ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 11, pp. 14129-14133, November, 2016

International Journal of Recent Scientific Research

Research Article

CORRELATION OF ANKLE FLEXIBILITY TO BALANCE AND FUNCTIONAL MOBILITY IN COMMUNITY DWELLING ELDERLY

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ARTICLE INFO

Article History:

Received 15th August, 2016
Received in revised form 25th September, 2016
Accepted 28th October, 2016
Published online 28th November, 2016

Key Words:

Balance, Elderly, Functional Mobility

ABSTRACT

Aim

To find out correlation of ankle flexibility to balance and functional mobility in community dwelling elderly.

Objectives

1. To correlate active and passive ankle dorsiflexion and plantarflexion range of motion with Berg Balance Scale.
2. To correlated active and passive ankle dorsiflexion and plantarflexion range of motion with Functional Reach Test.
3. To correlate active and passive ankle dorsiflexion and planterflexion range of motion with Timed Up and Go Test.

Conclusion

The study concludes that there is significant correlation between ankle flexibility and balance and functional mobility in community dwelling elderly

INTRODUCTION

Balance is a complex process involving the reception an integration of sensory inputs and planning and execution of movement to achieve a goal requiting upright posture. It is the ability to control the centre of gravity (COG) over the base of support in a given sensory environment.[1]

Functional mobility is the ability of an individual to initiate control or sustain active movement of the body to perform simple to complex motor skills.[2]

Maintaining balance and performing functional task depends on the interaction of multiple sensory motor and integrative Systems. These include vision, vestibular function, peripheral sensation, strength and reaction time.[3]

Foot problems are reported by community dwelling elderly people and are associated with reduced walking speed,[5] difficulty in performing activities of daily living[5,6] and increased risk of fall. [7-9]As the only source of direct contact with the ground during weight bearing task the foot contribution to the maintenance of stability in two main ways:

1. By providing mechanical support for the body via the osteoligamentous architecture of the arch and the coordinated function of lower limb muscles and
2. By the provision of the sensory information regarding body position from tactile mechanoreceptors.

It is therefore likely that deficit in foot posture, flexibility strength or sensation impairs this support function and predispose to loss of balance.

Flexibility is the ability of the muscle and other soft tissue to yield to a stretch force.[10] Flexibility of ankle joint provides an important contribution to safe execution of many functional tasks and added efficiency to maintenance of postural stability. Ankle strategy contributes to postural stability and balance,[11] The ankle strategy works as an inverted pendulum action and is elicited by activation in a distal to proximal recruitment pattern of anterior muscles of lower limb and trunk to overcome posterior displacement of body or activation of posterior muscles of lower limb and trunk to overcome anterior perturbation.

Two specific functional activities that rely on ankle dorsiflexion range being substantial include sitting sown standing up from a seat and ascending and descending stairs[13] During both the activities stability can be lost if insufficient range of ankle dorsiflexion is available and fall might result. Therefore maintenance of strength of the dorsiflexor and plantarflexor muscles as well as adequate ankle range of motion is necessary to allow efficient force generation and balance strategy execution to prevent fall.[12]

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Thus examination of ankle flexibility should be an important part of physiotherapy evaluation in elderly to evaluate effect on balance and flexibility.

When balance is affected in elderly population first vestibular or sensory system involvement is considered, but other literatures believe that in community dwelling healthy adults aged above 60 years, balance and ankle flexibility are inter-related and in them decreased balance can be associated with decreased ankle flexibility and not the nervous system.

Hence this study draws attention towards determining the association of ankle flexibility with balance and mobility and aims to find our correlation between ankle flexibility and balance. The measures used to evaluate balance were the Berg Balance Scale, and for functional mobility, Functional Reach Test and Timed Up and Go Test were used.

The Berg Balance Scale (BBS) was designed to measure changes in functional standing balance over time. The test was developed by Kathy Berg, a Canadian physical therapist. It is a 14-item scale that rates each function from 0 (worst) to 4 (best) along a dependence- independence continuum. This summative scale measures balance abilities seen during tasks involving sitting, standing, and positional changes. Total scores are indicative of overall balance abilities, with scores interpreted in the following manner: 0 to 20, wheelchair bound; 21 to 40, walking with assistance; and 41 to 56, independent. The BBS is relatively safe and simple to administer. The test is reported to have good test retest and interrater reliability (intraclass correlation coefficient (ICC + 0.98) and good internal consistency (Cronbach's Alpha + 0.96) (Berg et al 1989) with differe3nt patient populations, including brain injury, stroke, and geriatric patients.

The Functional Reach Test (FRT)– evaluates the maximum distance that a person can reach forward while maintaining a fixed base of support. The reliability of FRT: ICC across days was 0.01 (Duncan, et al, 1992). The validity of FTR: As reach decreased, the chance of falling increases (Duncan, et al, 1992).

