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THE RELATIONSHIP BETWEEN ANKLE'S RANGEOF MOTION WITH THE RISK OF FALLING IN ELDERLY MEN

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ABSTRACT

This study aimed to investigate the relationship between ankle's motion range and fall over risk in elderly men. This was practical correlation research. The population consisted of all elderly men with an average age of 66.26 ± 10.26 years old, average height of 166.26 ± 5.03 cm, and average weight of 62.26± 6.46who recently fellin Javanrood, Kermanshah in previous 12 months.After interview, 30 subjects participated voluntarily in the study. The demographic questionnaire was used to collect the data and medical records. The forward progress test,Functional Reach Test (FRT), and a ruler were used to measure the balance. The goniometer was used to measuredorsiflexion, plantar flexion,ankle eversion,and ankle inversion. The descriptive statistics including central tendency, dispersion, and tables was used for analyzing the data. The inferential statistics including Pearson correlation test was used for evaluating the correlation between variables. The SPSS21 software was used for conducting all the statistical operations. The significance level of tests was considered to be $p< 0.05$.

The findings showed that there is no relationship between ankle's active and passive plantar flexion and dorsiflexion motion range and risk of falling over in elderly men. Also, there was no

relationship between ankle's inversion and eversion motion range and risk of falling over in elderly men.

Keywords: Ankle's range of motion, elderly, risk of falling over, Active, Passive.

INTRODUCTION:

The increased lifespan and aging population is one of the achievements of this century.The aging and changes in body structure cause problems in the health of individuals. The statistical indices show the aging process has begun in Iran. It is predicted that the mean age of population in Iran will increased 10 years in 2006- 2026 period (Mirzaei, 2011: 20 and 21). The increased elderly population is due to reduced fertility, improvement of health services, and increased life expectancy. However, the problems of this group should be considered more than before.In 2002, about 600 million people of world's total population were over 60 years old. It is predicted that this figure will increase to two billion people in 2050 (Wells JL, 2003: 903). The community should pay more attention to the needs and problems of this group.

The falling over is one of the most common and most serious aging repeated problems. It has many physical (pelvic fractures, disability, loss of physical ability, and death) and psychological (loss of self-confidence and self-esteem and reduced life expectancy) consequences. Due to its high cost, the identification of its causes and prevention ways are considered. Given that deficits appear in sensory and motor function of lower limbs with increasing age in elderly people, theirinstability in postural control may cause falling over. The falling over is the sixth leading cause of death among elderly population which is associated with certain diseases and disabilities (Nodehi Mogadam et al., 2012: 41-48).

Since the falling over may endanger the individuals' function and independence, it is important to identify patients at risk of falling to prevent adverse events (Pajala, 2005: 60). The researchers consider the reduced balance and impaired working pattern as the key factors in falling and other motor problems of elderly people and believe that the balance is the basis of independent and dynamic living. Therefore, the evaluation of balance in elderly people seems necessaryfor physical therapy, helping appropriate treatment purposes, and to determine the appropriate means of assistance (Gallahue, 2006, p. 68 and 69).

The falling accounts for about two-thirds of all accidents in this age group. So, about 40%

of above 85 years old people falling leads to death. The falling is the major cause of elderly people death in the United States. Each year, one in three people over 65 years old fall over. Only in 1994, more than 7,000 people lost their lives due to falling (Nodehi Mogadam, et al., 2012, p. 94).

The research should be conducted to develop and use mechanisms for early detection of people at risk of falling and reduced function. According to above and the importance of subject, this study aims to investigate the relationship between ankle's motion range and fall over risk in elderly men.

METHODOLOGY

This was practical correlation research. The population consisted of all elderly men with an average age of 66.26 ± 10.26 years old, average height of 166.26 ± 5.03 cm, and average weight of 62.26± 6.46 who recently fell in Javanrood, Kermanshah in previous 12 months. After interview, 30 subjects participated voluntarily in the study. The independent and dependent variables were ankle's range of motion and falling, respectively.The demographic questionnaire was used to collect the data and medical records. The forward progress test, Functional Reach Test (FRT), and a ruler were used to measure the balance. The goniometer was used to measure dorsiflexion, plantar flexion, ankle eversion, and ankle inversion.

The Functional Reach Test (FRT) was used to measure the balance of samples.

Functional reach is tested by placing a yardstick or tape measure on the wall, parallel to the floor, at the height of the acromion of the subject's dominant arm. The subject is asked to stand with the feet a comfortable distance apart, make a fist, and forward flex the dominant arm to approximately 90 degrees. The subject is asked to reach forward as far as possible without taking a step or touching the wall. The distance between the start and end point is then measured using the head of the metacarpal of the third finger as the reference point. The final score is deducted from the initial score to obtain FRT. The reliability of this test is reported to be high (0.85 to 0.94 ICC) (Katz-Leurer et al., 2009).

The descriptive statistics including central tendency, dispersion, and tables was used for analyzing the data. The inferential statistics including Pearson correlation test was used for evaluating the correlation between variables. The SPSS21 software was used for conducting all the statistical operations. The significance level of tests was considered to be $p< 0.05$.

