Contents lists available at www.innovativejournal.in

INNOVATIVE JOURNAL OF MEDICAL AND HEALTH SCIENCE

Journal homepage: http://innovativejournal.in/ijmhs/index.php/ijmhs

ISSN No. 2277-4939

Research Article

EFFECT OF AGING ON TIMED BALANCE TEST SCORES

Neha Verma[1], Salvi Shah[2], Jignasha Joshi[3], Raksha Jivani[4]

[1]Senior Lecturer, SPB Physiotherapy College, Ugat-Bhesan Road, Surat.
[2]Lecturer, SPB Physiotherapy College, Ugat-Bhesan Road, Surat.
[3,4]Intern, SPB Physiotherapy College, Ugat-Bhesan Road, Surat.

ARTICLE INFO

Corresponding Author:
Salvi Shah
Postal Address: SPB Physiotherapy College, Ugat-Bhesan Road,Surat, Gujarat, India-395005.
shahsalup@yahoo.com

Key words: Age, balance, timed balance tests.

DOI:http://dx.doi.org/10.15520/ijmhs.2017.vol7.iss1.151.

ABSTRACT

Background - Tests of standing balance are frequently included in neurological evaluations, few objective data are available to indicate how well individuals of different ages should be able to maintain standing balance so the present study was carried out to establish the relationship between performance on timed balance tests and age. **Methodology**: Normal males and females (n=75) in the age group of 20-69 years were included in the study after they gave their informed consent. The subjects were allocated to 5 groups according to their age. Group A – 20-29 years, Group B – 30-39 years, Group C – 40-49 year, Group D – 50-59 years, Group E – 60-69 years. Subjects stood without shoes with weight bearing lower extremities inside 18×20- inches wooden frame on a smooth and level surface. Subjects in each age group performed eight balancing activities and time was recorded for each activity on a digital stop watch. **Results**- All subjects balanced for 30 seconds with feet apart and with feet together both with their eyes open and with their eyes closed. A significant negative correlation existed between the age and timed balance on one leg with eyes open and eyes closed. **Conclusion** – The results of the present study showed that timed balance test scores decreased with ageing.

INTRODUCTION

Balance is defined as the ability to maintain the projection of the body's center of mass within manageable limits of the base of support, as in standing or sitting, or in transit to a new base of support, as in walking. For many elderly subjects, the aging process is inevitably accompanied with restriction of the ability of independent movement and loss of balance.[1]Aging is associated with decline in the function of the sensory system,[2,3,4] with the diminished muscle strength ,decreased muscle volume and mass, loss of muscle fibers, alterations in the motor units, changes in posture and decreased balance control.[5]

Adequate postural control depends on the integration of vestibular, somatosensory and visual information of the body motion.[1] Loss of sensitivity in peripheral sensory systems has been reported so frequently in the elderly without diagnosable disease that these losses are widely regarded as a normal consequence of aging.[6]

It is well established that certain features of postural support change during the advancing years of life so that the stability of posture can be a problem with aging in the elderly.[7,8] The particular aspects of balance that decline with age and make older adults more prone to falling have not been identified specifically.[9] This problem persists because balance is a complex process involving the co-ordinated activity of many body segments to realize the goals of postural tasks. To balance with the feet in place, as in quiet upright bipedal stance, requires that the position of the body's center of gravity[COG] must be maintained vertically over the potential region of stability at the base of support.[10]

Age is often accompanied by balance disorders of age-related pathologies, for example osteoarthritis, stroke, parkinson's and alzheimer's disease, which hinder independent mobility and lead to postural instability. It is estimated that one third to one half of the population over 65 years presents some problems with balance control, as shown in literature.[11]Even balance tests , for which maximum timed end points[5-75 seconds] are established, do not specifically support the clinical appropriateness of the end points or support with objective data their description of changes in the capacity of older individuals to perform timed balance tests[12,13].For example potvin and tourtellotte[14,15]claimed that all young adult, healthy subjects can balance on one leg for 30 seconds with eye closed, but they offered no data to support their claim. Studies often included comparison of the ability to maintain stance for groups of young and older people only[5,16,17]or compared middle-aged and elderly people,[4]or include only a single age group.[3]Till now very few studies

have been done to find out effect of aging on timed balance test scores in Indian populations so the present study was undertaken.

MATERIALS AND METHODOLOGY:

The healthy subjects were 75 male and female volunteers who participated with informed consent in this study, which was approved by the Institutional ethical committee of SPB physiotherapy college,Surat.

