The Effectiveness of the BIOSWAY on Balance in College Aged Non-Athlete Females

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Abstract

Introduction: The Biodex BIOSWAY is a portable balance system that emphasizes specific movement patterns and is utilized for vestibular and balance training. Balance is an important factor in daily movements, as well as all types of exercise. The purpose of the present study is to determine the effectiveness of the balance training protocol provided by the BIOSWAY balance system in healthy women ages 18-24 who are not involved in organized sports. **Methods:** A total of 11 subjects participated in the present study. Subjects performed a pre-intervention balance assessment that involved the Balance Error Scoring System (BESS) test on a firm surface and a foam surface, as well as Postural Stability and Limits of Stability. Following the pre-intervention assessment, subjects followed the pre-loaded protocols on the BIOSWAY, one protocol per training day, three times a week for four consecutive weeks. Each protocol required the subjects to manipulate their center of balance (which is represented by a black dot) to a variety of blinking circles, through a maze and to follow a randomly moving circle. After four weeks of BIOSWAY training protocols, subjects were assessed for balance and data was compared to their baseline. **Results:** Statistical significance was determined for the Limits of Stability assessment (p=0.001, =19.09±12.92), which measures dynamic balance. Insignificant balance improvements were observed in the other three assessments: BESS test firm (p= 0.614, =0.273±0.524), BESS test foam (p= 0.672, =0.364±0.834), and Postural Stability (p= 0.640, = 0.0181±0.038), which measures static balance.

Conclusion: The results of the current study suggest that the training protocol provided by the BIOSWAY significantly improved dynamic balance. However, static balance was not significantly improved in the current study. Results of the current study suggest that static balance training may be limited by the protocol provided by the BIOSWAY. Limitations of the present study such as sample size, population demographics and training duration, may also complicate the effectiveness of the BIOSWAY's prescribed balance protocols.

Conclusion

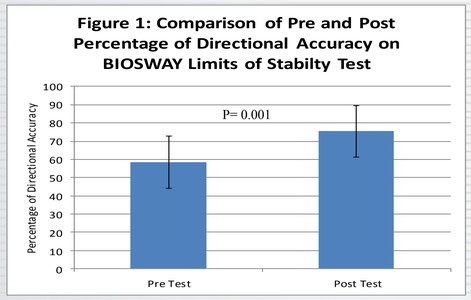
The results of the current study suggest that the training protocol provided by the BIOSWAY significantly improved (p= 0.01) dynamic balance. However, static balance was not significantly improved in the current study. These results suggest that static balance training may be limited by the protocol provided by the BIOSWAY. This information leads to the conclusion that the BIOSWAY protocol can be effective for training balance during movement (dynamic), but when trying to train static balance, another device may provide more effective results. When training balance, it is important to investigate thoroughly what types of balance gains are desired. Limitations of the present study such as sample size, population demographics and training duration, may also complicate the effectiveness of the BIOSWAY's prescribed balance protocols.

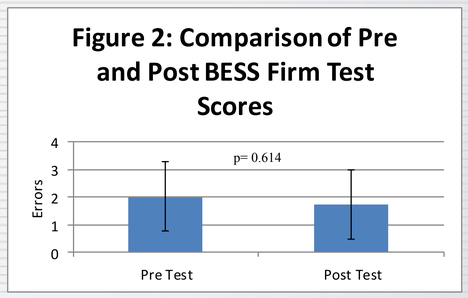
Introduction

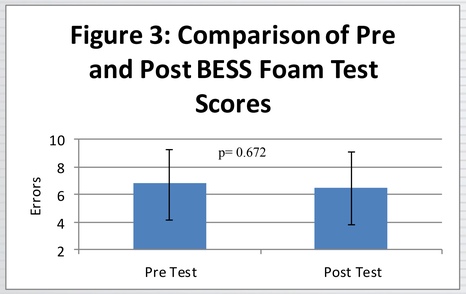
Balance is a functional term and controlling it requires a complex multi-dimensional process[2]. Being able to sense the threat of falling or losing balance requires selection of appropriate motor strategies to correct errors and these strategies are dependent upon task demands and environment[4]. Due to this complex nature of balance, when determining a therapy program to increase balance, many different aspects must be considered. Motor skill adaptation, acquisition, and maintenance are dependent upon use and can only progress with the active utilization of balance on a regular basis. Biofeedback is a type of training that has long been used to train balance and it is the use of electronic monitoring of a normally automatic bodily function in order to train someone to acquire voluntary control of that function. Biofeedback has been used for more than fifty years in rehabilitation to facilitate normal movement patterns after injury[4]. Virtual training works well because it allows the activity to be interactive while providing enjoyment for the participant. Due to the numerous issues associated with lack of balance and reduced mobility, the production of an effective rehabilitation program for people with impairments is crucial to counter act these problems[4].

