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Comparison of Self-Image Versus Verbal Prompts During Acquisition of Bear Hold Placement

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ABSTRACT

Objectives: This study uses a behavioral analytic method to evaluate the effectiveness of verbal compared to self-image prompting on the maintenance of correct body positioning in a bear hold.

Design: Participants were trained and tested on their ability to obtain a correct bear hold body position and were graded based on a set of objective criteria.

Setting: Participants and observers in this study were tested at a physical therapy and rehabilitation center. An OxeFit virtual training machine was used as the visual aid guide for the experiment.

Participants: Eight participants were included in the study between the ages of 18 and 40 years old. None of the participants were actively undergoing physical therapy.

Outcomes: The main outcomes assessed are the ability for participants to perform and hold a proper bear hold position with the use of verbal and visual prompts.

Results: None of the participants were able to correctly obtain and hold the bear hold position using either verbal or visual prompts.

Conclusions: The results of this study highlights the differences in one's ability to comprehend and execute specific instructions, emphasizing the need for attendance and observation of patients by physical therapists when implementing techniques that require proper form.

Introduction

Core stability protects individuals from injury and can support the movement of smaller muscle group movements such as hand, shoulder, and ankle movements [6]. To strengthen the core muscles, Dynamic Neuromuscular Stabilization (DNS) paradigms can be used to train older individuals in core stability in the same order that infant development occurs [6]. The DNS model targets the natural progression of stability through functional movement pattern exercises. Often, methodologies used in physical therapy align with the DNS paradigm for movement progression. Physical therapy is a rehabilitation service that focuses on preserving, enhancing, and restoring movement when impairment is present for the individual [1]. One exercise used frequently in physical therapy is the bear hold, which includes individuals holding a static position with toes and hands on the floor with knees bent at a 90-degree angle. In physical therapy, the bear hold is used to strengthen and correct major muscle groups to aid in recovery and reduce the risk of further injury. Physical therapy professionals use this exercise to target core stability, and, in many cases, can be used to measure and increase strength while recovering from injuries. While this exercise is quite common in physical therapy, there is usually confusion and frustration for the people receiving therapy about how to properly get into the position and maintain the correct form. Possible supports provided during therapy include verbal prompts for correct form or mirror image. The science of applied behavior analysis (ABA) frequently uses prompting to assist with su-

pporting individuals to meet behavior change criteria. ABA has been used in past research to target compliance and motor skills development during physical therapy [2-4].

This research project will utilize the principles of applied behavior analysis prompting levels to assess the most effective prompting technique for physical therapy patients who are acquiring the skill of performing a proper body placement bear hold. This will be a unique approach to addressing the frequent delays physical therapists observe in patients struggling to adjust their body placement during bear holds by taking a multidisciplinary approach to prompting patients. Often in settings of rehabilitation, physical therapists are not working with patients in an individualized setting. It may be common for physical therapists to be at the attention of multiple patients at once. This can lead to a breakdown in the quality of movements, exercises, and guidance that a patient receives from their physical therapist. It is because of this that the utmost importance is placed on proper technique if a physical therapist cannot monitor one singular patient for the duration of their visit. The presented study will measure the ability of a patient to get in the correct body placement during a bear hold with verbal prompting compared to using the aid of a video mirror image. This will assist in evaluating the best, individualized method of ensuring patients can maintain the proper form of a bear hold, as well as re-obtain the proper positioning in settings in which they may not be monitored consistently.

Methods

Participants

There were eight participants included in this study. IRB approval was given for the conduction of this research. Once IRB approval was obtained, participants were recruited and both written and verbal informed consent was given. The participants for this study were between the ages of 18 and 40 years and not under the care of a physician for any orthopedic injury. Each participant also had the ability to complete the required movements and positions properly without the physical assistance of another person. The participants were willing to wear tennis shoes to get into the proper position for the hold. The average age of the participants was 26.625 years. There were six males and two females included in the study. Four participants had prior experience with the Oxefit machine and four did not have prior experience with the Oxefit machine. Only one of the eight participants had prior experience with the Bear Hold movement (Table 1).

