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Evaluating the Effectiveness of TAGteach for Teaching Yoga Postures to Novice Yoga Practitioners

Jessica Sade Andrews

University of South Florida, jandrews@mail.usf.edu

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Evaluating the Effectiveness of TAGteach for Teaching Yoga Postures
to Novice Yoga Practitioners

by

Jessica S. Andrews

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts
with a concentration in Applied Behavior Analysis
Department of Child and Family Studies
College of Behavioral and Community Sciences
University of South Florida

Major Professor: Raymond Miltenberger, Ph.D.
Kimberly Crosland, Ph.D.
Kwang-Sun Blair, Ph.D.

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Abstract

Over the past few years there has been an increasing number of people practicing yoga. There also have been reports of injuries as a result of practicing yoga. Many injuries have been attributed to poor teaching which can result in improper alignment. This study utilized a teaching technology, TAGteach to aide in skill acquisition of novice yoga practitioners. The current study focused on teaching three beginner asanas (poses) to novice practitioners. The intervention included the asanas being broken down by task analysis and the steps tagged one by one. The intervention was assessed by a multiple baseline across behaviors design. All targeted yoga postures improved upon the implementation of TAGteach and the results maintained after reinforcement was no longer provided and generalized to the yoga class setting.

Chapter One: Introduction

Yoga is an ancient eastern practice, which dates back to approximately 2500 B.C (Tran, Holly, Lashbrook, & Amsterdam, 2001). Although yoga has been prevalent for thousands of years in India, recently, it has been gaining popularity in the western world (Ross & Thomas, 2010). According to the latest “Yoga in America” study published by *Yoga Journal*, there has been an almost 30% increase in Americans who practice yoga in the past four years (Macy, 2012). The practice of yoga involves asanas (postures) and pranayama (breathing exercises) (Iyengar, 1993). Yoga practitioners are guided through these postures and breathing exercises by their instructor and given feedback and adjustments as the instructor makes his or her way around the room while the postures are being held.

Garfinkel and Schumacher (2000) reported that many of the Americans practicing yoga have chosen to do so because of the proposed health benefits that come along with having a strong practice. The effects of yoga are so far-reaching that some health professionals are now recommending their patients directly to yoga instructors for a variety of ailments and injuries. They notice such improvements in their patients that they are considering yoga a “holistic approach to health.”

Aside from the media and a number of health professionals endorsing yoga due to its health benefits, there is also empirical evidence that supports these claims. In a study reviewing articles about the health benefits of yoga and other exercises, yoga proved to be more beneficial than traditional exercise for 22 of the 32 outcomes (e.g., flexibility, kidney function, psychotic

symptoms, sleep disturbance, and stress). The results of this study suggest that yoga is more beneficial than traditional exercise when it comes to certain health conditions (Ross & Thomas, 2010). In addition, given that yoga interventions have produced positive outcomes in both healthy and unhealthy (i.e., Schizophrenia, Multiple sclerosis, Hemodialysis) individuals, yoga appears to have both preventative and curative effects.

Although yoga is growing in popularity, a number of articles report possible side effects and injuries caused by yoga (Alvarez, 2010; Broad, 2012; Fishman, Saltonstall, & Genis, 2009). One of the most controversial articles, “When Yoga Hurts,” states that one of the main reasons for injuries in yoga is poor teaching, because it results in incorrect alignment (Alvarez, 2010). Injuries that have been reported vary in severity from mild injuries to permanent disabilities (Broad, 2012). Even though it has become evident that there are injuries occurring as a result of practicing yoga, it is still said to be safer than other forms of exercise (Fishman et al., 2009). Because behavioral procedures have been used to improve performance in sports and fitness, it may be beneficial to take a behavioral approach to preventing injuries in yoga as well.

A behavioral approach that has proved to be successful in teaching and perfecting skills in sports and fitness is feedback. Feedback is defined as, “information a person receives about a particular aspect of his or her behavior following its completion” (p. 262-263, Cooper, Heron & Heward, 2007). When feedback is being utilized, praise is delivered following a correct behavior, while corrective feedback (further instruction) is delivered following incorrect behaviors (Miltenberger, 2012). Feedback does not always come in the form of verbal descriptions though, it can also be provided by other means such as sounds or vibrations (Cooper et al., 2007). Feedback has been used in sports and fitness to improve the performance of the

athletes and to also promote skill acquisition (Allison & Ayllon, 1980; Boyer, Miltenberger, Batsche, & Fogel, 2009; Smith, Smoll & Christensen, 1996).

Feedback has been used as a component in numerous empirically evaluated behavioral coaching packages, these packages include the “freeze” intervention (Allison & Ayllon, 1980; Smith et al., 1996), video modeling and feedback (Boyer et al., 2009; Guadagnoli, Holcomb, & Davis, 2002; Rikli & Smith, 1980), augmented feedback (Kernodle & Carlton, 1992; Lauber & Keller, 2012; Zubiaur, Ona, & Delgado, 1999) visual and auditory concurrent feedback (Baudry, Leroy, Thouvarecq, & Chollet, 2006; Clarkson, James, Watkins, & Foley, 1986; Eriksson, Halvorsen, & Gullstrand, 2011) and TAGteach training (Fogel, Weil, & Burris 2010; Quinn, Miltenberger, & Fogel, 2013; Stokes, Luiselli, Reed, & Fleming, 2010). Although these studies found favorable results, some aspects of the interventions were not so favorable. In the “freeze” intervention, the participants had to remain in the same position while the coach or author specifically described the errors made by the athlete. Although the participants made significant improvements, from an average of 5% correct in baseline, to 51.3% correct with the behavioral coaching condition, there was an issue with social validity, some of the participants reported that the freeze position was uncomfortable, and essentially aversive (Allison & Ayllon, 1980). In another study, athletes in the experimental group received auditory concurrent feedback to signal incorrect body alignment. Results of the study showed significant differences between baseline and auditory concurrent feedback conditions, and the results showed that the improvements gained from the device were maintained over a period without the device (Baudry et al., 2006). The main issue with the studies by Allison and Ayllon (1980), Baudry et al. (2006), and others is that they focused on error correction, punishment, over-correction, and negative reinforcement to increase skill acquisition and performance. Recent behavioral coaching and teaching procedures

in sports and fitness are taking a more positive approach including: differential reinforcement, prompting, and shaping (e.g. Buzas & Ayllon, 1981; Scott, Scott, & Goldwater, 1997).

TAGteach (Teaching with Acoustical Guidance) is a teaching technology that seems to have promise but requires further research. TAGteach is used across a wide variety of populations to teach new skills, retrain skills, and decrease problem behaviors (Fogel et al., 2010). TAGteach evolved from clicker training, a method for training animals that also utilizes an audible signal (“click”) to reinforce the behavior immediately after it occurs (Langbein, Siebert, Nuer-berg, & Maleuffel, 2007; McCall & Burgin, 2002; Pryor, 1999). Although TAGteach is related to clicker training, it differs in that TAGteach minimizes the use of primary reinforcers, makes use of communication with its learner, and has its own tools, terminology, and methodology.

