International Journal of Physical Education, Sports and Health 2016; 3(1): 256-260

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 4.69
IJPESH 2016; 3(1): 256-260

www.kheljournal.com
Received: 25-11-2015
Accepted: 27-12-2015

Bijish Kumar Bhaskaran
Senior lecturer, Asia metropolitan university, Malaysia.

Rajan Balakrishnan
Senior lecturer, Asia metropolitan university, Malaysia.

Zul Halmi Bin Ahmad
Student, Asia metropolitan university, Malaysia.

Correspondence
Bijish Kumar Bhaskaran
Senior lecturer, Asia metropolitan university, Malaysia.

Effects of physiological quadriceps lag among male young healthy students

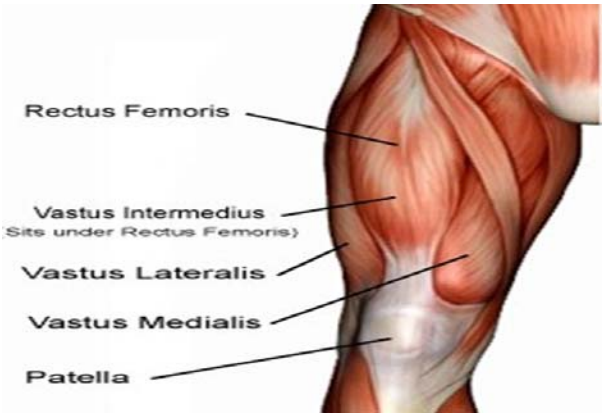
Bijish Kumar Bhaskaran, Rajan Balakrishnan, Zul Halmi Bin Ahmad

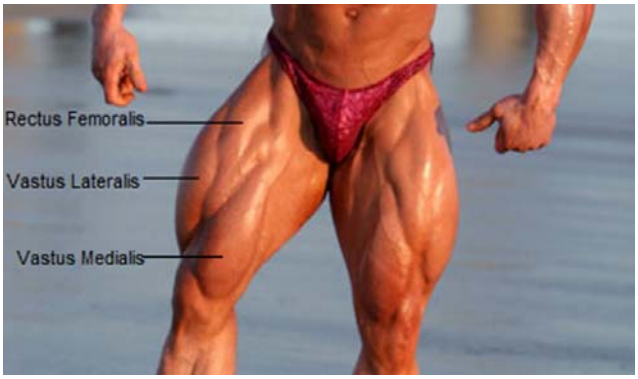
Abstract
Objective: The objective of this study was to determine physiological quadriceps lag, among male young healthy students
Background: A quadriceps lag is present when a person cannot fully actively extend the knee using muscle contraction, resulting in decrease in the range of motion at the joint on which it acts. Lag on quadriceps muscle may cause of physiologically changes.
Subjects: A 30 male students with an average age of 22 years participated in this study. Subjects were randomly assigned from Asia Metropolitan University
Methods: Active knee extension measurement was taken for all subjects. Subjects performed active knee extension and hold for 7 seconds with 2 repetitions, measurement were taken up to 5 seconds for each trial
Results: From the analysis of comparing mean were scheduled, paired 't' test were used an found that degree of freedom (df) t (29)=2.140 at $p < 0.05$ is (0.041) which showed that there was a significant difference and the null hypothesis was rejected and alternate hypothesis accepted
Conclusion and Discussion: This study concluded upon that the twice trial performance, physiological quadriceps lag has an effect on knee extension in range of motion

Keywords: Muscle lag; Muscle contraction; Physical therapy.

