Association between Physical Characteristics and Locomotive Syndrome in Elderly in Surabaya, Indonesia

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Abstract

The locomotive syndrome (LS) is a condition of reduced mobility due to impairment of locomotive organ. The LS was screened by Lococheck in elderly population. Prior research has been shown that physical characteristic such as age, gender, body weight, body height and body mass index has correlation with mobility limitation in elderly. We aimed to asses if the physical characteristic in elderly is able to use as a screening tool for locomotive syndrome in Indonesia. To investigate the association between physical characteristic and locomotive syndrome in elderly. This study was an observational cross-sectional study. A total 63 participants (37 females and 27 males) age 60-78 years participated in this study. This study was conducted by filling the Lococheck Indonesian version and measuring physical characteristic (Age, gender, body weight, body height and body mass index). The correlation between the Lococheck Indonesian version with physical characteristic was analyzed using Kendall's tau correlation test. Forty participant answer "yes" at least one item of the lococheck Indonesian version questionnaire. The lococheck result showed an insignificant correlation with age r<0.3 (0.01), p>0.05 (0.926), gender r<0.3 (0.061), p>0.05 (0.563), Body weight r<0.3 (0.061), p>0.05 (0.562), body height r<0.3 (-0.104), p>0.05 (0.328) and body mass index r<0.3 (0.122), p>0.05 (0.245). To sum up, these findings confirmed that no correlation between physical characteristic and locomotive syndrome in elderly

Keywords: *Elderly, locomotive syndrome, physical characteristics, Surabaya, Indonesia*

Introduction

Hamstring tightness is the reduction of the hamstring muscle's ability to lengthen from a neutral position accompanied by a feeling of limitation or discomfort in the posterior thigh[1,2,3]. Hamstring tightness often occurs due to the adaptive shortening of muscle structures, especially the myofascial tissue. Knee extension angle (KEA) is one of standard measurement of hamstring tightness. The patient is in supine position, the hip is flexed 90° and the knee was moved into full extension until he feels discomfort in his posterior thigh. The KEA is the degree of knee of knee flexion in terminal extension. KEA more than 20° shows hamstring tightness[2,3,4].

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Individuals who work while sitting for 6-8 hours per day have a risk of experiencing hamstring tightness with a prevalence of 85.7%[3]. A study by Naqvi *et al*. on healthy students found 35% of subjects had hamstring tightness[4]. Kanishka *et al*. found a prevalence of hamstring tightness in sewing machine operators of 83.4%, with 40% of them having symptoms of low back pain[5].

Shortening of the hamstring muscles can cause misalignment of the trunks, reduce neuromuscular efficiency, increase energy expenditure and give excessive strain to the knee joint[6]. In athletes' populations, limitation of hamstring flexibility can produce musculoskeletal symptoms such as reduced strength, stability and muscle endurance. This will increase the risk of repetitive injuries, decrease athletic performance, and affect the psychosocial aspects of athletes[7].

The use of foam roller to relax myofascial tissue and by that, increasing muscle flexibility is currently emerging because it is easy, economical and can be done independently[8]. Foam rolling application can improve joint range of motion, neuromuscular function, reduce muscle and myofascial pain and regulate muscle tone. The mechanism of action of a foam roller occurs due to changes in muscle, myofascial tissue and stimulation of mechanical receptors[9]. The use of foam rollers in combination with vibrations has only recently begun to be commercialized. A better range of motion of the knee joint was reported after application of a vibrating foam roller to the knee flexor muscles compared to using a regular foam roller[10,11]. The supplemented vibration can put an excessive load on the joint, and when the vibration is given it will cause co-contraction of the agonist and antagonist muscles acting on the joint[12]. There are few studies on the effect of vibrating foam roller application on muscle performance and activation using EMG. Based on the description above, the aim of this study was to assess the immediate effect of vibrating foam roller applications on the hamstring muscle activation of healthy subjects by measuring the EMG amplitude.

Methods

We conducted an observational cross-sectional study between in October–November 2020 in Panti Wreda Surya and Pusyandu Rungkut, Surabaya, East Java, Indonesia. The total subjects were 63 healthy men and women were recruited. The inclusion criteria were men and women, aged 60 years old or more, able to read and answesr the quesionaire and willing to participate in this study by signing the research agreement form. The exclusion criteria were unable to stand or walk with or without ambulation aid, cognitive impairment, and uncorrectable visual impairment.