In TAGteach a specific learning goal (tag point) is marked with a tag (a clicking sound emitted from a handheld tagger) the exact moment it occurs to signal success to the learner. Although previous behavioral coaching techniques utilize error correction, TAGteach exclusively uses positive reinforcement. In TAGteach, the target behavior is reinforced by a clicking sound (i.e., tag), a conditioned reinforcer. Before any empirical evidence was collected to support it, TAGteach was believed to be effective because of the immediacy of the reinforcement. As Skinner stated in *How to Teach Animals* (1951), a reinforcer “must be given almost simultaneously with the desired behavior; a delay of even a second destroys much of the effect.” (p. 1)

Although Scott et al. (1997) used a brief auditory signal as a reinforcer to increase proper arm extension by a pole vaulter, the first published study to evaluate the effectiveness of TAGteach used it as a component in a behavioral coaching package to improve the blocking

skills of high school football players (Stokes et al., 2010). In this study the offensive line coach selected five players who were struggling the most with pass-blocking skills and exposed them to several behavioral coaching procedures, descriptive feedback with and without video feedback, and TAGteach. The results demonstrated that descriptive feedback alone did not improve performance. Performance increased when video feedback was added, and further increased with the addition of TAGteach. Following the TAGteach phase, all the participants were performing within the acceptable performance range.

The second study to assess the efficacy of TAGteach was conducted by Fogel et al. (2010). Fogel et al. used TAGteach procedures to teach a novice golfer a golf swing. The golf swing was broken down into five skills: grip, address, alignment, pivot, and arm position and TAGteach was implemented sequentially with each skill. The results showed that four of the five skill sets improved with the TAGteach intervention. In addition, not only did the skills maintain, but they generalized to a different club.

One other recent study evaluated TAGteach for the acquisition of dance skills with young dancers (Quinn et al., 2013). Quinn et al. (2013) sequentially implemented TAGteach with three dance skills with four girls taking dance lessons at local dance studios. When TAGteach was implemented by the dance teacher, each dance skill improved for each girl above the level achieved through standard dance instruction in baseline.

These recent studies suggest that TAGteach is an effective training procedure for a number of different sports activities (football, golf, and dance). Considering the value of TAGteach for providing immediate feedback on performance to promote effective execution of these three disparate athletic skills, TAG teach may be valuable for use in many other sports skills such as yoga. With the growing popularity of yoga in the western world, there has also

been an increase in injuries due to improper position. If the correct yoga postures can be taught in a more efficient manner, the likelihood of injuries due to incorrect postures can be decreased. The use of the TAGteach procedure may facilitate the acquisition of each component step of the asana which will increase the practitioners' successful execution of the posture and will in turn help it be performed more safely. Therefore, the purpose of this study was to evaluate the effectiveness of a TAGteach procedure to teach yoga postures to novice practitioners.

Chapter Two: Method

Participants and Setting

The study included four healthy women at the novice level of yoga. The novice level was defined as individuals having little to no experience with yoga and performing the targeted yoga asanas (postures) at 50% correct or less. The participants ranged in age from 23 years old to 26 years old. RM was a 23-year-old graduate student with some prior yoga experience (less than 10 yoga classes- one hot yoga, the remaining at a local gym); upon inclusion in the study she was performing tree pose at 45%, down dog at 39%, and pigeon pose at 39%. LW was a 24-year-old graduate student with no prior yoga experience; upon inclusion in the study she was performing tree pose at 23%, down dog at 45%, and pigeon pose at 31%. JN was a 24-year-old undergraduate student with minimal yoga experience (one hot yoga class); upon inclusion in the study she was performing tree pose at 33%, down dog at 45%, and pigeon pose at 31%. JS was a 26-year-old graduate student with the most yoga experience (private yoga classes two times a week for a year 10 years ago, then 10 yoga videos since then); upon inclusion in the study she was performing tree pose at 38%, down dog at 42%, and pigeon pose at 32%. The researcher recruited potential participants by means of social media posts on Facebook and Instagram. After receiving emails regarding participation in the study, the researcher randomly selected four participants. The researcher reviewed the informed consent with the four potential participants before participating in any activities pertaining to the study. The researcher determined if individuals were eligible for participation in the study by conducting probes of the asanas to be

taught. The researcher showed the potential participants a picture and video model (featuring the first author) of the desired asana and asked the participants to perform the asana. While the potential participant performed the asana, the researcher took a video recording to later score the asanas using the corresponding task analysis. All potential participants met the inclusion criteria, by not performing better than 50% on the targeted asanas. To be considered for participation in the study, the adult could not have any current injuries. This was determined by a means of self-report.

The study took place at a university research laboratory, with the experimental procedure conducted two days per week. The experimental procedure was conducted by the researcher in the laboratory for a duration of 15 min per session.

Materials

The following materials were used in the study: yoga mats, a digital video camera, a MacBook laptop, and a tagger. The yoga mats were used for the duration of the study for the participants to perform the postures on. A digital video camera was used to record tag sessions and to record the participants performing each targeted asana at the end of each session. The MacBook laptop was used along with the QuickTime Player software to playback videos for scoring and to better analyze the videos with freeze frame and slow motion capabilities.

Target Behaviors and Data Collection

The target behaviors that were assessed in this study were three yoga asanas (postures). Those postures were of the beginner level and are used in almost every yoga class. The asanas were the Adho Mukha Svanasana (downward facing dog), the Vrksasana (tree pose), and the Salamba Kapotasana (pigeon pose). The asanas were broken down into task analyses (see appendix A, B, and C for the task analyses of the three yoga asanas). These task analyses were

created by the researcher based on her years of yoga experience and the Yoga Journal website. The task analysis was then modified based on the certified yoga instructor's suggestions. The task analyses included operational definitions for each step of the asanas and the corresponding personalized tagpoints. A personalized tag point is the label the learner provides for the target behavior once he/she is given the opportunity to engage in it. For example, the first step for pigeon pose is "begin on all fours (knees under hips, hands under shoulders)." Once a tag point was explained and the learner engaged in the described behavior, the learner was given the opportunity to come up with the personalized tag point ("hands and knees"). This personalized tag point was then used during the remainder of the tag session.

Prior to scoring the videos, five research assistants were trained using behavior skills training to score the targeted asanas using practice videos and were required to reach a criterion of 90% accuracy. The task analysis and the video recording were used to score each participant's performance of the targeted asana. Occurrence of each component step was recorded as a plus (+) and non-occurrence of the steps was recorded as a minus (-) on the task analysis sheet. Following the conclusion of each session, the percentage of steps correct was calculated by dividing the number of pluses by the number of steps and then multiplying that number by 100.

Interobserver Agreement

Interobserver agreement (IOA) data were collected in baseline, intervention, and maintenance phases for a minimum of 33% of all sessions. Trained research assistants collected IOA data while viewing the recorded videos. An agreement was defined as both of the observers recording an occurrence or a nonoccurrence of a step on the task analysis sheet. Disagreement was defined as one observer scoring an occurrence and the other observer scoring a nonoccurrence of a step in 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 for RM was 94% with a range of 89% to 100%. The mean IOA for LW was 93% with a range of 80% to 100%. The mean IOA for JN was 96% with a range of 83% to 100%. The mean IOA for JS was 94% with a range of 83% to 100%.

Social Validity

The first measure of social validity was a 5-item questionnaire completed by a certified yoga instructor to assess the validity of the steps in each task analysis and the intervention (see Appendix D). The certified yoga instructor rated the items on the questionnaire using a 5-point Likert-type scale (1= strongly disagree, 5= strongly agree). In addition to the items rated on a scale there was a comments section where the yoga instructor could suggest changes to be made to the task analysis. This validation of the task analyses was necessary before beginning the study. The task analyses were edited based on the feedback provided by the instructor.

Following the completion of the study, a second measure of social validity was taken. The participants were given a 6-item online survey (see Appendix E) and were asked to rate the acceptability of the intervention and their experience while participating in the study. Items in the questionnaire were rated on a 5-point Likert-type scale (1= strongly disagree, 5= strongly agree).