1. Introduction
The word quadriceps means "four heads," referring to the four distinct muscles that all join at a single tendon. Three of the four originate on the femur, or thighbone. The vastus medialis, on the inner front portion of the femur; the vastus lateralis, on the outer front, and the vastus intermedius, between the other two. The fourth, the rectus femoris, sits on top of the vastus intermedius and goes down the center of the thigh. It originates on the front of the pelvis just below the anterior superior iliac spine (often called the frontal hipbone).All four muscles join to insert, via the quadriceps tendon, on the patella, or kneecap. The strong patellar ligament then attaches the patella to the top of the tibia, or shinbone. The four quadriceps muscles strongly extends (straighten) the knee. In poses in which the quadriceps straightens the knee entirely, like straight-legged standing poses and standing and seated forward bends, this knee-extending action is obvious. But the quadriceps also work hard in poses in which the leg remains bent.[9]In addition to straightening the knee, the rectus femoris acts as a hip flexor, pulling the torso and the thigh toward each other. It must work with other hip flexors, simultaneously, it works with the other three quad muscles to hold the knee straight.

Materials and Methods
Study Design: A Quasi Experimental Design
Study Setting: This study was conducted in the physiotherapy lab, Asia Metropolitan University Batu9, Kemacahaya Cheras.
Study Duration: 6 months
Subjects: A 30 subjects with an average age of 22 (range 20-30 years old) volunteered to participate in this study for an hour. The subjects were required to complete two sessions in performing the task. All subjects were randomly chosen in the college. Subjects were chosen based on the inclusion criteria. Any volunteers who had contraindication were excluded.





Criteria for Selection

Inclusion Criteria

- Young male
- Aged 20-30
- Muscle power (MRC) grade 5
- Healthier student
- No disorder or any history of disorder
- Willingness to participate

Exclusion Criteria

- Unable to understand the command
- Muscle power (MRC) less than grade 5
- Subjects had disorder or any history of disorder
- Participant with history of knee injury
- Recent fractures to the lower limb
- Inability to actively move the knee joint

Procedures

Approval for this study was provided by the committee of Faculty Therapeutic Sciences Asia Metropolitan University. All participants gave informed written consent. This study was conducted with 30 subjects all male student of mean age 22 years. Subjects were taken for the study after meeting the inclusion criteria. Based on the preferred lower limb for kicking a ball, 25 were right lower limb dominant. No subject had any disorder, or any history of a disorder, which might influence the normal capacity to actively and passively extend the knee. Assessment Measurement was taken with the subject sat on the side of the treatment couch with the trunk supported in approximately 45 degrees flexion in order to minimize any resistance from hamstring muscle tightness during the test. For consistency, all tests were on the non-dominant knee. Goniometry were fix by double tape to the lateral aspect of limb, the fulcrum of goniometer was attach to the site of lateral condyle of femur and stationary arm along with midline of femur, and moveable arm to the lateral side of tibia. The time was set by using alarm stopwatch.

The passive limit of knee extension was determined by the examiner straightening the relaxed knee with a hand behind the heel until the subject's thigh just cleared the couch (Figure 2). In this position the unsupported knee was allowed to sag into extension determined by the weight of the limb. An examiner measure the range of motion of knee extensor directed at the lateral aspect of the limb. Examiner asking each subject to straighten the knee 'as far as possible' and to hold the fully extended position 'as hard as possible' until told to lower the leg (after approximately 7 sec) The examiner provided constant instructions and tone/reinforcement across all subjects in an attempt to standardize each subject's (maximum) effort during the active test.

The angle of maximum active knee extension was calculated as the average over 5 seconds. To facilitate data processing the straight knee position was represented as 0 degrees of flexion-extension. For each subject, the magnitude of extensor lag that is the angular limit of active knee extension was calculated at the last of 5 seconds. Then, for the better analysis subject were ask to rest 10 minutes in long sitting position in order to perform second trial. 1st 5 sec and 2nd 5 sec of the active contraction of knee extensor will be calculated as quadriceps lag via SPSS software version 20.0.

