International
Journal of Medical and Exercise Science
(Multidisciplinary, PeerReviewed and IndexedJournal)

ORIGINAL ARTICLE

Static and dynamic balance in low vision and normal vision adults

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Abstract

Purpose of the study: *To further understand the balance of low vision with myopia and hyperopia because they have the tendency to wear the spectacles for their own purpose like reading or while performing few activities. So this study provide evidence to visualize the balance problems even after removing spectacles and this result would be beneficial for future interventions focused on reducing falls in this population.* ***Materials used:*** *Measuring scale, two standard chairs (one with arm rest and one without arm rest), Foot stool, Stop watch.* ***Methodology:*** *Type of the study is descriptive and observational study. Individuals between 20-40yrs were assessed with low vision (Hyperopia and Myopia) and normal vision using Berg's balance scale.* ***Result:*** *There is co-relation between static and dynamic balance in individuals with low vision (Significant difference i.e., p<0.05 at 90% confidence interval level).* ***Conclusion:*** *This study concluded that the static and dynamic balance was affected in individuals with low vision using berg's balance scale.*

Keywords: Balance: *Low vision (Hyperopia, Myopia), Normal vision, Berg's balance scale.*

Received on 26th May2016, Revised 16thJuly 2016, Accepted on 10thAugust2016

INTRODUCTION

Balance is considered to be an important aspect of an individual to be Safe and independent while performing various daily activities which is achieved by multiple process involving the function of various systems.

Stability is of two types. They are static balance (quiet standing) and dynamic balance (maintaining a stable position while the subject undertakes a prescribed movement).

Static balance is defined as the ability to maintain the line of gravity of a body with in the base of support with minimal postural sway.

Dynamic balance is defined as the ability to maintain equilibrium while moving through space.Maintaining balance requires coordination of input signals from multiple systems such as Vestibular, Somatosensory, Visual and an appropriate output from the motor system[1].

The visual system plays an important role in postural control and postural sway increases in the absence of vision or in low vision. Visual impairment is associated with the reduction in postural control and is an important factor in falls and related injuries.

Currently, only a few studies have examined postural stability by comparing low vision and normal vision adult. It has been previously demonstrated that restricted vision could increase body sway and postural stability[2]. Although balance appears to be affected in individuals with low vision, this relationship has not been fully explored in the literature, particularly regarding static and dynamic multi tasks.

In this study, moderate degree myopia and hyperopia is taken.Hyperopia also termed as long sightedness or far sightedness is a common refractive error in children and adults.Myopia also known as short sightedness and near sightedness.

Balance is the key prediction of recovery and required in many one daily life activities and hence is often introduced into treatment plans by physiotherapist and having a correct assessment of balance is important[3].

In this study, the assessment is done by using a balance scale known as Berg's balance scale. The bergs balance scale was developed to measure balance among older adults with impairment in balance function by assessing the performance of functional tasks[4].

Aim of the study: To find out the static and dynamic balance in an individual among the low vision and normal vision using Bergs balance scale.

Objectives of the study:

1.To test whether low vision adults are able to maintain balance.

2.To compare these subjects (low vision and normal vision adults) in stable surface.

3.To compare the low vision and normal vision adult using Berg's balance scale.

Need of the study:

To further understand the balance of low vision with myopia and hyperopia because they have the tendency to wear spectacles for their own purpose like reading or while performing few activities. So this study provide evidence to visualize the balance problems even after removing spectacles and this result would be beneficial for future interventions focused on reducing falls in this population.

Background of the study: When previous literature was reviewed, it was found that more researches were carried out in geriatrics

than in healthy adults for screening static and dynamic balance[5]. Also it is not clear if static balance can predict dynamic balance. To assess the static and dynamic balance using bergs balance scale, So that clinically it will help in assessment and treatment planning of patient.

Hypothesis

Null hypothesis: There is no significant difference between low vision and normal vision adults regarding static and dynamic balance using Berg's balance scale.

Alternate hypothesis: There is a significant difference between low vision and normal vision adults regarding static and dynamic balance using Berg's balance scale.

METHODOLOGY

Study design: Descriptive and Observational study.

Sampling method: Simple randomized sampling technique.

Study setting: 99 degree fitness studios, kilpauk,Chennai.