A third measure of social validity was taken by asking two local certified yoga instructors to assess videos of the participants' performance of the asanas in baseline and intervention. A video from each phase for each subject for each asana was chosen and shown to the raters in random order. The observers were kept blind to the condition of the video they are assessing, similar to the study by Downs, Miltenberger, Biedronski, and Witherspoon (2014). The observers scored the videos for the execution of the asana by rating items on a 5-point Likert

scale (1= strongly disagree, 5= strongly agree). This measure of social validity (see Appendix F, G, H) is a measure of the participants' performance free from bias, because the raters are kept blind to the purpose of the study and the condition of the video.

Treatment Integrity

While the researcher was conducting the TAGteach sessions, treatment integrity was assessed. Two checklists (see appendix I and J) were used to ensure the researcher completed all TAGteach sessions with high fidelity. Both the researcher and a trained research assistant were given the checklists. The researcher completed the checklist while going through each session (introduction and TAGteach), while the research assistant viewed the video and scored the TAGteach session for treatment integrity. Treatment integrity was calculated for 51% of total sessions by dividing the number of steps completed by the number of steps in the task analysis. The percentage of interobserver agreement on treatment integrity was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying that number by 100. The mean score for treatment integrity of TAGteach sessions was 97%, and IOA for treatment integrity was 100%.

Design and Procedure

A multiple baseline across behaviors research design was used to evaluate the effectiveness of TAGteach for each participant.

The baseline data indicated the participant's current level of execution of each asana before the intervention was introduced. Once there was a stable baseline, TAGteach was introduced for that behavior for that participant. While TAGteach was implemented for the first asana, the other asanas remained relatively stable with slight increase as a result of practice effects. This process was replicated for the second and third baseline for all participants.

Baseline. In baseline, each participant was shown a picture of the three asanas, and a live model of the asanas, and then asked to perform each asana three times. The first author asked the participant to “show me your (name of pose)” while showing the corresponding picture and video model of the pose. In the video, the first author performed each asana with 100% accuracy based on the task analyses developed by a certified yoga instructor and researcher. This process was repeated for each asana. Each data point on the graph represents one attempt to perform the targeted asana. The first author provided no feedback during baseline, rather a simple “thank you” was provided following the participant’s execution of the asana. Each baseline assessment lasted approximately 3-5 minutes.

TAGteach. The first author was trained in TAGteach methodology through behavioral skills training by a Level 3 Certified TAGteach trainer. To ensure the first author implemented the TAGteach procedures with fidelity a checklist was created, this same checklist was used to assess treatment integrity.

In the first intervention session, the first author introduced herself and the purpose of the study, the first author then introduced TAGteach by saying, “TAGteach is a new teaching technology utilized in a wide variety of populations to teach new skills. TAGteach has been used to teach advanced skills such as gymnastics, dance, high jump, and basic skills such as handwriting and shoe tying. TAGteach stands for teaching with acoustical guidance.” Following a basic introduction of TAGteach, the first author introduced the tagger to the learner. A tagger is a hand-held device emitting a brief, distinct, uniform stimulus (clicking sound) used to denote behavior as it occurs (generalized conditioned reinforcer). The tagger was introduced by reciting a script used in the Quinn et al. (2013) study, “This is a tagger. I am going to give you an instruction

on what to do, this is known as a tagpoint, if you perform it correctly, you will hear this sound (author clicks the tagger). If you do not hear the click, it simply means to try again. If after three attempts you are still having difficulty with the tagpoint, I will need to debrief you, “break it down” and teach the skill again. Do you have any questions regarding the way the sessions will go?” After TAGteach and the tagger were introduced to the participant, the first author made sure the participant understood the intervention and protocol. The author tested the participant’s knowledge by engaging her in a couple of games. During these games, the participant first tagged the first author’s behavior, following that step the participant was given the chance to perform the behavior while the author tagged it. This series of games gave the participant the opportunity to experience TAGteach both as the trainer and the participant, which aided in her understanding. Some of the games included: having the participant tag every time the author opens her hand wide and every time the author says a certain word while reading a paragraph. If the participant tagged the author’s behavior correctly, the author provided praise for correctly tagging the behaviors. These games taught the participant that the sound of the tagger (tag) means, “Yes that is correct” and that the absence of a click means, “try again.” The click emitted from the tagger should function as a reinforcer.

The intervention phase of the study consisted of the first author conducting a 15-min TAGteach session. The first author began by informing the student of the lesson for that session and following the directions introducing the tag point. A tag point is a specific selected behavior that will receive the audible signal when it occurs. The author stated, “The tagpoint is...” followed by the current step being targeted. To test the participant’s understanding of the tag point, the author allowed the participant to tag her behavior while modeling it correctly. After the

participant was given the chance to tag the behavior of the first author, the participant attempted to engage in the appropriate behavior. Following this opportunity, the participant came up with a personalized tag point she wished to use for the current step. After the personalized tag point was decided upon, the participant engaged in the behavior to be tagged. If the participant correctly performed the tag point, the author tagged it. If the tag point was performed incorrectly, no feedback was provided and the participant attempted the skill again. If the participant still did not perform the tag point, the three-try rule was applied. The three-try rule states that if the participant has not successfully executed the tag point within three tries, further actions must be taken. After the three unsuccessful attempts, the first author broke it down and came up with a new step to work on with the participant, one already in the participant's repertoire. Breaking it down is splitting a target behavior into steps that are easy to achieve and reinforce (refine the task analysis). The participant was given opportunity to move on to the next tag point once she had successfully completed the current tag point six times. If after meeting the criterion to move onto the next tag point, the participant revealed that she did not feel comfortable moving on yet, the participant continued to work on the current tag point until she felt comfortable moving on. This process was repeated until the duration of the TAGteach session was completed.

Upon completion of the TAGteach session, the participant was asked to perform each asana three times while being video recorded. As in baseline assessments, no tags or other feedback were provided during this assessment.

Generalization. To assess generalization of the skills, one generalization class was held following the completion of the study. The generalization data were taken to reveal if the steps learned in the tag sessions would generalize to the typical hatha yoga class setting. Participants were video recorded during a hatha yoga class setting that was held in a university research

laboratory. The yoga class setting was modified for data collection purposes. The class consisted of only the four participants and an instructor (part of the study staff). The number of students in the class was kept low to help with the visibility while recording the asanas. The generalization classes were led by a certified yoga instructor and included the targeted yoga postures. The first author and trained research assistants then scored the videos of the participants' asanas with the task analyses.

Stopping Criterion. Throughout the duration of the study, a stopping criterion was enforced if there was an issue (i.e. physical discomfort from participation in the study). If two participants dropped out of the study due to injury the study would have been stopped and the USF Institutional Review Board would have been made aware of the injuries and the status of the study. The injuries must be directly related to participating in the study. The stopping criterion did not have to be put into effect, no injuries occurred as a result of participating in the study.

Chapter Three: Results

Percentage Correct on Task Analysis

Shown in Figures 1-4 are the results for all four participants. For all four participants each target behavior increased once TAGteach was implemented. During baseline there were slight increases for some of the participants as a result of practice effects (RM tree and pigeon, LW tree and pigeon, and JS pigeon), however, their baselines were stable before the intervention was implemented. According to data collected during the generalization class, the improvements made during the TAGteach sessions sustained to the normal yoga class setting. A mean was calculated for each participant using the last three data points in baseline, and the last three data points in intervention. The means were calculated this way to indicate each participant's final performance level in both baseline and intervention phases.

