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Effect of backward walking vs forward walking on quadriceps flexibility among individuals of physiotherapy colleges in Bengaluru, India

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Abstract
Introduction: Forward and backward walking, basically stimulate muscles of the lower limbs. It improves quadriceps flexibility. Forward walking has greater impact on knee and hip flexion. Backward walking relies less momentum has more efficient recruitment of motion unit. The study intended tocompare the effect of performing forward walking versus backward walking on quadriceps flexibility among normal individuals.
Method: 30 students (normal individual) 15 male and 15 female performed the walking test, that is forward walking and backward walking for 10mins for 3 alternative days for 1month (3weeks) to check the quadriceps flexibility among normal individual. Where Pre and Post session are compared.
Result: The intervention of forward walking was significantly improved the flexion ROM on left lower limb but not in flexion ROM of right lower limb. But, the intervention of forward walking was significant impact in flexion ROM of both the side.
Discussion: Forward walking is more effective as individual will be conscious and can more efficiently. But in backward walking often needs more effort to concentrate while walking. Hence forward is performed more easily than backward walking.

Keywords: forward walking, backward walking, quadriceps flexibility, Ely's test

Introduction

The quadriceps femoris is a hip flexor and a knee extensor. It consists of four individual muscles; three vastus muscles and the rectus femoris. They form the main bulk of the thigh. Nerve supply: lateral femoral circumflex artery. Function: The quadriceps work to extend (straighten) the knee. The rectus femoris also flexes the hip, The vastus medialis adducts the thigh and also extends and externally rotates the thigh and stabilizes the kneecap [1]. Backward walking: Can improve the muscular strength of lower extremities and locomotion balance owing to the different motor control mechanism from that for forward walking with greater reliance on neuromuscular control [1]. Increases strength in lesser-used leg muscles [2]. Helps rehabilitate knee injuries [3]. Improves walking technique [4]. Helps with balance [5]. Burns calories [6]. Helps you maintain a healthy weight [7]. Strengthens bones and muscles [8]. Boosts energy levels [9]. Elevates body's metabolism. Forward walking**:** 1. Improve cardiovascular fitness [2]. Strengthen your bones and muscles [3]. Improve muscle endurance [4]. Increase energy levels**.** Mostly Backward locomotion is used increasingly in sports and rehabilitation. As in forward walking, muscle activation is greater and during backward walking at similar speeds, and the metabolic requirements and oxygen consumption of backward walking are greater than during forward walking. Lower extremity kinematics are reverse quadriceps tightness happens or it increases causes affect while Backward walking and Forward walking. Muscle flexibility has been defined as the ability to bend and move a single joint or series of joints smoothly and easily through an unrestricted, pain free range of Motion (Range of motion)**.**During backward walking one has to rely more on the sense rather than the visual system (example-Auditory and sensory system). When quadriceps muscles are overworked from athletic movements such as jumping, running or weight training, they become tight and inelastic and exert unbalanced tension at the joints. Standing you're knees are hyper-extended, as well as spending long times sitting, can also produce tightness in the quadriceps.This tightness quadriceps effect causing loss flexibility of the muscle[2,3] Backward walking is recently emerging exercise that helps to increase the muscle flexibility.A person is prone to have several musculoskeletal injuries as a major consequence of having limited flexibility with decreased level of functione [4]Current athletes also undergoes improper training related to increasing flexibility of quadriceps muscle.Quadriceps weakness cause affect on flexibility can be caused by various injuries to the knee or hips, acquired myopathies (diseases that affect muscle tissue) such as Lyme disease and poliomyelitis, inherited myopathies such as certain muscular dystrophies and stroke, or neurological diseases such as multiple sclerosis or Bell's palsy [5]. Often stiffness of quadriceps affect flexibility among normal individuals. The Aim of the study was to find out the effects of forward walking versus backward walking on quadriceps flexibility among normal individual in Banglore India.

Methodology

30 students (normal individual) 15 male and 15 female performed the walking test, that is forward walking and backward walking for 10mins for 3 alternative days for 1month (3 weeks) to check the quadriceps flexibility among normal individual. Where Pre and Post session are compared. Padmashree Institute of Physiotherapy Bangalore. 1 month (April 1/2022 - April 30/2022). Manual trial. Padmashree Institute of Physiotherapy college students. 30 students 15 male and 15 female. 10 minutes test, forward walking [10]. minutes backward walking, for 3 alternative days for 1 month (3 weeks). Ely's Test is used to check quadriceps flexibility. Both male and female subjects aged 18-30 yr were included in the study. Subjects with weakness of quadriceps muscle. Subjects who are already participating in similar activity were excluded [6].