Sample size: 20 Individuals

Inclusion criteria:

•Age: 20 – 40yrs.

•Individuals with myopia (moderate degree ranges from -3.00 to -6.00 (diopters).

•Individuals with hyperopia (moderate degree ranges from +2.25 to +5.00 (diopters).

•Individuals having ability to use vision for planning or executing tasks.

Exclusion criteria:

•Current or past medical diagnosis of injury affecting balance with in the last 3 yrs.

•Medication affecting central nervous system.

•Current symptoms of dizziness or light headedness.

•Orthopedic or neurological diagnosis or symptoms suggestive of vestibular or neurological disorders.

Outcome measures: berg's balance scale

Materials used:

•Ruler(measuring scale)

•Two – standard chairs(one with arm rests, one without) -Fig 1.1

•Foot stool - Fig 1.2

•Stop watch -Fig 1.3

•15 feet walk away

Fig 1.1 Chairs

Fig 1.2 Stool

Fig1.3 Stopwatch

Procedure:

Participants were required to complete a structure, a self-administered questionnaire written for this study concerning a history of falls, Fractures, stumbling, dizziness and the perception of disequilibrium. The subjects were explained the need of the study and procedure of the scale and Formal informed consent was also taken from the subjects.

The subjects that are taken for this study are 20 in numbers. 10 male and female with normal and 10 male and female composed of low vision group having myopia and hyperopia were participated for this study. The normal vision group sample selected from the community after an assessment using Snellen's optometric scale. The low vision groups were categorized from the community having myopia (short sightedness) and hyperopia (long sightedness).

The Berg Balance Scale is 14-item scale designed to measure balance of the adult in a clinical setting. The following instructions were explained to the subjects. They are as follows:

Sitting to standing, Standing unsupported, Sitting unsupported, Standing to sitting, Transfers , Standing with eyes closed, Standing with feet together , Reaching forward with outstretched arm , Retrieving object from floor ,Turning to look behind, Turning 360 degrees , Placing alternate foot on stool, Standing with one foot in front, Standing on one foot[6].

The subjects were assessed using Berg's Balance Scale.Subjects are instructed that they must maintain their balance while attempting the tasks. The choice of which leg to stand on or how far to reach is left to the subjects. And the individual perform the task without using spectacles in low vision group.

Fig 2.1 Standing unsupported with closed Eyes

Fig 2.2 Standing unsupported with feet together

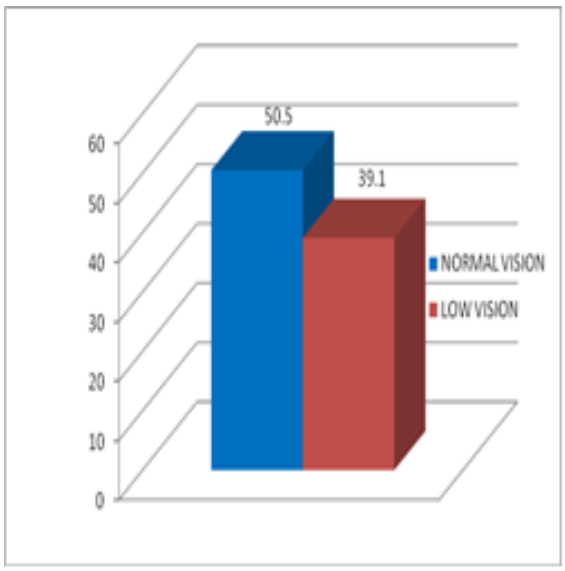
Fig 2.3 One leg standing

RESULT

There is a co-relation between static and dynamic balance in the individuals with low vision presenting with myopia and hyperopia (Significant difference i.e, $p<0.05$ at 90% confidence interval).

Vision	Mean	Standard deviation	t-value	p-value
Normal vision	50.5	1.58	2.318	0.024
Low vision	39.1	3.69		

Table 1 Low vision and normal vision adults using berg balance scale



Graph 1 Bar diagram of static and dynamic balance in low vision and normal vision adults

DISCUSSION

Vision is important for balance and precision of the velocity of movements of objects and segments of body as well as for the time and exactness of the motor reactions, and its decrease could lead to postural mal-adjustment.