Timed Up and Go Test (TUG) –the patient is seated in a chair and the patient is instructed to rise, stand and then walk 3m at a normal walking speed, turn and come back and sit on the chair. The taken by the patient is noted using a stopwatch. Interrater reliability was very high, with r=.98,.99, and .99 for the TUG. Validity Measures: Older adults who take longer than 14 seconds to complete the TUG have a high risk for falls.

Need of the Study

In elderly usually the ankle range of motion is affected, as increased stiffness and rigidity in "aged" connective tissue contributes to decreased range of motion.

A change in the structure and function of joint connective tissue occurs simply as natural process of growing old.

The type and degree of physical activity and advanced age often occur simultaneously and may have a combined effect on joint connective tissue.

The effects of disease, reduced physical activity and advanced age often occur simultaneously and may have a combined effect on joint function.

The mechanical properties of the periarticular connective tissue around the ankle joint change with old age.

Ligaments and tendons around the ankle joint increase in stiffness and demonstrate a decrease in the maximal length at which rupture occurs.

The articular cartilage becomes more susceptible to mechanical failure due to reduced water content that occurs with old age. The dehydrated articular cartilage may have a reduced ability to dissipate forces across the joint.

As individual's advances in age and become less active, a loss of bone mass per unit volume usually occurs. Decreased bone mass results in a decreased ability of bone to support loads and resist external forces.

As these structural and functional changes can influence the balance and functional mobility, hence it was necessary to evaluate balance and functional mobility and to correlate it with ankle flexibility.

Aim and objectives

Aim

To find out correlation of ankle flexibility to balance and functional mobility in community dwelling elderly.

Objectives

1. To correlate active and passive ankle dorsiflexion and plantarflexion range of motion with Berg Balance Scale.
2. To correlated active and passive ankle dorsiflexion and plantarflexion range of motion with Functional Reach Test.
3. To correlate active and passive ankle dorsiflexion and planterflexion range of motion with Timed Up and Go Test.

Hypothesis

Reseaech Hypothesis

There exist correlation between ankle flexibility and balance and functional mobility in community dwelling elderly.

Null Hypothesis

There is no correlation between ankle flexibility and balance and functional mobility in community dwelling elderly.

MATERIAL AND METHODOLOGY

Type of Study: Observational Study
Location: Home for the Aged, Mumbai.
Duration: 2 Months
Sample Selection: Convenience sampling
Sample Size: Total: 60
Male: 30
Female: 30

Inclusion Criteria

1. Age : 60 years and above
2. Individuals able to stand with or without support.
3. Individuals able to walk with or without support.

Exclusion Criteria

1. Any CNS disorder
2. Pyrexia
3. Lower limb fracture
4. Diabetic foot
5. Any acute cardiac pathology
6. Any knee deformity
7. Visual impairment
8. Ankle sprain
9. Neuropathy of lower limb

Variables: Gender

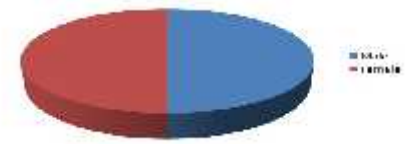
Material

1. Low stool, 15-20cm in height
2. High Stool, 45-50 cm in height
3. Chair with back support
4. Stop Watch
5. 360^0 goniometer
6. Horizontal wall mounted measuring tape

Procedure

60 geriatric subjects who were above 60 years of age, from a private old age home were selected for the study, by using convenience sampling method. Prior starting the study, a written informed consent was taken of each subject in the language best understood by them. After gaining the consent of the subject, the Ankle Range of Motion was taken using 360^0 universal goniometer and the outcome measures were incorporated i.e. Berg Balance Scale, Functional Reach Test and Timed Up and Go Test and the scores was noted.

The data collected was then statistically analysed and the results were prepared.



Graph – 1 Sex distribution

RESULTS AND TABLES

Table 1 Gender Distribution

Sex	Frequency	Per cent
Female	30	50.0
Male	30	50.0
Total	60	100.0

Table 2- Correlation of Bbs with Active Dorsi Flexion Range of Rigit Side

		Active Dorsiflexion Right
BBS	Pearson Correlation	-.036
	P value	.783
	Significance	Not significant
	N	60

Table 3 Correlation of Frt With Active Dorsi Flexion Range of Rigit Side

		Active Dorsiflexion Right
FRT	Pearson Correlation	-.027
	P value	.835
	Significance	Not significant
	N	60

Table 4 Correlation of Tug with Active DORSI Flexion Range of RIGIT Side

		Active Dorsiflexion Right
TUG	Pearson Correlation	-.187
	P value	.152
	Significance	Not significant
	N	60

Table 5- Correlation of BBS with Active DORSI Flexion of Left Side

		Active Dorsiflexion Left
TUG	Pearson Correlation	-.023
	P value	.864
	Significance	Not significant
	N	60

Table 6 Correlation of FRT with Active DORSI Flexion of Left Side

		Active Dorsiflexion Left
FRT	Pearson Correlation	.141
	P value	.283
	Significance	Not significant
	N	60

