Original Research Article

Effective of VBF training involving lower extremity (Bipedal erect stance) in individual somatosensory deficit utilizing BAPS

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Abstract

Background: The balance impairments negatively affect function, often reducing the individual's ability to participate fully in life. BAPS training with help of VBF its designed to aid in the re-education proprioceptive system by improving mechanoreceptor function and restore normal neuromuscular co-ordination.
Aim: To assess the effective of VBF training in individual with somatosensory deficit utilizing BAPS on gender variables
Materials and methods: Total 80 subject were included as per inclusion criteria. The study conducted at Geetanjali College of Physiotherapy (Udaipur) from March 2014 to April 2015. Subjects tested using BBS, one week prior to beginning of VBF training utilizing BAPS (pre- test) and after conclusion of VBF training utilizing BAPS (post- test).
Results: On comparing gender variability between post BBS score of female gender (44.65 $\pm$ 3.36) and post BBS score of male gender (45.13$\pm$3.48) on applying t-test, t (78) = -0.169, p = 0.538 demonstrate insignificant gender variability on post BBS score following BAPS training.
Conclusion: BAPS with VBF training showing an improvement in proprioception balance training on individual subject but it have produce similar effect on gender variability between male and female.

Key words

BAPS (Biomechanical Ankle Platform System), VBF (Visual Biofeedback Function), Gender, Proprioceptive, Balance.

Introduction

One in 3 persons over 65 years of the age and almost one in 2 person over 80 years of age will fall at least once each year [1]. This incidence increase to 66% for ambulatory resident of nursing home [2]. The incidence of ankle sprains is high and that lead to ligamentous damage as well as damage to mechanoreceptor [3] because of the degenerative change and reduction in proprioceptive awareness, a correlation to postural instability may exist [4]. Tinetti and speeshley [5] identified 3 factors that correlate highly falling in community dwelling and institutionalized elderly person: lower extremity disability, foot problem and gait and balance abnormality.

Proprioception are responsible for deep sensation and also responsible for position sense, awareness of joint at rest and movement, vibration [6]. Postural stability means the ability to maintain an upright posture and keep the COG within the limit of the BOS [7]. Synergies are referred to as ankle, hip and stepping strategies. These postural movement strategies are used in both feedback and feed-forward (anticipation) situation in order to maintain equilibrium in a number of circumstance.

Co-ordination and/or balance problem will be exaggerate, when vision are occluded or when patients eyes are closed (e.g. positive Romberg sign) [8]. Mirror visual feedback can accelerate recovery of function from a wide range of neurological disorder such as phantom pain, hemiparesis, from stroke or other brain injury or lesion, complex regional pain syndrome and possibly even peripheral nerve or musculoskeletal injury [9]. The COP based visual biofeedback also significantly reduced postural sway of lower trunk.

The BAPS has closed kinetic training on multi-axial platform, it re-education the proprioceptive system by improving mechanoreceptors function and restore normal neuromuscular co-ordination [10-13]. There is limited research on the effect VBF training utilizing BAPS on gender variability so aim of study is to assess the effectiveness of visual biofeedback training in individual with somatosensory deficit utilizing BAPS on gender variability.

Materials and methods

Study was conducted at the Geetanjali College of Physiotherapy and Hospital, Udaipur. 40 male and 40 female subject were included

Inclusion criteria based on gender (female and male), MMT, ROM (ankle joint). Subject with visual depth perception disorder, diagnosed as vestibular disorder, medication with known potential side effect on balance and contracture and deformity were excluded.

MMT (Manual Muscle Testing) measured using (Kendal and associated 1949 entiled muscle: testing and function) [14]. Balance was measured using Berg Balance Scale BBS, ROM (American Academy Orthopedic Surgeon AAOS) [15].

BBS developed by Berg and Coworkers [16-22] is an objective measure of static and dynamic balance abilities. The berg balance test used to differentiate between subjects based on their use of assistive device. BBS have multi-task test of 14 balance tasks common in everyday living: 6 static balance items8 dynamic balance items. It focus on (1) maintenance of position (2) postural adjustment to voluntary movement, Items 1-5: test of basis balance ability, scoring of 5 point ordinal scale (gradual 0-4) with specific task criteria and maximum score was 56.

Validity of BBS was 0.91 and reliability (ICC) Interrater = 0.98, intrarater = 0.99. Individual items ranged from 0.71 to 0.99, internal consistency (cronbach‘s alpha) = 0.96 and

predictive of fall in the elderly (hospitals, long term care, community).

All the participants gave there inform consent in English and Hindi and outcome measured were taken. BBS score assessed in 80 subject. Statistical analysis was done using t –test.

Results

Descriptive analysis was done for BBS balance score before and after proprioception training program. Insignificant difference was found between post BBS score between male and female gender, significant increase ($p < 0.001$) was found in post BBS score of male and significant increase ($p < 0.001$) was found in post BBS score of female (**Table - 1, 2, 3, 4, 5, 6** and **Graph - 1, 2, 3**).