Table 1: Patient Demographics.

Demographics	
Age years (mean)	26.625
Sex (Male:Female)	6:2
Prior Experience with Oxefit (yes:no)	4:4
Prior Experience with Bear Hold (yes:no)	1:7

Setting

The setting for this trial was a gym environment which included an Oxefit training system. An Oxefit system is a fitness machine that incorporates robotics, performance training, and analytics through force plate and video capture systems. This project did not require video capturing option but did use the mirror feature on the machine to mimic a mirror image as a mirror is common in the physical therapy environment. The Oxefit has a large panel on the front of the machine, which can be turned off to remove any visual prompts. The video panel can also show a mirror image of participants or an avatar image that tracks their real-time movements. The mirror image was chosen to assess the effectiveness of mirror self-image prompts compared to verbal prompts for this study. The avatar image was excluded from this research project due to the novelty of this aspect of the machine. If chosen, the external validity of the research would be minimized due to the lack of this technology in the general physical therapy environment. However, mirror self-image can be transferred to physical therapy environments with mirror availability for patients to review their movement patterns. The teaching session occurred in an area away from the Oxefit platform within the gym environment. Only verbal prompts were used to teach the proper body placement for the bear hold, and one image of a person in the correct form was shown to the participants. No other people, besides the data collectors, were present during the data collection processes or teaching session.

Materials

Each training session was completed by two investigators, the principal investigator and a co-investigator to take interobserver agreement data (IOA). Therefore, two data sheets were prepared along with the required writing utensils. Additionally, a printed image of the correct form for a bear hold was used during the initial training session but removed from view during testing trials. Testing trials occurred on the training pad of the Oxefit machine for both testing conditions. This allowed for optimal sight of the visual prompts for the participants. Participants were asked to wear appropriate clothing that allowed them to properly perform the bear hold and shoes which will not impede a 90-degree angle like pointed-toed shoes.

Independent Variable

The independent variables in this study consisted of the randomization of two prompt levels (self-image and verbal) to the participant to complete a proper bear hold movement. The self-image prompt was provided through the mirror capabilities of the Oxefit machine. For the self-image prompt, the Oxefit machine was turned to the settings which allowed the participant to see themselves on the machine. At the onset of testing trials, the Oxefit machine was set to the appropriate prompt level. Then the prompt to "step up" was given, which prompted the participants to step onto the Oxefit testing platform for optimal sight of the Oxefit mirror. Once the participants were on the Oxefit platform, the participants were prompted to "get into position" and given 5 seconds to get into position before their body placement was scored based on the following criteria: 90-degree angle at the

knees, ankles, and shoulders with a flat back. After the first movement, the participant was prompted "stand up" to reset their body placement. This process was completed for each participant until five consecutive trials of self-image prompts were completed. Following the five consecutive trials the participants were prompted to "do five jumping jacks" to change the muscle pattern of the participant and prepare them for the next testing condition.

For the verbal prompt, the screen on the Oxefit machine remained off. The prompt to "step up" was given and the investigator prompted the participant with the following: "Remember 90-degree angle at the knees, ankles, and shoulders with a flat back. You can get into position". Once the prompt was provided, the participant had 5 seconds to perform the bear hold and it was scored based on the preset criteria. After the bear hold was completed, the participant was prompted to "stand up" to reset their body placement. This process was completed until five consecutive trials of verbal prompts were completed and then the participant was prompted to "do five jumping jacks" to change the muscle pattern of the participant.