Data Analysis and Interpretation

Data Interpretation: Data Analysis

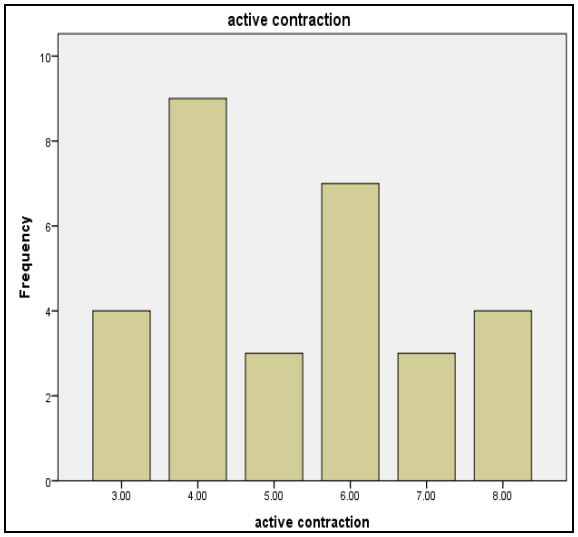
Data analysis is the method by which the validity of a research study is evaluated. It requires a number of closely related operations such as establishment of categories to raw data through coding, tabulation and then drawing statistical inferences. A total of 30 participants with no any disorder or any history of disorder with the age group between 20 to 30 years were included in this study**.** Interpretation means examining the result from data analysis, forming conclusion, exploring the significance of the finding and suggesting for the studies. Paired "t" tests were used to find out whether there were any significant differences within the active contraction1 and active contraction2

Active contraction1

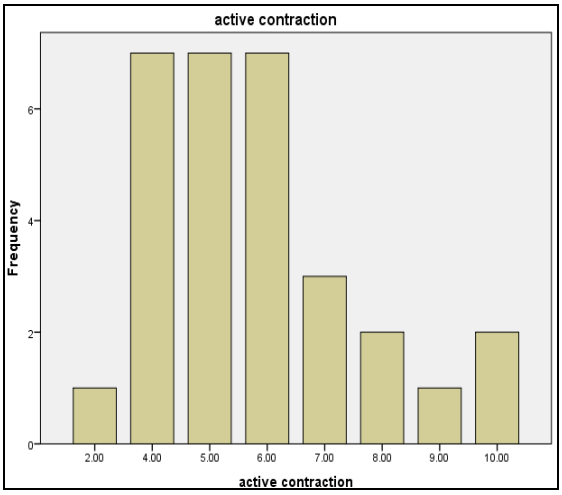
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.00	4	13.3	13.3	13.3
	4.00	9	30.0	30.0	43.3
	5.00	3	10.0	10.0	53.3
	6.00	7	23.3	23.3	76.7
	7.00	3	10.0	10.0	86.7
	8.00	4	13.3	13.3	100.0
	Total	30	100.0	100.0	

Active contraction2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	3.3	3.3	3.3
	4.00	7	23.3	23.3	26.7
	5.00	7	23.3	23.3	50.0
	6.00	7	23.3	23.3	73.3
	7.00	3	10.0	10.0	83.3
	8.00	2	6.7	6.7	90.0
	9.00	1	3.3	3.3	93.3
	10.00	2	6.7	6.7	100.0
	Total	30	100.0	100.0	



Active cotraction1



Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	active contraction1	5.2667	30	1.63861	.29917
	active contraction2	5.7667	30	1.86960	.34134

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	active contraction1 & active contraction 2	30	.741	.000

Descriptive statistic

From the descriptive statistic it is shown that the (mean ± SD) for active contraction1 is (5.26 ± 1.63) and active contraction2 is (5.76 ± 1.86) respectively. Here there is a difference between the mean values which confirm the average value difference.

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	active contraction1 - active contraction2	-.50000	1.27982	.23366	-.97789	-.02211	-2.140	29	.041

Inferential statistics: From the analysis of comparing mean were scheduled, pair't' test were used an found that degree of freedom (df) t (29) =2.140 at $p < 0.05$ is (0.041) which show that there is a significant difference and the null hypothesis is rejected and alternate hypothesis accepted.

Discussion

The purpose of the study was to find out the effect of physiological quadriceps lag. Totally, 30 participants were selected randomly according to the criterion selection. There were two respective measurement taken from each subject and the outcome measure used was range of motion of knee extensor. All the subject were performed active knee contraction in approximately 7 seconds. There is two trial was done, first measurement right after subjects were given instruction and the second measurement were taken after 10 minutes of first trial with the subjects were ask to sat in long sitting position. The first measurement mean was 5.27 and the mean of second measurement was 5.8. There is increase in the mean of extensor lag in the second measurement.

