIX C

SERIES I (STANDING SERIES) TASK ANALYSIS

Participant #: _____ Researcher:_____

Date:_____ Session #:_____

Level of Testing (Circle One): Baseline Training Testing Re-Training Maintenance

Observer (Circle One): Primary Secondary

Scoring: (+) = Correct(-) = Incorrect

SERIES I	SCORE
Transitional Posture: Tadasana (Mountain Posture)	NA
Posture One: Urdhva Hastasana (Upward Salute)	NA
1. Turn arms outward (or laterally) so palms face away from torso and thumbs point backward	
2. Sweep arms out to the sides and up toward the ceiling and press palms firmly together	
3. Extend elbows fully and reach up with arms as straight as possible and look up toward palms	
Transitional Posture: Tadasana (Mountain Posture)	NA
Posture Two: Anuvittasana (Standing Back Bend)	NA
1. Place palms of hands on lower back with the finger tips pointing toward the ground and draw elbows together	
2. Lift body up through crown (top) of head	
3. Arch spine backwards (as far as comfortable for the body) and keep neck and head in line with the spine, looking forward OR drop head all the way back and gaze follows neck position	
Transitional Posture: Tadasana (Mountain Posture)	NA
Posture Three: Uttanasana (Standing Forward Bend)	NA
1. Place hands on hips and bend forward from the hip joints (not from the waist)	
2. Bring arms and fingertips toward the floor (as much as possible) and reach with the crown of the head toward the floor	
3. Knees and legs remain as straight as possible	
Transitional Posture: Tadasana (Mountain Posture)	NA
TOTAL NUMBER OF CORRECT STEPS	/9

APPENDIX D

SERIES II (KNEELING SERIES) TASK ANALYSIS

Participant #: _____ Researcher:_____

Date:_____ Session #:_____

Level of Testing (Circle One): Baseline Training Testing Re-Training Maintenance

Observer (Circle One): Primary Secondary

Scoring: (+) = Correct(-) = Incorrect

SERIES II	SCORE
Transitional Posture: Bharmanasana (Table Pose)	NA
Posture One: Marjaryasana (Cat Pose)	NA
1. Round spine toward ceiling with the tail bone down	
2. Release head down to floor and look down while pressing down with hands	
3. Arms remain straight, with wrists, elbows, and shoulders directly in line and knees remain below hips	
Transitional Posture: Bharmanasana (Table Pose)	NA
Posture Two: Bitilasana (Cow Pose)	NA
1. Lift sitting bones and chest toward ceiling and let stomach drop to floor while arching back	
2. Left head up and look up toward ceiling	
3. Arms remain straight, with wrists, elbows, and shoulders directly in line and knees remain below hips	
Transitional Posture: Bharmanasana (Table Pose)	NA
Posture Three: Balasana (Child's Pose)	NA
1. Bring big toes together, sit on heels, and separate knees about as wide as hips	
2. Hinge forward over pelvis and walk your hands in front of you	
3. Lower torso towards thighs and rest head, elbows, forearms, and palms on floor in front of you	
Transitional Posture: Bharmanasana (Table Pose)	NA
TOTAL NUMBER OF CORRECT STEPS	/9

APPENDIX E

VERBAL FEEDBACK SCRIPT

If all three behaviors included in a posture are performed correctly as described in the task analysis, verbal feedback will include:

"Good job performing [Sanskrit and English name of posture]."

For example, if performing marjaryasana, or cat pose, if the participant performs all three behaviors involved in the posture correctly, the verbal feedback would include:

"Good job performing marjaryasana, or cat pose."

If any behavior involved within a posture are performed incorrectly, one verbal feedback will be provided in the format of a corrective statement.

If only one behavior is performed incorrectly, feedback will include the script:

"Make sure to [definition of the behavior as described in task analysis]"

For example: if performing marjaryasana, or cat pose, if participant incorrectly performs the behavior that includes arm positioning (e.g. bent arms), the corrective statement would include:

"Make sure your arms remain straight, with wrists, elbows, and shoulders directly in a line."

If more than one behavior is performed incorrectly (i.e. two or three), feedback will include a comment directing awareness to the model for the following trial:

"Make sure to pay close attention to this posture, [Sanskrit and English name] when observing the model in the next trial."