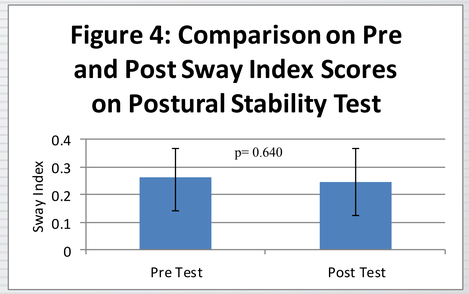
Balance is the key to all functional movement. The motion of life involves dynamic changes and we must conform and adapt to those changes. "The human being's ability to maintain balance during bipedal stance is key to effective and efficient performance of many daily activities"[1]. As individuals reach older ages, their sense of equilibrium starts to diminish and consequently, their balance suffers. Incorporating balance exercises before they reach that older age could potentially postpone deteriorating balance that is expected of older adults and could theoretically reduce the risk of injuries.

The ability to balance is important for persons to be able to perform daily activities without the fear of falling and injuring themselves. Previous research has demonstrated a clear need of balance rehabilitation programs for people with limited balance or mobility needs. This information caused the research team to question the effectiveness of similar balance rehabilitation programs for younger people that do not experience balance or mobility impairments. The researchers asked the question, "Would utilization of a BIOSWAY balance program protocols prove beneficial for balance?" To the best of the researcher's knowledge, this question has not been adequately and been supported by research. The purpose of this project is to answer that question based on research and also to provide a base knowledge that can lead to research for other populations.









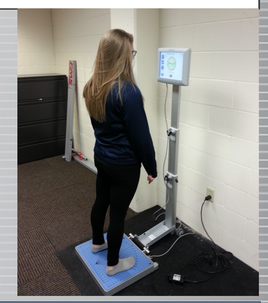
Results

Statistical significance was determined for the Limits of Stability assessment (p=0.001, =19.09±12.92), which measures dynamic balance. Insignificant balance improvements were observed in the other three assessments: BESS test firm (p= 0.614, =0.273±0.524), BESS test foam (p= 0.672, =0.364±0.834), and Postural Stability (p= 0.640, = 0.0181±0.038), which measures static balance.

Methods

After reviewing a variety of articles focused on improving balance, the research team used a device that is similar to the devices used in past studies. Through investigation of various devices, the BIOSWAY Balance System by Biodex was the machine that would adequately answer the research question. The research team wanted to also utilize this machine according to the protocol that was set up by the device to allow for optimal gains.

Participants were healthy females age 18-24 who do not participate in any organized sports, and were given an informed consent notifying them of the nature and parameters of the study. Health history and risk stratifications were taken in order to ensure their safe participation and also to highlight any risks that make them ineligible for the inclusion criterion. Anthropometrics, such as height and weight, were taken prior to testing. If the participant was deemed healthy, the subjects participated in a four-week training protocol consisting of a pre-training test, 12 training sessions, and a post-training test. The first testing session served as familiarization to acclimate the participants to the equipment as well as to analyze their balance as scored by the BIOSWAY Balance System. By conducting a Balance Error Scoring System (BESS) the researchers were able to test the balance of the participants in a manner independent of the BIOSWAY. Participants removed their footwear while conducting the BIOSWAY testing and training as well as to adhere to the protocols set by the BESS test. Immediately following the testing protocol the subjects began their training session, which consisted of three sessions per week for four weeks. Each of the three days involved the training modes programmed on the BIOSWAY. These training modes were limits of stability, maze control, and random control and were continued in that respective order throughout each week for the training. Each training protocol has several difficulty settings and these settings were used according to the progression of the participant. Subjects were asked to avoid working out 12 hours prior to balance testing and balance training in order to maintain consistency. Upon completion of the 4 week training session, subjects were evaluated in a final test identical to the pre-test they completed on the first day of familiarization (BIOSWAY testing and BESS test). Scores were recorded, analyzed, and compared with pre-test scores via a paired t-test.



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