The volunteers were between 20 and 79 years of age with 15 or more volunteers in each decade of age.All subjects were able to follow instructions. Subjects were excluded from the study if they were unable to follow instructions or had any exclusion criteria like vertigo, any neurological diagnosis that could account for possible loss in balance and falls such as CVA, Parkinson's disease ,cardiac problem, TIA, multiple sclerosis, orthopaedic dysfunction of trunk and lower extremities such as fracture, surgery ,lower limb joint replacements ,were undergoing balance training or strength training for lower limb, were unable to walk without an assistive device, were dependent in activities of daily living. The volunteers consisted of employees of health-care institutions, patients with unrelated problems, students of physiotherapy college and their family members. Subjects were then assigned into 5 age groups. Group A – 20-29 years,Group B – 30-39 years, Group C – 40-49 years, Group D – 50-59 years, Group E – 60-69 years.15 subjects were taken in each age group. All subjects were asked to perform the eight balancing activities as mentioned below and instructed to maintain balance for 30 seconds. The goal of each activity was to balance for 30 seconds, an end point used by a number of previous investigators.[2-5]

1. Balancing on two legs, with the feet 8 inches apart (with eyes open)
2. Balancing on two legs,with the feet 8 inches apart (with eyes close)
3. Balancing on two legs,with the feet together (with eyes open)
4. Balancing on two legs,with the feet together(with eyes close)
5. Balancing on right leg (with eyes open)
6. Balancing on right leg (with eyes close)
7. Balancing on left leg(with eyes open)
8. Balancing on left leg (with eyes close)

The subjects were asked to stand without shoes with weight bearing lower extremities inside 18- by 20- inches frame on a smooth and level surface .Time was recorded for each activity on a digital stop watch. Each subject was permitted five attempts per activity to reach the 30 seconds goal .If the subject did not reach 30 seconds goal, the best of the five timed trials was recorded.[18]

All subjects performed two-legged activities before the one-legged activities. They were allowed to rest as necessary and to alternate between legs as they wished during one-legged balance. If any of the following events occurred before 30 seconds had lapsed,timed trial was stopped and time recorded.

a. During two legged balance, any displacement of the feet on the floor;
b. During one legged balance,any use of the arms or the contralateral leg for support such as bracing non-weight bearing lower extremity against the weight bearing lower extremity, hopping on the weight bearing lower extremity, or moving the weight bearing lower extremity outside the confines of the frame; and
c. Opening the eyes during the eyes closed activities

RESULTS:

Although a few old subjects required more than a single trial , all subjects balanced for 30 seconds with feet 8 inches apart and with feet together both with their eyes open and with their eyes closed. One legged balance activities were not, however, accomplished for 30 seconds by all subjects. The test results for the 5 groups are summarized in table 1.

The mean duration that one legged balance could be maintained was longer with the eyes open than with the eyes closed. Similarly a larger percentage of subjects failed to balance for 30 seconds with the eyes closed than with the eyes open.

The mean amount of time subjects could maintain balance on one leg and the percentage of subjects balancing for 30seconds diminished with age. A significant relationship existed between the age and time balanced on one leg with eyes open and closed when analysed using a correlation test.(Table II)

Table I: Comparison of variables in different age groups.

	Group A	Group B
	Mean(SD)	Mean(SD)
Feet Apart(eyes open)	30(0)	30(0)
Feet Apart(eyes close)	30(0)	29.2(2.99)
Feet together(eyes open)	30(0)	30(0)
Feet together(eyes close)	28.6(4.095)	27.13(5.49)
Right leg (eyes open)	29.6(1.083)	28.06(4.35)
Right leg (eyes close)	23.93(8.8049)	22.66(8.490)
Left leg (eyes open)	26.66(5.87)	28.46(3.30)
Left leg (eyes close)	14.6(6.194)	14(3.74)

Table II: Correlation between the age and time balanced on one leg

Variable	r	p
Time for balancing on right leg Eyes open	-0.4997	<0.0001
Time for balancing on right leg Eyes close	-0.5585	<0.0001
Time for balancing on left leg Eyes open	-0.4172	<0.0001
Time for balancing on left leg Eyes close	-0.5045	<0.0001

DISCUSSION

The present study gave objective information regarding standing balance. Although tests of standing balance are frequently included in neurological examinations, few objective data are available to indicate how well individuals of different ages should be able to maintain standing balance.