Figure 1 shows the results for JN. The mean for tree pose was 35% in baseline and 98% in intervention. The mean for downward facing dog was 30% in baseline and 100% in intervention. The mean for pigeon pose was 28% in baseline and 100% in intervention. Figure 2 shows the results for LW. The mean for tree pose was 30% in baseline and 100% in intervention. The mean for downward facing dog was 42% in baseline and 95% in intervention. The mean for pigeon pose was 50% in baseline and 100% in intervention. Figure 3 shows the results for JS. The mean for tree pose was 33% in baseline and 100% in intervention. The mean for downward facing dog was 39% in baseline and 100% in intervention. The mean for pigeon pose was 54% in baseline and 98% in intervention. Figure 4 shows the results for RM. The mean for tree pose

was 52% in baseline and 100% in intervention. The mean for downward facing dog was 42% in baseline and 100% in intervention. The mean for pigeon pose was 50% in baseline and 100% in intervention. Figure 5 shows the means for both baseline and intervention for all three poses for each participant.

Social Validity Results

The results from the social validity questionnaire completed by the participants following the conclusion of the study were positive. The participants rated six items based on a 5-point Likert scale (1- Strongly disagree to 5- Strongly agree). The mean scores for the six statements ranged from 4.8 to 5. For the statement, “I believe my execution of Tree Pose (Vrksasana) has improved from the beginning of this study” participants responded with a mean score of 5. For the statement, “I believe my execution of Pigeon Pose (Salamba Kapotasana) has improved from the beginning of this study” participants responded with a mean score of 5. For the statement, “I believe my execution of Downward Facing Dog (Adho Mukha Svanasana) has improved from the beginning of this study” participants responded with a mean score of 5. For the statement, “I enjoyed using TAGteach to learn the yoga asanas” participants responded with a mean score of 4.8. For the statement, “I think my poses got better after using TAGteach” participants responded with a mean score of 5. For the statement, “Participating in the TAGteach sessions were enjoyable” participants responded with a mean score of 4.8. In addition to highly rating all items on the questionnaire, participants also provided positive comments in the optional comments section of the questionnaire. All participants that filled out the comments section stated that they feel much more confident when performing the poses after TAGteach. One participant commented that she “really enjoyed TAGteach and learning yoga this way,” and reported that

breaking the poses down helped her learn to execute the poses correctly. The mean scores of this social validity measure are shown in Table 1.

The last form of social validity required certified yoga instructors rate the participants' performance of each pose using a Likert scales (1- Strongly disagree to 5- Strongly agree) on a four question rating sheet. The last assessment from baseline and intervention were chosen for each pose and participant, these videos were then randomized and shown to the instructors to be rated. According to the blind ratings of the videos, the instructors believed the participants' performance of the targeted poses improved from baseline to intervention. The scores of this social validity measure are shown in Figure 6.

Treatment Integrity Results

Treatment Integrity data were collected for 51% of all TAGteach sessions. The researcher enjoyed using the treatment integrity checklist during each session to keep her on track, and help her remember each step to the methodology of TAGteach. Once the researcher used the treatment integrity list a few times it became second nature to her. The mean score for treatment integrity of TAGteach sessions was 97%, and IOA for treatment integrity was 100%.

Chapter 4: Discussion and Limitations

The current study evaluated the effectiveness of TAGteach for teaching yoga postures to novice yoga practitioners. During baseline, their performance never reached over 56%. For all four participants, once TAGteach was implemented, there was an immediate and a consistent increase in percentage correct. It should be noted that during the TAGteach sessions the researcher only tagged the steps in each the task analysis that the participant performed incorrectly during baseline sessions. All participants reached 100% correct on the task analysis at least once during the TAGteach phase. These substantial effects were maintained after TAGteach was no longer being implemented for the targeted poses, and also carried over to a generalization yoga class.

The maintenance phase began after each participant completed the targeted task analysis using TAGteach. The maintenance phase demonstrated that in the absence of the tag, the skills acquired during the TAGteach phase maintained. Each participant remained in the maintenance phase until the generalization probe. Not only did the skills acquired in the TAGteach phase maintain after training, they also generalized to a yoga class setting. The generalization probe (yoga class) was conducted at the end of the study for three participants (JS, JN, and LW), and prior to the last follow up session for RM.

Consistent with previous research, the results of this study confirm that TAGteach is an effective teaching technology to increase performance in the arena of sports and fitness (Fogel et al., 2010; Quinn et al., 2013; Stokes et al., 2010). This study adds to the limited body of

knowledge on the efficacy of TAGteach. Although TAGteach has been shown to be successful in improving the performance of experienced athletes, this is only the second study to show that TAGteach is also successful in improving performance of novice practitioners of the targeted sport. Although some of the participants had prior yoga experience, they were still scoring under 50% upon inclusion in the study. This study demonstrates that participants can learn to perform the poses correctly and safely even when not participating in yoga classes. The effectiveness of TAGteach with novice athletes should be evaluated with many other sports and fitness areas. TAGteach should also be evaluated further with athletes who are already receiving training as it can be used as individualized performance feedback to target an individual's deficits and supplement group or team training.

Not only was TAGteach effective in improving the targeted yoga poses for the four participants, but all participants reported enjoying the study and recognizing the effect it had on their performance. Participants also reported feeling more confident when performing these poses post-intervention. This feeling of confidence corresponded with objective improvements as was evident when comparing baseline to intervention videos.

The results of this study differ from the results of a previous TAGteach study by Quinn et al. (2013) in that all participants in this study reached 100% on the task analyses and maintained performance scores around 90-100%. In the Quinn et al. study, participants rarely reached 90%. Quinn et al. attributed this to the task analysis being strict, listing what would be expected of perfect performance in a dance competition. In the current study, the task analysis was created with a certified yoga teacher, and included 12-20 steps in basic poses that were attainable by novice yoga practitioners. In addition, some steps were modified to accommodate the novice nature of the participants. For example, in downward facing dog, the heels should be touching

the ground. However, the participants were given credit for this step if they moved their heels toward but did not touch the ground (recognizing that it may have been impossible for some to have the flexibility needed for the heels to be on the ground).

Although there were many strengths of the study, there were also a few limitations. The current study included only female participants. The intervention proved to be effective for all four participants, but despite the effectiveness of the current study, future research should replicate this study with both women and men to guarantee that it is effective for different genders. In a recent study evaluating video feedback for enhancing yoga postures with two men as participants, the participants did not achieve the same high level of performance as did the women in the current study (Downs et al., 2014). Research should evaluate the effects of TAGteach for yoga poses performed by men to identify whether the different intervention or gender of participants resulted in the different outcome across studies. Additionally, the current study's participants were young adults (23-26 years of age). The participants had differing levels of experience, but they were all under the age of 30 years old. It would be beneficial for future researchers to replicate this study with older populations to see if the results of the current study carry over to older age groups.

The final limitation of the study is that the study only tested the intervention with three beginner postures. Although these postures are elementary, and performed in almost every yoga class, it may be beneficial to replicate the study with different postures with varying levels of difficulty. Future researchers could also replicate the study with more experienced participants to make sure that the intervention is effective for all postures of yoga despite the difficulty of the pose and experience of the participant.