Table 7 Correlation of Tug with Active DORSI Flexion of Left Side

		Active Dorsiflexion Left
TUG	Pearson Correlation	-.286*
	P value	.027
	Significance	Not significant
	N	60

Table 8 Correlation of BBS with Passive DORSI Flexion of Right Side

		Passive Dorsiflexion Right
BBS	Pearson Correlation	-.137
	P value	.296
	Significance	Not significant
	N	60

Table 9 Correlation of FRT With Passive DORSI Flexion of Right Side

		Passive Dorsiflexion Right
FRT	Pearson Correlation	.012
	P value	.929
	Significance	Not significant
	N	60

Table 10 Correlation OFTUG With Passive dorsi Flexion of Right Side

		Passive Dorsiflexion Right
TUG	Pearson Correlation	-.059
	P value	.656
	Significance	Not significant
	N	60

Table 11 Correlation of BBS with Passive Dorsi Flexion of Left Side

		Passive Dorsiflexion Left
BBS	Pearson Correlation	.074
	P value	.574
	Significance	Not significant
	N	60

Table 12- Correlation of FRT with Passive Dorsi Flexion of Left Side

		Passive Dorsiflexion Left
FRT	Pearson Correlation	.142
	P value	.281
	Significance	Not significant
	N	60

Table 13 Correlation of Tug with Passive DORSI Flexion of Left Side

		Passive Dorsiflexion Left
TUG	Pearson Correlation	.190
	P value	.145
	Significance	Not significant
	N	60

Table 14 Correlation of BBS with Active Plantarflexionof Right Side

		Active Plantarflexion Right
BBS	Pearson Correlation	.196
	P value	.133
	Significance	Not significant
	N	60

Table 15 Correlation of FRT With Active Plantarflexionof Right Side

		Active Plantarflexion Right
FRT	Pearson Correlation	-.238
	P value	.067
	Significance	Not significant
	N	60

Table 16 Correlation of TUGWITH Active Plantarflexion of Right Side

		Active Plantarflexion Right
TUG	Pearson Correlation	-.001
	P value	.993
	Significance	Not significant
	N	60

Table 17 Correlation of BBS With Active Plantarflexionof Left Side

		Active Plantarflexion Right
TUG	Pearson Correlation	-.001
	P value	.997
	Significance	Not significant
	N	60

Table 18 Correlation OFFRT With Active Plantarflexionof Left Side

		Active Plantarflexion Left
FRT	Pearson Correlation	-.151
	P value	.251
	Significance	Not significant
	N	60

Table 19 Correlation of TUG With Active Plantarflexionof LEFT Side

		Active Plantarflexion Left
TUG	Pearson Correlation	-.088
	P value	.502
	Significance	Not significant
	N	60

Table 20 Correlation of BBS With Passive Plantarflexionof Right Side

		Passive Plantarflexion Right
TUG	Pearson Correlation	-.257
	P value	.047
	Significance	Not significant
	N	60

Table 21 Correlation of FRT With Passive Plantarflexionof Right Side

		Passive Plantarflexion Right
FRT	Pearson Correlation	-.335
	P value	.009
	Significance	Not significant
	N	60

Table 22 Correlation of TUG With Passive Plantarflexionof Right Side

		Passive Plantarflexion Right
T	Pearson Correlation	.089
	P value	.501
	Significance	Not significant
	N	60

Table 23 Correlation of BBS With Passive Plantarflexionof Left Side

		Passive Plantarflexion Left
BBS	Pearson Correlation	.066
	P value	.615
	Significance	Not significant
	N	60

Table 24 Correlation of FRT With Passive Plantarflexionof LEFT Side

		Passive Plantarflexion Left
FRT	Pearson Correlation	-.252
	P value	.052
	Significance	Not significant
	N	60

Table 25 Correlation of TUG With Passive Plantarflexionof Left Side

		Passive Plantarflexion Left
TUG	Pearson Correlation	.007
	P value	.957
	Significance	Not significant
	N	60

DISCUSSION

Graph no. 7 shows that the mean of Active dorsiflexion of left ankle joint shows significant correlation with the mean of TUG.

Graph no. 20 shows that the mean of Passive plantarflexion of right ankle joint shows significant correlation with the mean of BBS.

Graph no. 21 shows that the mean of Passive plantarflextion of right ankle joint shows significant correlation with the mean of FRT.

This shows that TUG shows correlation with active range of ankle which is usually required while getting up from chair and walking and BBS is showing correlation with the passive range

of ankle also FRT is correlating significantly with passive ankle range.

CONCLUSION

The study concludes that there is significant correlation between ankle flexibility and balance and functional mobility in community dwelling elderly.

Limitation

- Individual component of the Berg Balance Scale were not correlated with ankle range of motion.
- The knee range of motion was not taken into consideration in this study.

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How to cite this article:

Ajay Kumar *et al*.2016, Correlation of Ankle Flexibility To Balance And Functional Mobility In Community Dwelling Elderly. *Int J Recent Sci Res.* 7(11), pp. 14129-14133.