Dependent Variable

The dependent variable in this study was the participant's proper body placement in a bear hold. The proper body placement was graded based on the following criteria: 90-degree angle at the knees, ankles, and shoulders with a flat back. Each data collector had a data sheet with the randomization order and a scoring column. If participants were in the correct form at the end of the timing period, a score of "+" was placed in the trial box. If the participant was not in the correct form, a score of "–" was used to indicate the error in body placement. No verbal feedback was given to the participant on how each trial was scored to ensure the feedback did not skew the effects of the prompts provided, which was the independent variable of the study.

Data Collection

Paper data collection sheets were stored in a locked cabinet in the faculty advisor's office, which only she has the key, to maintain the security of the data collection sheets. The paper data collection sheets identified the participants by a number which corresponded to the number provided in sequential order they completed the informed consent process. All information and data collected during this research was recorded in Microsoft Excel on a password protected computer. This spreadsheet does not contain protected health information. Records related to this study will be securely retained in a secure location for 3 years after the study's completion or longer as required by law. At that time, all records will be properly destroyed in accordance with protected health document destruction, even though no health information is included in this study.

Interobserver Agreement (IOA)

The IOA method used for this study was trial by trial exact county IOA. IOA was conducted on 100% of testing procedures. The IOA was collected by the principal investigator and sub investigator of this project. Practice IOA trials occurred until 80% or higher IOA was met between investigators. IOA was collected with the two observers positioned within the same room but far enough away that each data collector could not observe the other collector's data. The same data collection sheets were used for each data collector and a data collector identifier was placed at the top of the data collection sheet for Data Collector 1- Principal Investigator and Data Collector 2- Investigator #2. For this method of IOA, the two observers scored each trial across participants, and at the conclusion of the session, the data were compared. The total number of trials scored the same by both observers were divided by the total number conducted and then multiplied by 100 to find the exact count IOA score. IOA maintained 80% or higher during testing sessions. In summary, IOA remained high across all participants with an average of 91.6% agreement across all participants. Table 2 includes trial by trial IOA data for each participant and data collector.

Table 2: Interobserver Agreement.

Participant	1	2	3	4	5	6	7	8	Average
Trial by Trial IOA	81.25%	100%	100%	86.67%	100%	80%	100%	85%	91.6%

Experimental Design

A prospective, trials to criteria, alternating treatment design was used to assess the two conditions across eight participants. The two conditions were randomized for each participant, and each participant completed twenty trials of each prompt or until they got into the correct placement for three consecutive trials as agreed upon by two data collectors for that prompt level. Once three correct consecutive trials were obtained for one prompt level, the data collectors agreed that the criteria were met for that prompt level and the prompt level was removed from the sequence. The other prompt level continued until the max trials are met or the criteria was met. If a participant did not meet three consecutive correct placement trials before the twenty trials was completed, the prompt level was scored as disfluent.

Procedures

Training Session: The training session for this project consisted of the participants being directly trained on the proper body placement for a bear hold until they could successfully meet the criteria

once. The training included verbal feedback or physical guidance when needed or requested by the participant. The participants got into the bear hold position and had direct feedback from the investigator on placement. An image of the correct placement was provided to the participant during the training sessions, but this image was removed during the testing trials. Once the training session ended, a timer was set for five minutes to signal to begin the testing session.

Testing Session: The testing session for this study began five minutes after the training session to prevent the skills learned in the training session from being directly imitated in the testing session. Once this time elapsed, the participant began the sequence of prompts listed in the randomization of prompts section. The participant was prompted to begin the bear-hold position and given 5 seconds to correctly get into position. Once these 5 seconds elapsed, the body placement was scored, and the participants were provided a 15-second resting period before the new prompt was provided. This continued until the participant reached 20 total trials of a prompt level or 3 consecutive correct responses of a prompt level. If a prompt level reaches the criterion, it will be removed, and the remaining prompt level will continue until the criterion is met or 20 trials are met. A prompt level will be marked as disfluent if it does not reach the set criterion.

