

Age Influence on Knee Joint Flexors Tightness

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Abstract

Background : Knee flexors tightness has been documented in apparently healthy adults and in those with musculoskeletal problems, but the influence of age on the tightness has not been studied in Iraq. This study was therefore designed to determine the influence of age on knee flexors tightness in apparently healthy subjects.

Methods: Knee flexors tightness was measured using the active knee extension test (AKET) in 200 apparently healthy male and female subjects, aged 13 to 59 years. The subjects were recruited into 5 age groups using the purposive sampling technique.

Knee flexors tightness was compared across the age groups using one-way analysis of

variance (ANOVA). The independent t-test was used to compare knee flexors tightness on both lower limbs in male and female subjects.

Results: Subjects' mean age was 29.63 ± 16.72 years. All subjects had knee flexors tightness (absolute extension lag) and this increased with age up to age group 40-49 years. The male subjects had significantly higher knee flexors tightness than the females in all the age groups.

Conclusion: This study suggests that knee flexors tightness increases in apparently healthy persons from adolescent up to age 40-49 years and it is higher in males than females.

Key words: knee flexors tightness, age, active knee extension test

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Introduction

Muscle tightness is caused by a decrease in the ability of the muscle to deform, resulting in a decrease in the range of motion at the joint on which it acts⁽¹⁾. The term has also been used to denote a slight to moderate decrease in muscle length; usually the movement in the direction of the elongating muscle is limited⁽²⁾. Muscle tightness usually results from inadequate or improper rehabilitation following sustained muscle injury or low levels of physical activity in individuals⁽³⁾. It could make the musculotendinous unit more susceptible to injury, increase resistance to various anatomical structures, which may lead to overuse syndrome⁽⁴⁾. It could also lead to some pathological conditions at the joint on which the muscle acts, especially on a muscle like the knee flexors which passes over two joints⁽³⁾.

The knee flexors comprise three large muscles, namely semitendinosus, semimembranosus and biceps femoris which originate from the ischial tuberosity. They are located in the posterior compartment of the thigh and span the hip and knee joints. Hence, they are extensors of the hip and flexors of the knee.

Knee flexors tightness may be measured using the active unilateral straight leg raising test (SLRT)⁽⁶⁾, the passive unilateral SLRT⁽⁷⁾⁽⁸⁾ and the active knee extension test (AKET)⁽⁹⁾.

The SLRT apart from being used to measure knee flexors tightness, the SLRT is also widely used as neurological test, hence it does not give valid measures of knee flexors tightness because of pelvic rotation that occurs during the tests⁽¹⁰⁾.

The AKET measures knee flexors tightness by the angle subtended by knee flexion after a maximum active knee extension, with the hip stabilized at 90 degrees. The test-retest reliability coefficient for the AKET was reported to be 0.99 for both lower limbs and this has been attributed to the strict body stabilization method, the well-defined end point of motion and accurate instrument placement of the test⁽¹¹⁾.

Tight knee flexors muscles increase the patellofemoral compressive force because of the increased passive resistance during the swing phase of ambulation and running⁽¹²⁾, knee flexors tightness has been reported to be the cause of posterior pelvic tilting, reduced lumbar lordosis and exacerbation of existing pain in patients with low back pain⁽¹³⁾⁽¹⁴⁾. It has been reported to play a role in different forms of

lumbar significantly higher in adults with mechanical low back pain. (17)(18).

The aim of the present study is to determine whether or not age and gender would have significant influence on knee flexors tightness in apparently healthy individuals.

Methods

Two hundred apparently healthy subjects, aged between 13 and 59 years participated in this study. 40 subjects were recruited for each age group (13-19 years; 20-29 years; 30-39 years; 40-49 years and 50-59 years).

Subjects with health problems that might contribute to muscle tightness, such as deformities, contractures, spastic paralysis, and those involved in exercise training or active sports participation which might enhance muscle flexibility were not allowed to take part in the study.

The procedure was explained to the subjects and their ages were recorded.

The following measurements were taken for each subject:

1. Body weight.
2. Height .
3. Limb length was measured, to ascertain that there was no limb length discrepancy.
4. Body mass index (BMI) was calculated by dividing the subject's weight by the square of his or her height:

Knee flexors tightness was measured using the AKET. Subject was asked to bend the leg to be tested. The hip is in 90 degree flexion. The subject actively held this position with the knee in flexion and the ankle in plantar flexion.

The subject was then asked to actively extend the knee while maintaining hip flexion. the angle of knee flexion was observed on the goniometer that was attached to the knee. The complementary angle to the knee flexion, which is the knee extension lag, was computed by subtracting the knee flexion from 180. This was recorded as knee flexors tightness.

DATA ANALYSIS

Data were summarized using the means and standard of deviation.

ANDYA was calculated to determine whether significant differences existed or not in knee flexors tightness across the different age groups.