Table – 1: Descriptive statistics of Mean, SD, Std Error Mean between per and post BBS score of female.

Groups	Mean	N	Std. Deviation	Std. Error Mean
PRE BBS	41.18	40	3.463	0.548
POST BBS	44.65	40	3.386	0.535

Table – 2: Mean difference of lower and upper 95% confidence interval in female gender.

Paired Differences					t	Df	Sig. (2-tailed)
Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
-3.475	1.301	0.206	-3.891	-3.059	-16.898	39	<0.001

Graph – 1: Pre and post BBS score of female.

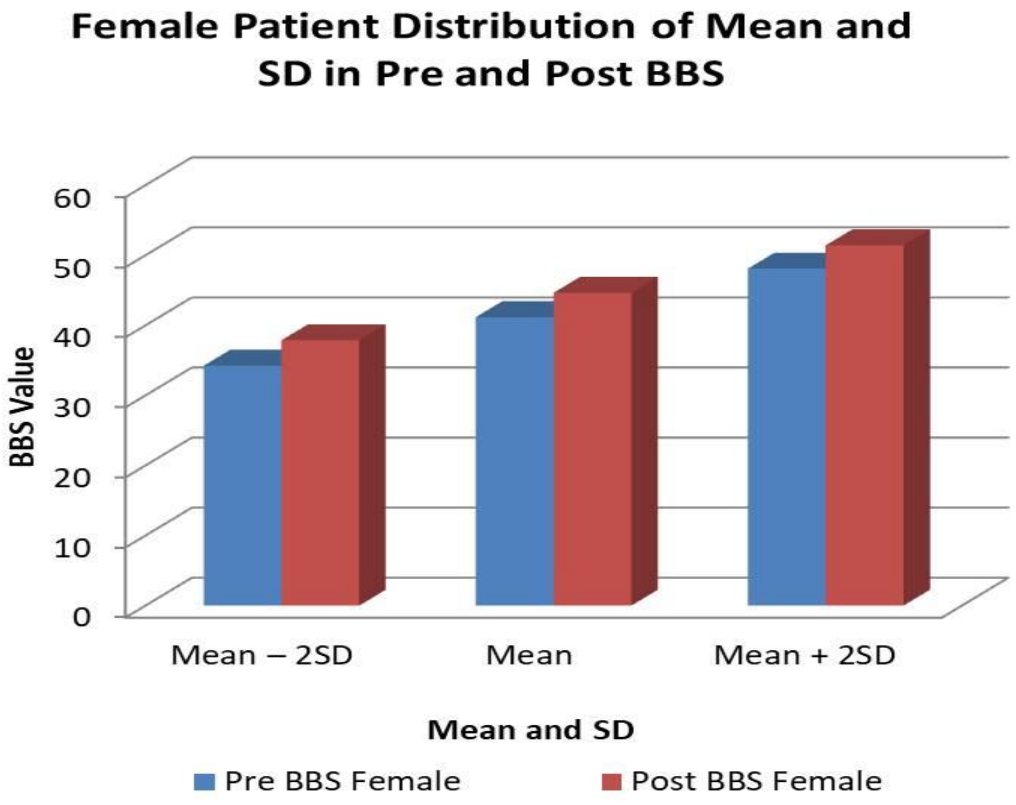


Table – 3: Descriptive statistics of Mean, SD and Std. Error Mean between pre and post BBS score of male.

Groups	Mean	N	Std. Deviation	Std. Error Mean
PRE BBS	41.58	40	3.448	0.545
POST BBS	45.13	40	3.480	0.550

Table – 4: Mean difference of lower and upper 95% confidence interval in male gender.

Paired Differences Paired					t	Df	Sig. (2-tailed)
Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
-3.550	1.218	0.193	-3.940	-3.160	-18.427	39	<0.001

Graph – 2: Pre and post BBS score of male.