Internal Validity: Internal validity was measured at 100% during the study procedures. This was obtained by ensuring both data collectors were present for all study procedures and adhering to the study procedures. This study displayed internal validity using the randomization of prompts which did not allow the participant to prepare for which form of feedback they received. This study will also show internal validity as the protocol followed as written with IOA data being collected through all procedures and no deviations from the protocol were observed.

Results

A total of 8 participants were enrolled in this study. 3 participants' data were excluded due to not meeting the criteria for both conditions during the training session. One participant was excluded due to 0% accuracy across both conditions. The remaining 4 participants had varying results in both conditions. Of those four participants, two did not meet the conditions for correctly positioning themselves in the proper bear hold technique for 3 consecutive attempts (participant #6 & participant #8). The remaining two participants met the conditions with one participant (participant #4) meeting the criteria with verbal instructions on their first attempt, but not meeting the conditions while using the video mirror of the Oxefit. The other participant (participant #1) met the criteria using the video mirror of the Oxefit on their first attempt and on their second attempt with verbal instructions.

Discussion

The need for individual attention to patients in a physical therapy setting is important. Physical therapists can see up to 20 patients a day, all with varying degrees of injuries and ailments and when data is analyzed across the group, individual differences may be masked [4]. With the focus of helping patients recuperate and recover from injury or surgery, the emphasis on attention to detail is of utmost importance further supporting individualized intervention during physical therapy. Patient satisfaction and positive outcomes have been found to be highly associated with multiple factors to include time spent with the physical therapist, proper instruction, and thorough explanation of the techniques and exercises the patient is to perform [5]. Inversely, one factor found to not be correlated with patient satisfaction during physical therapy was the type of equipment used [5]. Thus, it can be concluded that patient satisfaction is strongly linked to the quality of time and instruction spent between the patient and physical therapist [6]. An emphasis on equipment should not be made to ensure patients can properly perform techniques such as the bear hold, unless a patient warrants specific equipment due to injury or consistent inability to perform a technique by other mechanisms. It is evident by the results of this study that the use of minimal equipment such as a mirror is sufficient enough for a generalized population of participants to properly perform a standard use technique in physical therapy environments. The goal of this study was to evaluate a way to ensure that a common technique, the bear hold, can be performed consistently, confidently, and properly by patients and be repeated when not under the direct observation of their physical therapist. Our results show that there are varying degrees of comprehension and ability to perform this technique correctly with simple verbal instructions or with the use of a video mirror. Participants were a representative sample of the general population with varying degrees of physical ability, stature, gender, and prior experience with this technique. With such mixed results, we can conclude that the approach to physical therapy techniques, especially those requiring strict adherence to proper form, needs to be attended to and observed at all times by a physical therapist.

There is no single solution to ensure patients can properly perform rehabilitation exercises, especially those recovering from major surgery further supporting the findings of Gonella that a multidisciplinary approach to physical therapy with focus on individual performance will support patients best. It is our recommendation that physical therapists spend individualized time with their patients to find what methods of learning and comprehension work best for the individual and emphasize proper technique and instruction. It is evident that individuals are capable of performing the bear hold technique with simple verbal instructions and the use of a mirror, and a majority of patients may favor one of these methods. However, some patients may not be able to properly perform exercises required of them using either method. Focused and individualized methods of instruction should be explored with each individual patient, and there should not be an assumption that one method of instruction works best for every patient. If common techniques like the bear hold cannot be performed and repeated properly without the guidance of a physical therapist,

then the detriment is only to the patient. The push for an individualized approach to care and recovery of patients in a physical therapy setting should be a more common practice for the sake of patient safety and positive outcomes.

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Author's Contributions

Jessi Truett is the Principal Investigator. Shane Kelley, Kenneth Kersey, Mary Golden and Leasha M. Barry are the Co-investigators.

Ethical Statement

This research has been approved by the appropriate ethical committees related to the institution(s) in which it was performed and all subjects gave informed consent to the research.

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