Results of the present study suggested that an inability to maintain balance for 30 sec while the feet are together is abnormal, whether the eyes are open or closed in individuals from 20-69 years of age and showed a trend toward age-related declines .This finding are consistent with the report of potvin,Tourtellotte[14,15] and Richard w. Bohannon et al[18].The mean time scores reported for one-legged balance in this study were somewhat lower, at least in the younger age group, than they would have been if an upper limit of 30 seconds had not been established.

Analysis demonstrated that an inverse relationship persists between age and balance. This suggests that grouping according to age is required if normative data is

to be obtained. The findings of the present study are in agreement with previous studies examining balance during quiet stance showing increased body sway in the elderlies[2,16,17,19] .It is known that the body sway increases also with deficit of information from one of the sensory systems: visual, vestibular or somatosensory[4] but the values increased significantly in the absence of visual information (with eyes closed) in each age group examined in the present study. Interesting to note is that the combination of sensory deficit (visual, somatosensory or both) with advancing age is likely responsible for the postural instability.

The limited number of subjects in the study prevents the use of these results as true normative values for balance, as does the nature of the sample (i.e., volunteers rather than randomly selected subjects).The information does, none the less, indicate the level of balance for subjects of different ages.

CONCLUSION

The results of the present study showed that decrease in timed balance test scores with ageing.The duration that individuals are able to maintain standing balance on one leg is highly related to age.

REFERENCES

1. WoollacottMH.(1993) Age – related changes in posture and movement. Jgerontol, 48,56-60.
2. Du pasquire RA, Blanc V, sinnreich M, Landis T, Burkhard P, vingerhoetsFJG.(2003). the effect of ageing on postural stability : a cross sectional and longitudinal study. Clinneurophysiol 33,213-218.
3. Lord SR,Menz HB. (2000) Visual contributions to postural stability in older adults. Gerontology 46, 306 – 310.
4. Franson PA, kristinsdottir EK, hafstrom A, Magnusson M, Johansson R(2004) Balance control and adaptation during vibratory perturbations in middle aged and elderly humans. Eur J Appl physiol 91,595-603.
5. Wolfson L, Whipple R, Derby CA, AmermanP,tobin JN, Nashner L.(1994) Gender differences in the balance of healthy elderly as demonstrated by dynamic posturography J gerontol 49(4), 160-167.
6. Horak FB, shupert CL, Mirka A.(1989) Components of postural dyscontrol in the elderly A review. Neurobiol Aging 10,727-738.
7. Sheldon JH. (1963) The effect of age on the control of sway. GerontolClin 5,129-38.
8. Woollacott M, Shumway-Cook A, NashnerL.(1986) Aging and posture control: changes in sensory organization and muscular coordination. International Journal of Aging and Human Development 23,97- 114.
9. King MB, Judge JO, Wolfson L.(1994) Functional base of support decreases with age. J Gerontol Med Sci 49,258-63.
10. Nashner LM, McCollum G. (1985)The organization of human postural movements: a formal basis and experimental synthesis. Behav Brain Sci 8,135-72.
11. Hausdoeff JM, Nelson ME,Kaliton D, Layne JE, Bernstein MI, Nuernberger A, Singh MA.(2001)etiology and modification of gait instability in older adults, A randomized controlled trial of exercise. J Applphysiol 82,262 – 269.
12. Stribley RF, Albers JW, Tourtellotte MW et al.(1974) A quantitative study of stance in normal subjects. Arch phys med rehabil 55,74- 80.
13. AshbumA.(1982) A physical assessment for stroke patients. Physiotherapy 68,109-113.
14. PotvinAR,tourtellotte WW, Henderson WG,etal.(1975) quantitative examination of neurological function:reliability and learning effects.Arch phys Med Rehabil 56,438-442.
15. Potvin A R, tourtellotte WW.(1975)neurologice examination: advancements in its quantification. Arch phys Med Rehabil 56,425-437.
16. Manchester D, Woollacott M, Zederbauerhylton N, Marino(1989).Visual vestibular & somatosensory contributions to balance control in the older adults. J grontol Med sci 44,118-127.
17. Prieto TE, Myklebust JB, Hoffman RG,Lovett EG, Myklebust BM.(1996)Measure of postural steadiness. Differences between healthy young and elderly adults. IEEE trans biomed eng 43, 956-966.
18. Richard w. Bohannon, Patricia a. Larkin, Amy c. Cook. James gear and Julio singer.(1984)Decrease in Timed Balance Test Scores with Aging. Physical therapy64 (7), 1067-1070.
19. Colledge N R, Cantley P, Peaston I, Brash H, Lewis S, Wilson JA.(1994)Ageing and balance: The measurement of spontaneous sway by posturography. Gerontology 40,273 – 278.