This research was initiated by vital signs and physical examinations. Research detail and procedure were informed to all subjects and provided signed, informed consent before the study. The responden was demanded to fill the Lococheck Indonesian version quesionairre. Lococheck consists of the items such as unable to put on a sock while standing on one leg, frequent trips or slips around the house, need to hold a handrail when climbing stairs, difficulty doing moderately heavy housework, difficulty carrying home 2 kg of shopping, unable to walk for 15-min nonstop, unable to cross a street before the light turns red. Risk of LS is defined as having at least one of these items. Moreover, respondens were measured for body weight, body height and body mass index. Meanwhile, the age and gender data was taken from responden identity card. All statistical analysis were performed using SPSS. The normal distribution of all variables was tested with Shapiro-Wilk test. The correlation between the Lococheck Indonesian version with physical characteristic was analyzed using Kendall's tau correlation test. The test were two-sided with significance level $p<0.05$ and correlation coeficient $r>0.4$.

Results and Discussion

Sixty three respondens participted in this study (26 males and 37 females). The age average was 67.87 years old, the body height average was 157.67 cm, the average of body weight was 60.62 kg, and the average of body mass index was 24.56 kg/cm^2. Table 1 shows the overall responden chracteristics. The result of this study showed an insignificant correlation between locomotive syndrome with age $r<0.3$ (0.01), $p>0.05$ (0.926), gender $r<0.3$ (0.061), $p>0.05$ (0.563), body weight $r<0.3$ (0.061), $p>0.05$ (0.562), body height $r<0.3$ (-0.104), $p>0.05$ (0.328), and body mass index $r<0.3$ (0.122), $p>0.05$ (0.245). The correlation between responden characteristic with locomotive syndrome was shown in Table 2.

Table 1. Characteristics of Respondent.

Characteristics	Means (±SD)
Age (year)	67.87±4.70
Body Height (cm)	157.67±8.92
Body Weight (kg)	60.62±11.91
BMI (kg/m2)	24.56±3.87

*BMI: Body Mass Index

Tabel 2. Correlation Between Respondent Characteristics with Locomotive Syndrome.

Characteristics	Correlation Coefficient	p
Age	0.01	0.926
Body Weight	0.061	0.563
Body Height	-0.104	0.328
BMI	0.122	0.245
Gender	0.235	0.064

*BMI: Body Mass Index

Theoretically, these physical characteristics can affect the condition of the three main components of the locomotive system, namely bones (supports), joints and intervertebral discs (mobility, impact absorption) and the muscular and nervous systems (driving, control)[3]. Any damage to these organs causes pain, limited range of motion in the joints or spine, muscle weakness and balance deficits leading to locomotive syndrome.

Some of the most common causes of locomotive syndrome include chronic disease, disc degeneration (lumbar spondylosis, cervical spondylosis, lumbar disc herniation, cervical disc herniation), lower limb cartilage degeneration (knee and hip osteoarthritis), and osteoporosis-related proximal femur fractures[3]. Among these diseases, old age is a risk factor for chronic disease, joint degeneration and osteoporosis; whereas a high BMI is a risk factor for chronic disease and joint degeneration.

In this study, there was no relationship between locomotive syndrome and age, weight, height, body mass index (BMI) and gender. This result is in contrast to a study conducted by Nakamura *et al*. on 165 elderly women aged over 60 years in Japan, showing that elderly with a BMI greater than 23.5 kg/m, shorter height, and a higher percentage of body fat. greater risk of SL[3]. Another study conducted on 350 respondents aged 40-91 years in Japan showed that age over 60 years, female gender, height and body mass index have a significant correlation with locomotive syndrome as measured by the 25-question Geriatric Locomotive Function Scale (GLFS-25) but this study showed no relationship between locomotive syndrome and body weight[9].

Research conducted by Kim *et al*. on 664 women and men in Japan aged 30 years or over showed that female gender, older age, higher body mass index, lumbar spondylosis and heart disease have a significant relationship with the syndrome. locomotives were measured by lococheck and GLFS-25[10]. However, a study conducted by Noge *et al*. in 2017 in Japan on 71 female respondents aged between 64 years and 96 years showed that body mass index and body weight were not related to locomotive syndrome as measured by lococheck. However, it is closely related to age, muscle mass and quality of life[4].

The difference in results in some of these studies can be caused by differences in the character of the respondents involved in the study[11,12,13]. For example, in several studies using respondents with a wider age range when compared to this study. While other studies only measure respondents with one gender only. In some of these studies there are also differences in measuring instruments, in which some studies use the lococheck measurement tool, while other studies use the GLFS-25 measuring instrument[14,15,16,17].

There are several limitations to this study. The first of all is that this study cannot describe the general population because respondents are only drawn from one location so that they cannot describe the characteristics of the elderly in general[18,19,20]. The second limitation is the measuring tool for assessing locomotive syndrome in this study using only one questionnaire, so the other measuring tools are still needed as a comparison[21,22].

Conclusion

In summary, these findings confirmed that no correlation between physical characteristic and locomotive syndrome in elderly in Surabaya, Indonesia.

Conflict of Interest: The authors declare that they have no conflict of interest.

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