Table 1

Mean Social Validity Scores for Participants

Statement	Mean rating
I believe my execution of Tree Pose (Vrksasana) has improved from the beginning of this study.	5
I believe my execution of Pigeon Pose (Salamba Kapotasana) has improved from the beginning of this study.	5
I believe my execution of Downward Facing Dog (Adho Mukha Svanasana) has improved from the beginning of this study.	5
I enjoyed using TAGteach to learn the yoga asanas.	4.8
I think my poses got better after using TAGteach.	5
Participating in the TAGteach sessions were enjoyable.	4.8

Note: 1= Strongly disagree and 5=Strongly agree

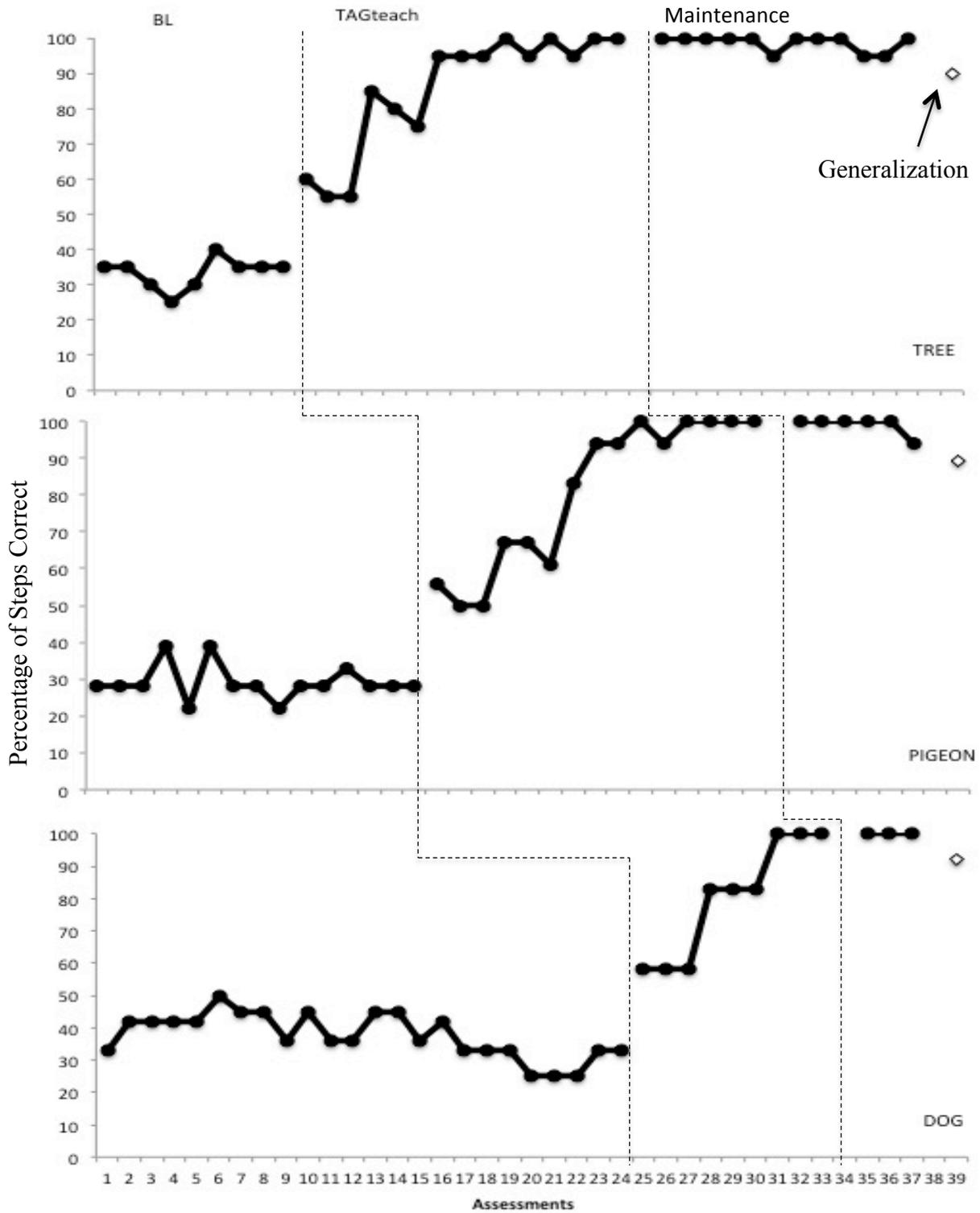


Figure 1. The percentage of task analysis steps completed correctly for each of three asanas for JN in baseline, TAGteach, maintenance, and generalization session.

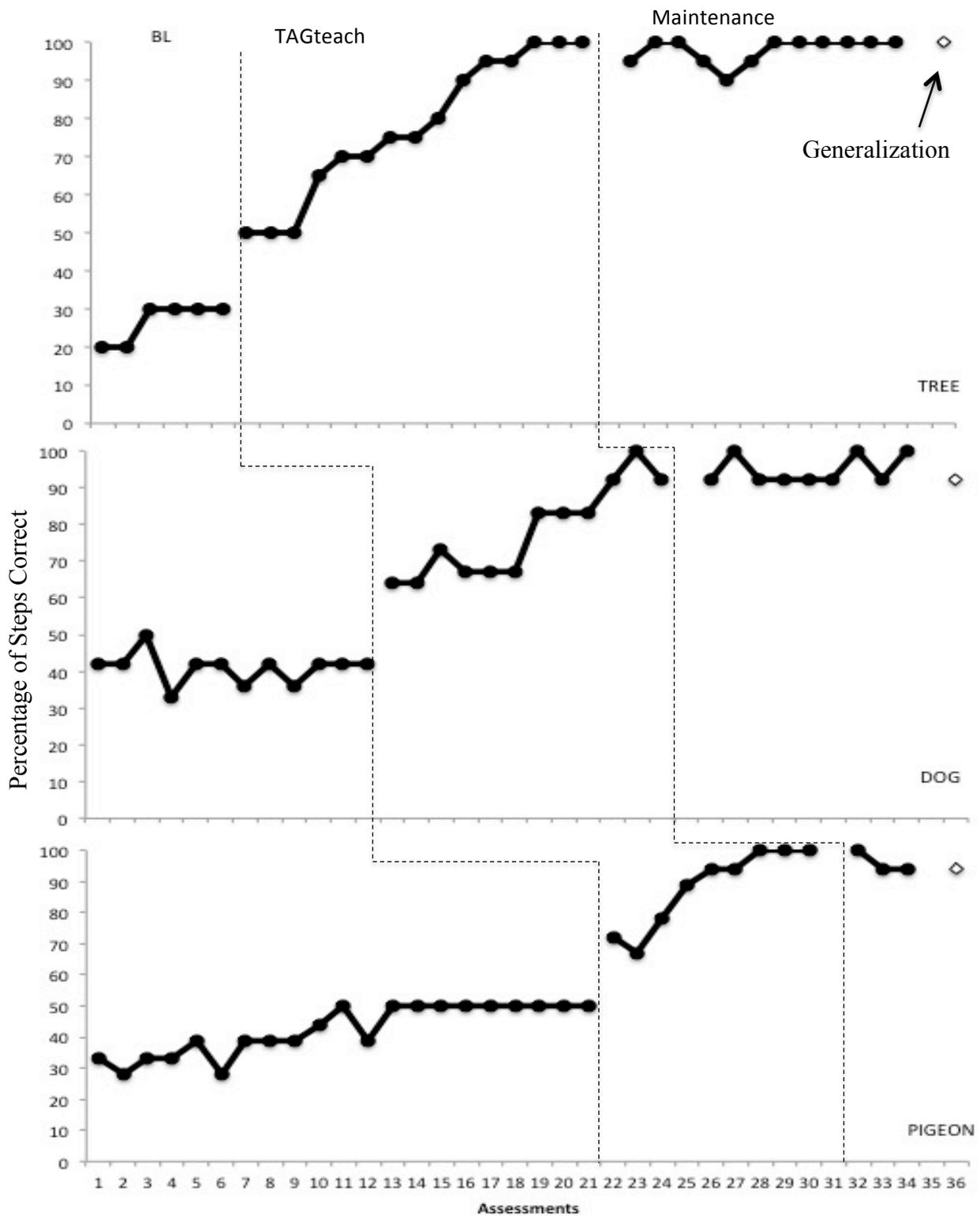


Figure 2. The percentage of task analysis steps completed correctly for each of three asanas for LW in baseline, TAGteach, maintenance, and generalization session.