From the analysis of comparing mean, pair "t" test were used and found that p valued was 0.041(two tail) which show that there is a significant difference in physiological quadriceps lag. Quadriceps lag at instant of maximum active extension has shown that most healthy young adults, when assessed in the manner described, manifest a quadriceps lag of at least 5 degree**.** Stillman BC (2014) [1]. Muscle lag is one manifestation of active insufficiency, this normal phenomenon, commonly termed 'active insufficiency', is due to a diminished capacity of shortened muscle to develop actomyosin cross-bridges.

Conclusion

The results of this study accept the alternate hypothesis and concluded that there was significant difference in the effect of quadriceps lag in nature and impact to the clinical significance among male young healthy students. With reference to the statistical analysis and interpretation, it was noted that there were significant difference between active contraction1 and active contraction2. There is significant increase of quadriceps lag in active contraction 2.

Limitations of the Study

- The sample size was small
- Resting time period was only for 10 minutes

Recommendations

- A comparison between males and females could be done
- Should compare dominant with non-dominant limb
- Check lower limb muscle power, spasm and pain before perform the tasks

References

1. Stillman Physiological quadriceps lag, its nature and clinical significance. The University of Melbourne, 2014, 50.
2. Sebastian D, Chovvath R, Malladi R. The sitting active and prone passive lag test: an inter-rater reliability study. J Bodyw Mov Ther. 2014; (2):204-9.
3. Barber SD, Noyes FR, Mangine RE, McCloskey JW, Hartman W. Quantitative assessment of functional limitations in normal and anterior cruciate ligament–deficient knees. Clinical Orthopaedics, 1990; 255:204-214.
4. http:www.yogajournal.com/article/practice-section/thighs-matter Copyright©Cruz Bay Publishing, Inc. All rights reserved 2014.
5. Lieb FJ, Perry J. Quadriceps function: An anatomical and mechanical study using amputated limbs. Journal of Bone and Joint Surgery. 1968; 50A:153-1548.
6. Enoka RM, Stuart DG. Neurobiology of muscle fatigue. Journal of Applied Physiology. 1968; 72:631-1648.
7. Greenfield BH. Rehabilitation of the Knee: A Problem-Solving Approach. Philadelphia: FA Davis, 1992; 56:57-sss418
8. Hertling D, Kessler RM. The knee. In Hertling D and Kessler RM (Eds): Management of Common Musculoskeletal Disorders: Physical Therapy Principles and Methods (3rd edn.). Philadelphia: Lippincott-Raven, 1996; 331.
9. Liu JZ, Brown RW, Yue GH. A dynamical model of muscle activation, fatigue, and recovery. Biophysical Journal. 2002; 82:2344-2359.
10. Magee DJ Orthopedic Physical Assessment (2nd edition). Philadelphia: W B Saunders, 1992; 383.
11. Portney LG, Watkins MP. Foundations of Clinical Research: Applications to Practice (2nd edition). Norwalk: Appleton and Lange, 2000; 579-580.
12. Robert B. Sprague, Phd, Rpt the journal of Orthopaedic and Sport Physical Therapy. 2013.
13. Shree Pandya, Julaine M Florene, Wendy M King, Jenny Dively Robinson, Mindy Oxman and Michele A Province.

Journal of the American Physical Therapy Association. 1985; 65:1339-1342.
14. Jules M Rothstein, Peter J Miller and Richard F Roettger. Goniometric reliability in a clinical setting: elbow and knee measurements. Journal of the American Physical Therapy Association. 1983; 63:1611-1615.
15. Baker v, Bennel K, Stilman B, Cowan S, Crossley K. Abnormal knee joint position sense in individual with patellofemoral pain syndrome. Journal of Orthopaedic Reserch. 2002; 20:208-214.