Procedure

30 students (normal individual) 15 male and 15 female performed the walking test, that is forward walking and backward walking for 10mins for 3 alternative days for 1month (3weeks) and check the quadriceps flexibility was assessed on first day and after completion training. Before forward and backward walking participants range of motion has been checked by using goniometer through Ely's test. Which is done by making participant to lie in prone position. The heel should touch buttocks. Test is done on both the sides. Forward walking test: Participants are asked to walk forward for 10 min at their normal walking speed in an open place. Backward walking test: The backward walking session was same as forward walking session except the subject walked backward for 10 min to measure the flexibility of quadriceps muscle.For backward walking the therapist again trained the subject and mark the position of the toe, as this was portion of the foot that made initial contact with the ground, for both trials forward vs backward walking the experimenter stayed in direct linear alignment with the subject to reduce the potential for directional causes. After session the tests are formed to check flexibility of quadriceps muscle tested side rises up from the table, the patient feels pain or tingling in the back or legs.

Results

Table 1: Range, mean and SD of outcome measures of flexion ROM in group-A

S no	Outcome measures	Group-A: Forward walking				Paired t-test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	Flexion ROM (left)	100-135	120.67±9.79	120-140	127.40 ±6.30	t=3.171*	p=0.007
2	Flexion ROM () Right)	115-140	128.20±7.04	110-143	129.53±9.52	t=0.649^{NS}	p=0.527

Note *-Significant (p<0.05), NS-Not significant (p>0.05).

Table 2: Range, mean and SD of outcome measures of flexion ROM in group-B

S No	Outcome measures	Group-B: Backward walking				Paired t-test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	Flexion ROM (left)	110-145	127.13±8.78	120-140	128.67 ±6.80	t=0.816^{NS}	p=0.428
2	Flexion ROM ()Right)	115-139	127.33±7.26	110-143	128.73±10.43	t=0.533^{NS}	p=0.602

Note; *-Significant (p<0.05), NS-Not significant (p>0.05).

Table 3: Range, mean and SD of outcome measures of flexion ROM in group-B

S No	Outcome measures	Group-B: Backward walking				Paired t-test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	Flexion ROM (left)	110-145	127.13±8.78	120-140	128.67 ±6.80	t=0.816^{NS}	p=0.428
2	Flexion ROM () Right)	115-139	127.33±7.26	110-143	128.73±10.43	t=0.533^{NS}	p=0.602

Note; *-Significant (p<0.05), NS-Not significant (p>0.05).

Discussion

The present study was undertaken to evaluate the effectiveness of backward walking versus forward walking in quadriceps flexibility among normal individual. The present randomized controlled trial aimed to find out the effects of backward walking versus forward walking on quadriceps flexibility among normal individuals The result suggests that there was statistically significant improvement in flexion range of motion on both sides in forward walking. Hence the forward walking is more effective to improve quadriceps flexibility among normal individual. It is effective in improving the knee flexion after one month among normal individuals. However there was a more or less proportion of samples of normal individuals according to the gender was insignificant [6]. Biomechanically muscles around ankle and knee reversed their action during backward walking. In Backward walking the knee gives the primary power along with co-contraction of the Quadriceps and Hamstring7.In Backward walking shear forces at the knee joint is always directed anteriorly whereas it is opposite in forward walking [8]. It is well known that a physical exercise is always accessible as well as cost effective and beneficial

in reducing diseases like Obesity. Forward walking has a relatively greater impact on the ankle and knee joints since walking is only possible with flexion of the knee or hips because ankles show minor movement [9]. Even though backward walking is not practiced in day-to-day life, it is effective in stimulating muscles of the knee joints and quadriceps in a more balanced manner. Therefore, it appears that people who complain of pain in the knees may note some [10]. During forward walking is used to control speed, stability and accurate foot placement However in backward walking uses the visual information is removed which may require reweighting of sensory information, increasing demand on neural resources to control backward walking [11]. The lower complexity of backward walking could also be due to the on different anatomical and mechanical constraints of backward walking, for example the reduced knee and hip range of motion [12, 13]. Backward walking relies less on the momentum that also leads to increase in the muscle activity and practice of repeated bouts of backward walking leads to more efficient recruitment of the motor unit [14, 15, 16].

Conclusion

It can be concluded that there was significant improvement in forward walking on quadriceps flexibility in male population and female population. Forward walking training has significant improvement on quadriceps flexibility Thus this study conclude that though clinically forward walking can lead to increase quadriceps flexibility.

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