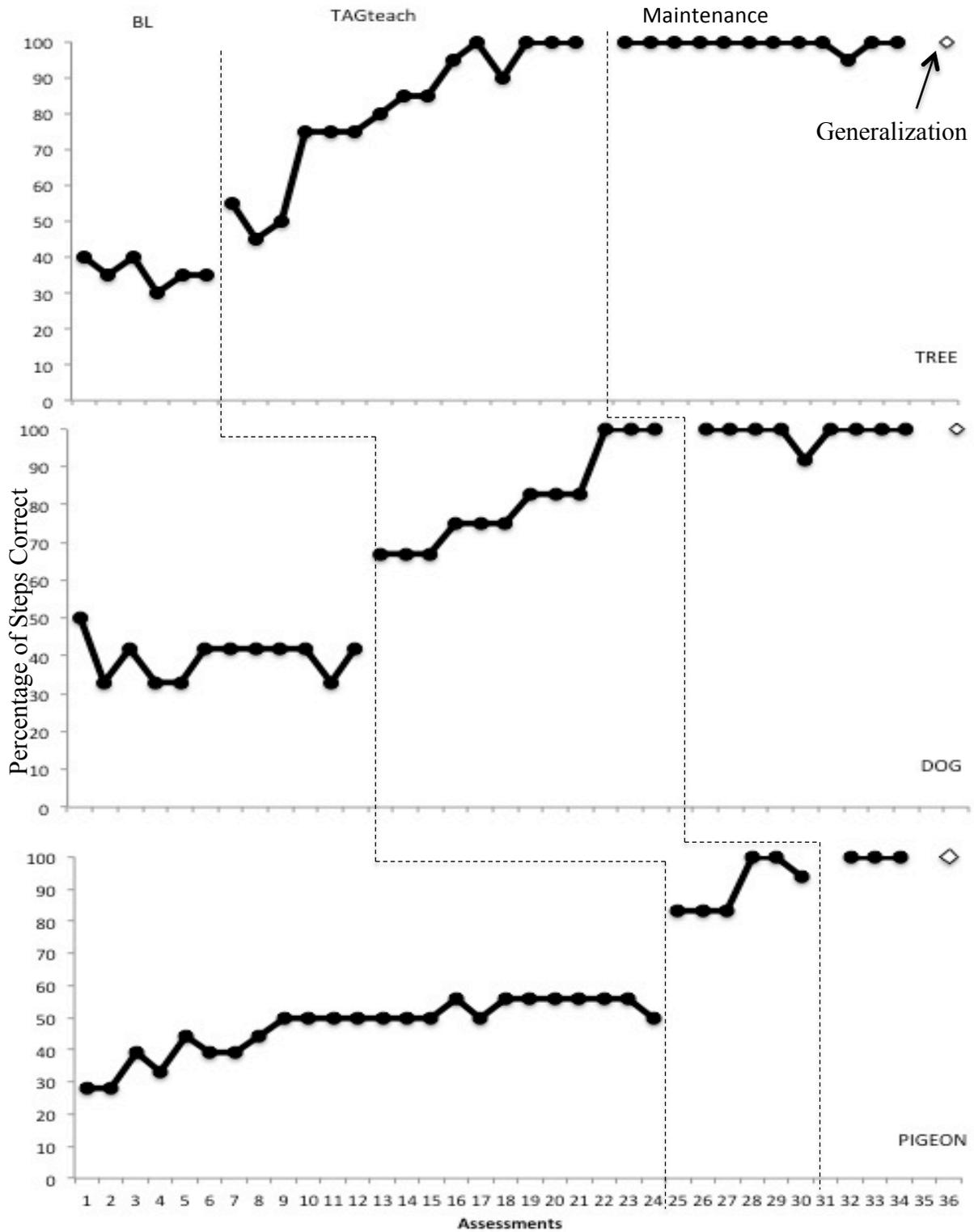


Figure 3. The percentage of task analysis steps completed correctly for each of three asanas for JS in baseline, TAGteach, maintenance, and generalization session.

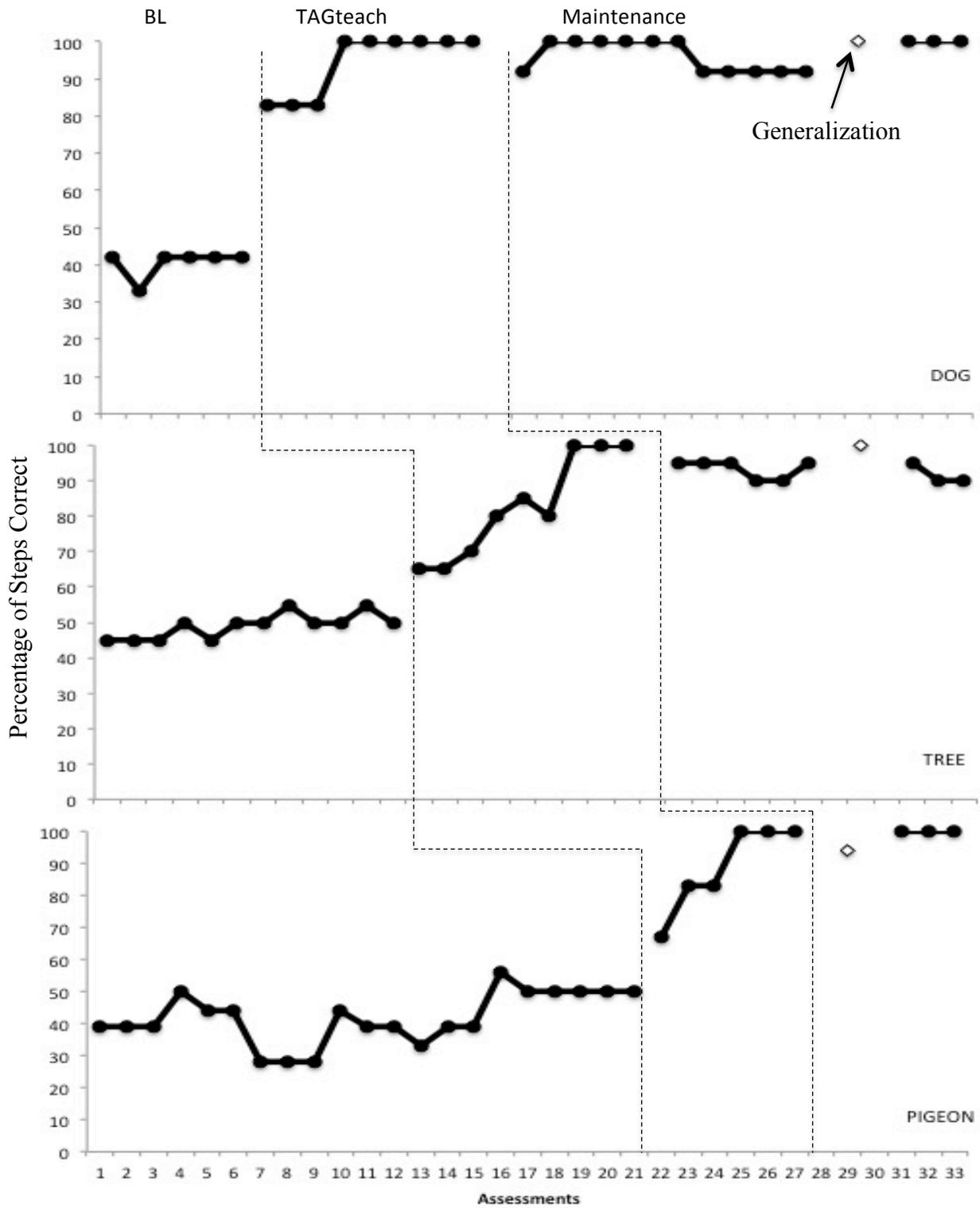


Figure 4. The percentage of task analysis steps completed correctly for each of three asanas for RM in baseline, TAGteach, maintenance, and generalization session.