The independent t-test was used to determine if there was significant difference in knee flexors tightness between males and females and between the right and left lower limbs. Level of significance was set at 0.05

Results

100 males and 100 females with , they were aged 29.6 ± 16.7 years. The subjects' mean weight and height were 57.4 ± 19.1 kg and 1.6 ± 0.2 m respectively. The physical characteristics of the subjects in different the age groups are shown in table 1.

Table 2 shows that knee flexors tightness gradually increased from age group 13-19 years (39.65 ± 8.96 and 40.40 ± 8.71 for the right and left lower limbs respectively) to age group 40 -49 years (53.65 ± 5.08 and 54.85 ± 5.51 for the right and lower limbs respectively) after which it decreased slightly (51.45 ± 5.18 and 52.60 ± 5.15 the right and left lower limbs respectively for the age group 50-59 years).

Knee flexors tightness in males (49.03 ± 7.50 and 50.30 ± 7.25 for the right and left lower limbs respectively) was significantly higher ($p=0.05$) than in females (40.48 ± 9.24 and 41.63 ± 8.63 for the right and left lower limbs respectively) (table 4).

One-way analysis of variance showed that knee flexors tightness differed significantly across the age groups ($p=0.00$) (table 3).

Discussion

The results showed that knee flexors tightness was present in all age groups studied and that it tended to increase with age. However, there was no significant difference in knee flexors tightness in subjects in age groups 13-19 and 20-29 years. In age groups 30-39 and 40-49 years, knee flexors tightness was higher than that for any of the younger age groups. It was significantly lower in age group 50-59 years when compared with age group 40-49 years. These findings suggest that knee flexors tightness occurs

in early adolescent and it tends to increase with age. However, it does not significantly increase until the 30-49 years age range, after which it seems to fall. This corroborates the observations that knee flexors tightness in adolescents is less than that in adults (18). The progressive decline in flexibility with age has been attributed to changes in elasticity and decreased level of physical activity.(19)(20) Results also showed that males recorded higher values of knee flexors tightness compared to their female counterparts across the age groups. This supports the finding that females of most ages have greater trunk/hip flexibility than males.(21)

These findings suggest the need to teach routine stretching of the knee flexors muscles to all age groups, especially before age 30 when the tightness seems to increase greatly. School teachers, especially physical education teachers can help in this wise.

Conclusion

The findings of this study suggest that knee flexors tightness is present in early adolescent and increases with age in apparently healthy subjects.

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Table 1. Age and Physical Characteristics of Subjects

	All Subjects	Age groups				
		13-19 yrs N=40	20-29 yrs N=40	30-39 yrs N=40	40-49 yrs N=40	50-59 yrs N=40
	N=200					
Age (years)	29.6±16.7	13.8±1.3	23.3±2.0	34.5±2.3	44.7±2.7	54.2±2.3
Weight (kg)	57.4±19.1	48.6±9.4	60.6±0.1	69.8±6.1	71.5±7.8	71,8±6.6
Height (m)	1.6±0.2	1.6±0.1	1.7±0.1	1.7±0.1	1.7±0.1	1,7±0.1
BMI (kg/m)	21.7±4.5	19.3±2.4	21.4±2.1	24.8±2.4	25.0±2.8	25.6±2.0
RLLL (cm)	86.7±11.5	90.8±7.7	89.3±5.4	90.6±5.4	92.9±5.9	95.6±5.4
LLLL (cm)	86.7±11.5	90.8±7.7	89.3±5.4	90.6±5.4	92.9±5.9	95.6±5.4
N sample size BMI body mass index RLLL right lower limb length LLLL left lower limb length						

Table 2. Comparison of Knee Flexors Tightness on Right and Left Lower Limbs in Different Age Groups

Age groups years	Knee flexors tightness		T=value	p-value
	RLLL	LLLL		
13-19	39.65±8.96	40.40±8.71	0.05	0.96
20-29	41.00±9.66	42.50±7.14	0.14	0.88
30-39	45.20±7.13	45.60±5.33	0.05	0.96
40-49	53.65±5.08	54.85±5.51	0.16	0.87
50-59	51.45±5.18	52.60±5.15	0.15	0.87

Table3. Analysis of Variance of Knee Flexors Tightness Across the Age Groups

	Source of variation	DF	Sum of squares	Means of squares	F ratio	P value
Right lower limb	Between groups	5	8396.15	1679.23	30.72	0.00
	Within groups	234	12788.5	54.65		
Left lower limb	Between groups	5	7948.33	1589.67	32.01	0.00
	Within groups	234	11619.4	49.66		

Table 4. Comparison of Knee Flexors Tightness in Male and Female Subjects

	Right lower limb		Left lower limb	
	Males N=100	Female N=100	Male N=100	Female N=100
Mean muscle tightness	49.03±7.50	40.48±9.24	50.30±7.25	41.63±8.63
t	7.89		8.44	
p	0.00		0.00	

Significant t – value at P= 0.05

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