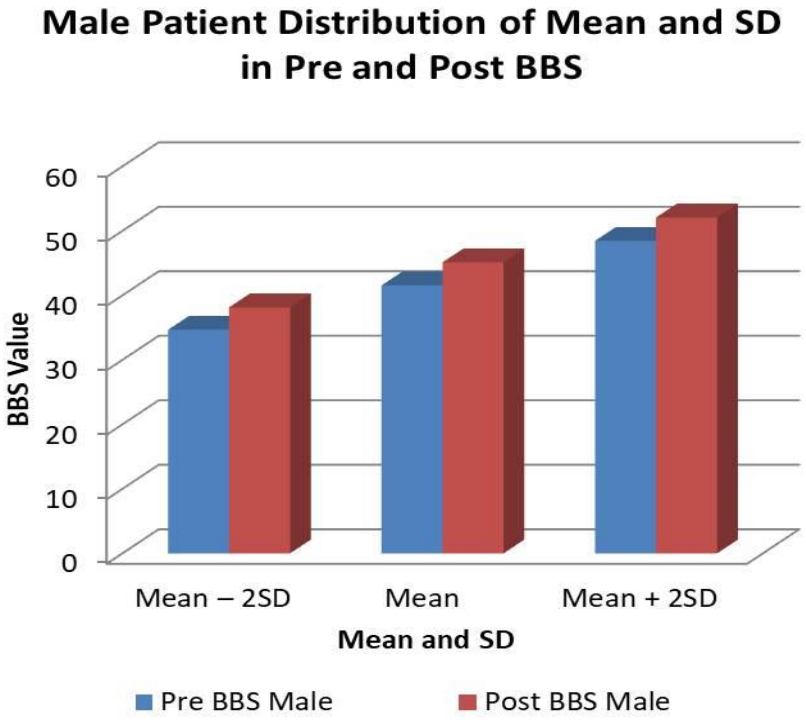


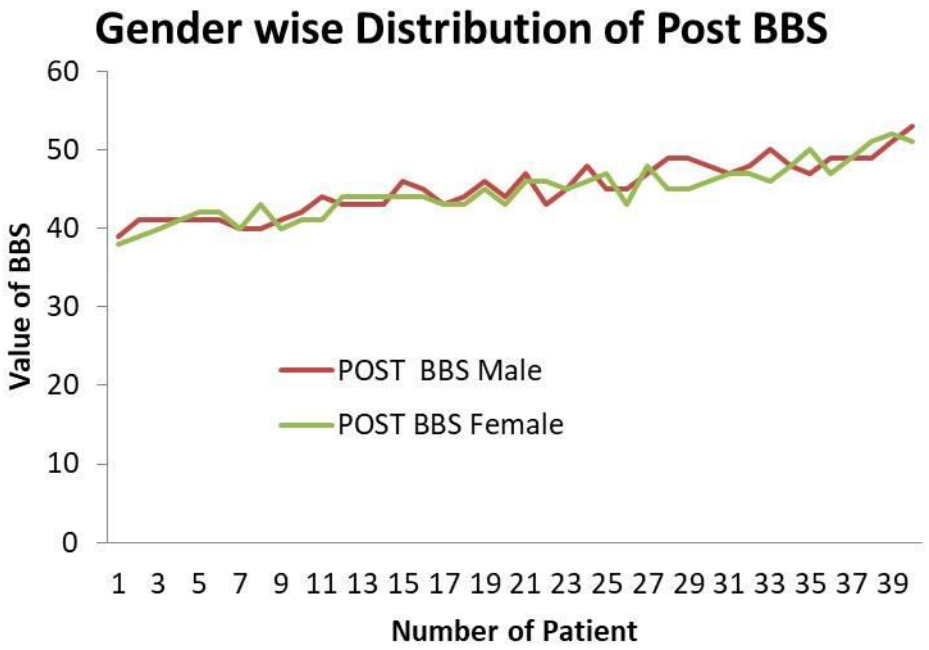
Table – 5: Descriptive statistics of mean and SD between post BBS score in male and female.

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Post-BBS scores	Female	40	44.65	3.386	0.535
	Male	40	45.13	3.480	0.550

Table – 6: Insignificant difference of post BBS score in male and female.

Levene's Test for Equality of Variances		t-test for Equality of Means				
F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.311	0.579*	-0.619	78	0.538	-0.475	0.768

Graph – 3: Gender wise distribution in post BBS of male and female.



Discussion

BAPS training program on gender variability, BAPS training program has been shown to help improve balance in a single to help improve balance in a single leg stance, increased neuromuscular control and proprioception [23-28]. MVF can accelerate recovery of function from a wide range of neurological disorder such as phantom pain, hemiparesis from stroke or other brain injury or lesion, CRPS and peripheral nerve or musculoskeletal injury [29]. In this study the program was designed to enhance subject proprioceptive and postural control for activity of daily living. The program was divided on two group depend on gender variability with same training program. This study showed significant improvement in BAPS program training but there is insignificant on gender variability. Thus there is no difference found on male and female training program.

Thus this balancing proprioceptive training program was effective in preventing lower extremity injury by improving dynamic exercise. The program aimed to enhance motor skill, body control, improve balance and reduced the risk of leg injury to some extent. Verhagen, et al. [30], who studied the effect that a 36 week balance board training program on reducing ankle sprains in adult Dutch volleyball players, found that the number of self-reported ankle sprains was significant lower in athletes completing the intervention program. Bahr, et al. [31] reported that the incidence of ankle sprain was reduced by 47% from the third years and similarly, a number of case report and series [32, 33] found benefit of visual biofeedback therapy in hemiparesis following stroke. The object of BAPS training program with VBF was to improve the ability to generate a fast neural activity and increase dynamic joint stability and balancing awareness.

Conclusion

This study has indicated that a combination of BAPS and VBF training program of proprioceptive training demonstrated on improvement in postural balance control. The major finding of this study is: significant improvement in the post BBS score in male and female, insignificant difference between post BBS score in male and female.

Based on these finding, it can be concluded that proprioceptive training program are effective in improving balance of lower extremity in somatosensory deficit in individual subject.

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