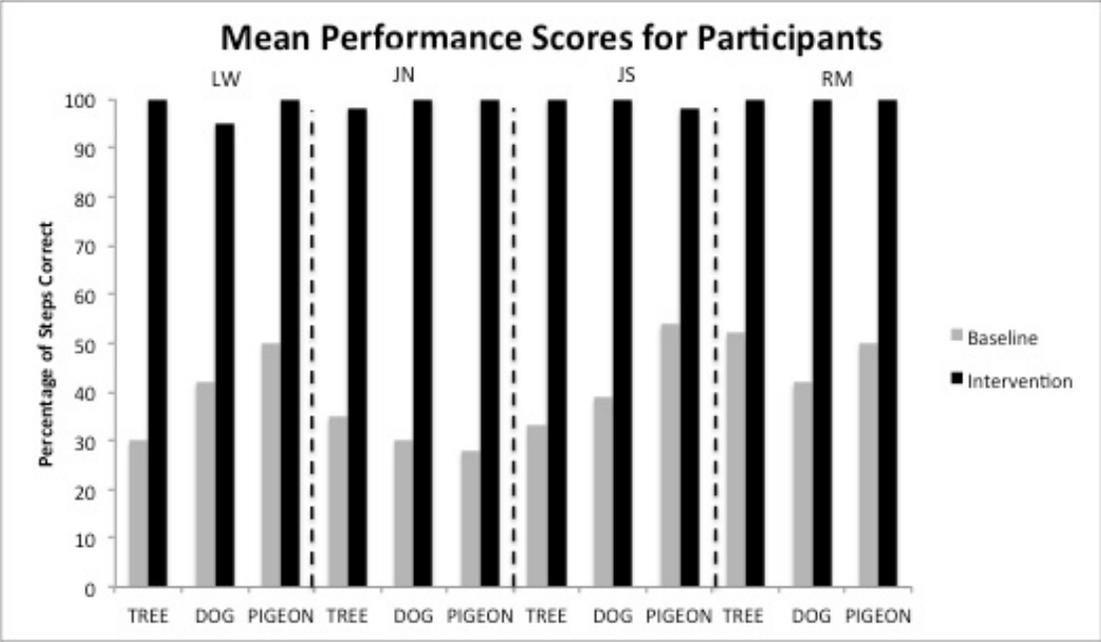


Figure 5. The means for the last three data points baseline and intervention for all three poses for each participant.

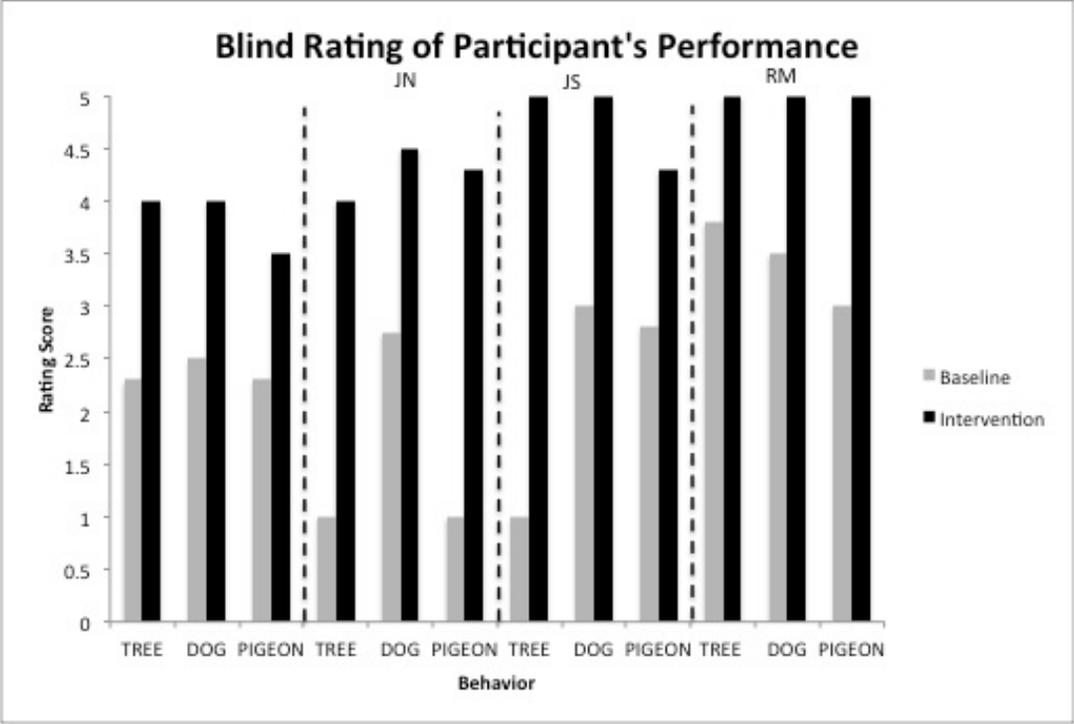


Figure 6. The blind rating scores of each participant's tree, dog, and pigeon posture.

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Appendix A: Tree Pose (Vrksasana) Task Analysis

Participant name: _____

Research Assistant: _____

Date: _____

Tree Pose (Vrksasana)	Personalized Tag point	(+) = Correct (-) = Incorrect		
Video #				
1) Stand on your mat with your heels hip width apart				
2) Shift your weight onto your right (or left) foot				
3) Bend your left (or right) knee keeping toes still planted to the ground				
4) Turn your left (or right) knee toward your left side				
5) Bring left hand (or right) out to your left side				
6) Extend you left (or right) hand to grab inside of your left (or right) calf or ankle				
7) Place the sole of your left (or right) foot against right inner thigh above your knee				
8) Release ankle				
9) Press palms together in front of your heart				
10) Keeping your palms pressed together extend both arms up straight above head				
11) Separate your palms keeping them about shoulder distance apart				
12) Roll your shoulders back				
13) Center your pelvis				
14) Tuck your tailbone				
15) Gaze straight ahead				
16) Hold position for 6-8 breaths				
17) Bring your palms back together straight above your head				
18) Slowly slide down hands back over your heart's center				
19) Bring hands down next to your sides				
20) Bring your foot down to starting position (hip width)				

*Modifications if needed: toes into floor, foot on calf

Pigeon Pose (Salamba Kapotasana) Task Analysis

Participant name: _____

Research Assistant: _____

Date: _____

Pigeon Pose (Salamba Kapotasana)	Personalized Tag point	(+)= Correct (-)= Incorrect		
Video #				
1) Begin on all fours (knees under hips, hands under shoulders)				
2) Move your hands slightly in front of your shoulders				
3) Slide your right (or left) knee forward to meet your right (or left) wrist				
4) Flex your right (or left) foot				
5) Slide your right (or left) foot slightly forward trying to make it parallel to the top of your mat, keeping your foot flexed				
6) Extend the left (right) leg behind you				
7) Square your hips to the floor				
8) Extend your arms up by your ears				
9) Forward fold resting your torso onto your right (or left) leg keeping arms extended by ears				
10) Rest your palms and forearms on the floor, (optional- rest your head as well)				
11) Hold for 4-6 breaths				
12) Continue to stay folded on your right (or left) leg				
13) Slide your hands back towards the front shin				
14) Press your fingertips into the floor				
15) Lift torso away from thigh				
16) Shift weight onto your right (or left) hip				
17) Sweep your left (or right) leg forward from behind				
18) Unfold right (or left) leg to meet left leg straight ahead				
		/	/	/
		___%	___%	___%