FINDINGS

The findings showed that according to measurements, ankle's active dorsiflexion, ankle's passive dorsiflexion, ankle's active plantar flexion, ankle's passive plantar flexion, ankle's inversion, ankle's eversion, and FRT were equal to 68.66 ± 5.81 cm, 56.33 ± 6.39 cm, 77.80 ±13.61 cm, 69.33 ± 14.86 cm, 21.00 ± 6.22 cm, 31.66 ± 11.70 cm, and 92.71 ± 9.23 cm, respectively.

According to P values obtained from the Pearson correlation coefficient, there was no significant difference between ankle's active and passive dorsiflexion motion range and risk of falling over. Also, there was no relationship between ankle's active and passive plantar flexion motion range and risk of falling over.

According to P values obtained from the Pearson correlation coefficient, there was no significant difference between ankle's active and passive dorsiflexion motion range and risk of falling over. Also, there was no relationship between ankle's inversion and eversion motion range and risk of falling over.

Table 4-1: The correlation between ankle's active and passive dorsiflexion and plantar flexion motion range and risk of falling over

Variable 1	Variable 2	correlation coefficient	Sig. level
Ankle's active dorsiflexion range of motion	**Risk of falling over**	**- 0.28**	**0.30**
Ankle's passive dorsiflexion range of motion	**Risk of falling over**	**- 0.06**	**0.82**
Ankle's active plantar flexion range of motion	**Risk of falling over**	**- 0.37**	**0.17**
Ankle's active plantar flexion range of motion	**Risk of falling over**	**- 0.37**	**0.16**

Table 4-2: The correlation between ankle's inversion and eversion motion range and risk of falling over

Variable 1	Variable 2	correlation coefficient	Sig. level
Ankles' Inversion motion range	**Risk of falling over**	**-0.01**	**0.95**
Ankles' Eversion motion range	**Risk of falling over**	**-0.13**	**0.62**

DISCUSSION AND CONCLUSION

The angular displacement at dominant foot causes a relatively large displacement atpressure center. These displacements in pressure center cause torque around the ankle joint and result in balanced position in mass center (Whipple et al., 1987). The standing on one leg is one of the many people's daily activities. It is challenging, because all of the body weight is tolerated by one leg and support level decreases(At Water et al., 1990). Johns Duter (2007) argues that due to poor muscle strength and endurance, the elderly people cannot stand on one leg for a long time. The findings in this study did not show the relationship between ankle's motion range and balance. However, it may be associated with poor muscle strength and

endurance. This is consistent with the findings of Nagano and collegues (2006) and Mac Conway and Bennett (2005); and it is inconsistent with the results of this study.

Macagni and colleagues (2000) reported a significant and positive relationship between ankle's motion range and dynamic balance in elderly people. Gribble and Hertel (2003) showed that there is no significant relationship between internal and external rotation of hip and ankle's dorsiflexion, and dynamic balance in young men and women; this is consistent with the findings of present study.

The maximum ankle's dorsiflexion motion range in walking is a key diagnostic criterion to distinguish elderly people with low and high level of performance.The shortening of calf muscles which is characterized by reduction of ankle's dorsiflexion occurs in the normal process of aging in men and women. It is known that aging is associated with a reduction in the number and size of muscle fibers. The reduction in the number of motor units and atrophy of muscle fibers may cause reduction of muscle size and strength in elderly people and explain the observed reduction in their flexibility and length. The reduction of muscle length due to decrease in the number of sarcomere was observed in the muscles of animals which were motionless in shortened state. Therefore, the limited elderly dorsiflexion may be similar to observed shortening mechanical adjustment in the muscles of animals which were motionless in shortened state (Gajdosik et al., 2005). The hypothesis that shortened calf muscle and reduced muscle size and strength occurs during the natural aging period is consistent with Gajdosik and colleagues study. They showed that older women have lower maximum isometric strength in their calf muscles. The decreased muscle mass and decreased calf muscles length decreases the ability of these muscles to deal with maximum passive stretch (Gajdosiket al., 2004).

This study is consistent with the findings of Hosseinifar et al. (2008), KianiDehkordi et al. (2005), Golpayegani et al (2006), and Tavafianet al (2004). According to P values obtained for active dorsiflexion (0.3), passive dorsiflexion (0.82), active plantar flexion (0.17), and passive plantar flexion (0.16) from Pearson correlation coefficient, there was nosignificant difference between ankle's active and passive dorsiflexion and plantar flexion and risk of falling over. Also, there is no relationship between ankle's active and passive dorsiflexion and plantar flexion motion range and risk of falling over in elderly people.

This study is consistent with the findings of Hosseinifar et al. (2008), KianiDehkordi et al. (2005), Golpayegani et al (2006), and Tavafian et al (2004). According to P values obtained for ankle's inversion (0.95) and ankle's eversion (0.62)from Pearson correlation coefficient, there was no significant difference between ankle's inversion and eversion motion range and risk of falling over. In general, the results showed that there is no relationship between ankle's motion range and risk of falling over in elderly people.

Limitations:

- Elderly people formed the study population.
- The age range of participants was 60-80 years.
- Motivation level of participants in the study was not known.
- The control of psychological conditions of subjects was not possible.
- The sleep, feeding, and resting of subjects was notcontrollable.

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