The anatomical separation of the systems involved in balance suggests that the nervous system has the tendency to change the primary source necessary for posture adjustments. In absent of visual system, the dominance passes to the vestibular and somatosensory system, a fact that explains postural control in the visual impairment.

In agreement with the literature, the low – vision individuals demonstrated less postural stability than those with normal vision. Several studies have suggested that vision impairment can increase postural instability and that the interaction between the central nervous, muscle and peripheral sensory systems is fundamental.

It is a known fact that the BBS was created to evaluate balance and risk of falling in elderly persons, with a maximal score of 56. A score of 0 to 20 is related to poor equilibrium, 21 to 40 with medium fall risk and 41 – 56 with low fall risk.

Alonsa et al [7] stated that there were no significant differences between the dominant and non-dominant legs at the two levels of stability.

Hazime et al [8]stated that the role of vision increases in SLS. After proprioception reintegration, vision does not affect postural recovery. Balance training programs must take that into account.

Schmid M et al [9] stated that vision plays an obligatory role in the processing and integration of other sensory inputs for the selection of the balancing strategy in the control of equilibrium.

The present study analyzed the posture control of individuals with low vision presenting with myopia and hyperopia having moderate degree. The results obtained in this study by means of the BBS, showed that there is difference in balance between low vision and normal vision individuals the low vision individual. The low vision individual show increased in body sway and postural instability.

Balance, mobility functional status and fear of falling are variables that suffer multifactorial influences, and thus, vision is also one of the causes for the alterations. The difficulties related to visual function and physical performance increase with age[10].

CONCLUSION

This study concluded that the static and dynamic balance was affected in individuals with low vision using Berg's balance scale.

REFERENCES

1. Blum, Lisa; Korner-Bitensky, Nicol (2008). "Usefulness of the Berg Balance Scale in Stroke Rehabilitation: A Systematic Review". Physical Therapy 88 (5): 559–566. doi: 10. 2522/ptj.20070205.
2. Shumway-Cook A, Woollacott MH. (2001) Motor Control: Theory and Practical Applications. Philadelphia: Lippincott, Williams & Wilkins.
3. Mônica S.V. Tomomitsu, Angelica Castilho Alonso, Eurica Morimoto, Tatiana G. Bobbio, and Julia M.D. Greve Clinics (Sao Paulo). 2013; 68(4): 517–521. Clinics (Sao Paulo).
4. Hellström, K. (2002),On self-efficacy and balance after stroke. ActaUniversitatisUpsaliensis. Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine 1112. 60 pp. Uppsala. ISBN 91-554-5206-X.
5. Edwin H.F. van Asseldonka, Jaap H. Buurkeb, Bastiaan R. Bloemd, Gerbert J. Renzenbrinkb, c,Anand V. Neneb, c, Frans C.T. vanderHelma (2006), Disentangling the contribution of the paretic and non-paretic ankle to balance control in stroke patients Herman van der Kooij Experimental Neurology Volume 201, Issue 2, Pages 441–451.
6. Friedrich M, Grein HJ, Wicher C, Schuetze J, Mueller A, Lauenroth A, et al. (2008), Influence of pathologic and simulated visual dysfunctions on the postural system. Exp Brain Res.;186(2):305–14.
7. Alonso AC, Brech GC, Bourquin AM, Greve JM. (2011), The influence of lower-limb dominance on postural balance. São Paulo Med. J;129:410–3.
8. Hazime FA, Allard P, Ide MR, Siqueira CM, Amorim CF, Tanaka C.(2012), Postural control under visual and proprioceptive perturbations during double and single limb stance. J Body, Mov.Ther.16(2):224–9.

9. Schmid M, Nardone A, De Nunzio AM, Schmid M, Schieppati M (2007), Equilibrium during static and dynamic tasks in blind subjects: no evidence of cross-modal plasticity.Brain;130(Pt 8):2097–107.

10. Martina Mancini and Fay B Horak (2010), The relevance of clinical balance assessment tools to differentiate balance deficits Eur J PhysRehabil Med. ; 46(2): 239–248.

Citation:
Dr.Tilak Francis T G andNandhiniPriyaS , Static and dynamic balance in low vision and normal vision adults, IJMAES, *2016; 2 (3),167-173.*