*Modifications if needed: block under hip, block under arms when leaning forward, rest head on block instead of floor

**Downward Facing Dog (Adho Mukha Svanasana)
Task Analysis**

Participant name: _____

Research Assistant: _____

Date: _____

Downward Facing Dog (Adho Mukha Svanasana)	Personalized Tag point	(+)= Correct (-)= Incorrect		
Video #				
1) Begin on all fours (knees under hips, shoulders stacked over wrist)				
2) Push your sit-bones towards your heels				
3) Extend arms forward				
4) Spread your fingers with index fingers forward				
5) Tuck your toes under so your feet are perpendicular to the floor				
6) Lift your knees away from the floor as sit-bones reach towards the ceiling (keeping knees slightly bent)				
7) Press into your hands pulling your abdomen towards your thighs				
8) Gaze through knees				
9) Press your heels towards the floor and lengthen legs				
10) Roll your shoulders back bringing you head between your arms				
11) Hold for at least 4-6 breaths				
12) After 4-6 breaths have passed, bring knees down to meet mat				
		/____%	/____%	/____%

Appendix B: Instructor Rating Scales

Instructor Task Analyses Rating

Please read and answer the following statements. Please circle the corresponding number that best indicates your opinion on the statement made.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The task analysis of Tree Pose (Vrksasana) has properly broken down the asana.	1	2	3	4	5
The task analysis of Pigeon Pose (Salamba Kapotasana) has properly broken down the asana.	1	2	3	4	5
The task analysis of Downward Facing Dog (Adho Mukha Svanasana) has properly broken down the asana.	1	2	3	4	5
There are no missing steps in the task analyses.	1	2	3	4	5
Scoring the asanas will be made easier by using these task analyses.	1	2	3	4	5

Additional comments to perfect task analyses: _____

Appendix C: Participant Social Validity Rating Scale

Participant Rating Scale

Participant number: _____

Please carefully read and answer the following questions. Please circle the number that best indicates your opinion on the statement made.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I believe my execution of Tree Pose (Vrksasana) has improved from the beginning of this study.	1	2	3	4	5
I believe my execution of Pigeon Pose (Salamba Kapotasana) has improved from the beginning of this study.	1	2	3	4	5
I believe my execution of Downward Facing Dog (Adho Mukha Svanasana) has improved from the beginning of this study.	1	2	3	4	5
I enjoyed using TAGteach to learn the yoga asanas.	1	2	3	4	5
I think my poses got better after using TAGteach.	1	2	3	4	5
Participating in the TAGteach session was enjoyable.	1	2	3	4	5

Appendix D: Blind Observer Rating Scales

Rating Scale for Tree Pose

Observer name: _____

Participant number: _____

Video number: _____

Please carefully read and answer the four statements independently while watching the video.

Please circle the number that best indicates your opinion on the statement made.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The participant seems experienced when performing the Tree Pose (Vrksasana).	1	2	3	4	5
The participant made no mistakes when performing the Tree Pose (Vrksasana).	1	2	3	4	5
The participant performed the Tree Pose (Vrksasana) fluidly.	1	2	3	4	5
The participant performed the Tree Pose (Vrksasana) safely.	1	2	3	4	5

Blind Observer Rating Scales

Rating Scale for Pigeon Pose

Observer name: _____

Participant number: _____

Video number: _____

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The participant seems experienced when performing the Pigeon Pose (Salamba Kapotasana).	1	2	3	4	5
The participant made no mistakes when performing the Pigeon Pose (Salamba Kapotasana).	1	2	3	4	5
The participant performed the Pigeon Pose (Salamba Kapotasana) fluidly.	1	2	3	4	5
The participant performed the Pigeon Pose (Salamba Kapotasana) safely.	1	2	3	4	5

Please carefully read and answer the four statements independently while watching the video.

Please circle the number that best indicates your opinion on the statement made.

Blind Observer Rating Scales

Rating Scale for Downward Facing Dog

Observer name: _____

Participant number: _____

Video number: _____

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The participant seems experienced when performing the Downward Facing Dog (Adho Mukha Svanasana).	1	2	3	4	5
The participant made no mistakes while performing the Downward Facing Dog (Adho Mukha Svanasana).	1	2	3	4	5
The participant has performed the Downward Facing Dog (Adho Mukha Svanasana) fluidly.	1	2	3	4	5
The participant performed the Downward Facing Dog (Adho Mukha Svanasana) safely.	1	2	3	4	5

Please carefully read and answer the four statements independently while watching the video.

Please circle the number that best indicates your opinion on the statement made.

Appendix E: Treatment Integrity Checklist- Introducing TAGteach

Date: _____

Observer name: _____

Video number: _____

Directions: Please indicate that a treatment step was completed by marking a ✓ in the corresponding box.

	YES	NO	N/A
Author introduces herself and the study			
Author introduces TAGteach			
Discusses different populations TAGteach is used in			
Introduces tagger and verbiage (i.e. the tagpoint is...)			
Gives a tagger to participant			
Hand wide open game			
Reading game			
First author provides reinforcement if the participant tags correctly			
If participant does not tag correctly, the first author repeats the games until he/she tags 3 times correctly			

Treatment Integrity Checklist- TAGteach Sessions

Date: _____

Observer name: _____

Video number: _____

Directions: Please indicate that a treatment step was completed by marking a ✓ in the corresponding box.

	YES	NO	N/A
The researcher allows the participant to warm up for five minutes			
Researcher reviews tagpoints from prior session			
Researcher informs the student on the lesson for current session			
Researcher states, “The tag point is...”			
Researcher tests the participants understanding of tag point (participant tag researcher modeling)			
Once the participant tags author’s behavior correctly, they switch roles			
If the participant performs tag point correctly the author tags it			
If tag point is done correctly, researcher ask for 6 more times			
Following the 6 th time, researcher debriefs (move on or keep working)			
If the tagpoint is performed incorrectly no feedback is provided			
If after 3 attempts the participant still does tag point incorrectly, author debriefs (BID, new tag point)			
The above process is repeated until the session time expires			
At the end of session, the participant is asked to perform the asana			
Researcher videos participant’s attempt			

Appendix F: IRB Approval Letter



RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

3/27/2014

Jessica Andrews, B.A.
ABA-Applied Behavior Analysis
13301 Bruce B Downs Blvd.
Tampa, FL 33612

RE: Full Board Approval for Initial Review

IRB#: Pro00014715

Title: Evaluating the Effectiveness of TAGteach for Teaching Yoga Postures to Novice Yoga Practitioners

Study Approval Period: 3/21/2014 to 3/21/2015

Dear Ms. Andrews:

On 3/21/2014, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

Approved Item(s):

Protocol Document(s):

[Jessica A_Proposal_Final ver3 3-25-14.docx](#)

Consent/Assent Document(s)*:

[IRB CONSENT ADULT.pdf](#)

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

A handwritten signature in black ink, appearing to read 'Kristen Salomon', followed by a horizontal line.

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board