APPENDIX F

YOGA INSTRUCTOR TASK ANALYSIS RATING SCALE

Name: _____ Title:_____

Please carefully read the following statements and answer the questions by circling the number that corresponds with your answer:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Series I is composed of beginner level postures	1	2	3	4	5
Tadasana is an appropriate transitional posture for this series	1	2	3	4	5
The task analysis for urdhva hastasana has properly broken down the posture	1	2	3	4	5
The task analysis for anuvittasana has properly broken down the posture	1	2	3	4	5
The task analysis for uttanasana has properly broken down the posture	1	2	3	4	5
Series II is composed of beginner level postures	1	2	3	4	5
Bharmanasana is an appropriate transitional posture for this series	1	2	3	4	5
The task analysis for marjaryasana has properly broken down the posture	1	2	3	4	5
The task analysis for bitilasana has properly broken down the posture	1	2	3	4	5
The task analysis for balasana has properly broken down the posture	1	2	3	4	5
I believe these task analyses are easy to understand	1	2	3	4	5
I believe these task analyses are representative of the true form of each posture	1	2	3	4	5

Additional comments or suggestions:_____

_____

APPENDIX G

TREATMENT ADHERENCE CHECKLIST FOR TRAINING FEEDBACK

CONDITION 1: VERBAL FEEDBACK

Date:_____ Participant Number:_____

Observer name: _____ Video Number: _____

Directions: Please indicate that a treatment step was completed by marking a "x" in the corresponding box, or "NA" if not applicable.

	YES	NO
1. Researcher introduces Sanskrit and English name of each posture within the respective series		
2. Researcher provides written and verbal instructions for each posture within the given series		
3. Researcher shows participant video model of each posture within the given series one time		
4. Researcher instructs participant to rehearse series of postures		
5. Researcher allows 15 seconds for participant to emit behaviors involved in each given posture before providing feedback		
6. Researcher provides one verbal feedback comment according to the script for each posture within the given series		
7. Researcher appropriately timed the trial (began timer immediately following the rehearsal phase and ended timer following the final posture in the series)		
8. Researcher offers participant a five-minute break in between trials and employs stopping criterion if necessary		
TOTAL	/7	/7

APPENDIX H

TREATMENT ADHERENCE CHECKLIST FOR TRAINING FEEDBACK

CONDITION 2: ACOUSTICAL FEEDBACK

Date:_____ Participant Number:_____
Observer name: _____ Video Number: _____

Directions: Please indicate that a treatment step was completed by marking a "x" in the corresponding box, or "NA" if not applicable.

	YES	NO
1. Researcher introduces the acoustical feedback condition and explains what acoustical feedback is and how the clicker will be used		
2. Researcher explains to participant that he or she will have three attempts to perform the posture		
3. Researcher role-plays a scenario to aide in description of how acoustical feedback will be used		
4. Researcher asks participant for their level of understanding of how acoustical feedback will be used		
5. Researcher introduces the Sanskrit and English name of each posture within the respective series		
6. Researcher provides written and verbal instructions for each posture within the given series		
7. Researcher shows participant video model of each posture within the given series one time		
8. Researcher instructs participant to rehearse series of postures		
9. Researcher provides one "click" when all three discrete behaviors within the posture are performed accurately		
10. Researcher allows 15 seconds or three unsuccessful attempts prior to instructing participant to move to next posture		
11. Researcher does not provide verbal feedback other than to instruct participant to move to next posture		
12. Researcher offers participant a three-minute break in between trials and employs stopping criterion if necessary		
13. Researcher begins watch immediately prior to rehearsal of the first posture and ends watch immediately following rehearsal of the final posture		
TOTAL	/12	/12

APPENDIX I

PARTICIPANT SOCIAL VALIDITY RATING SCALE

Please carefully read the following statements and answer the questions by circling the number that corresponds with your answer:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am more comfortable performing the postures from Series I than before I participated in this study	1	2	3	4	5
I am more comfortable performing the postures from Series II than before I participated in this study	1	2	3	4	5
I felt the verbal feedback condition was more effective than the acoustical feedback condition	1	2	3	4	5
I felt the acoustical feedback condition was more effective than the verbal feedback condition	1	2	3	4	5
The verbal feedback condition was enjoyable	1	2	3	4	5
The acoustical feedback condition was enjoyable	1	2	3	4	5

Additional comments:_____

_____

_____

_____