ORIGINAL RESEARCH PAPER

Volume-7 | Issue-4 | April-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TRUNK FLEXIBILITY, STRENGTH, AND ENDURANCE IN PHYSIOTHERAPY STUDENTS – A CROSS SECTIONAL SURVEY

Physiotherapy

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ABSTRACT

Background: Back pain is a common musculoskeletal discomfort seen in physiotherapists. Musculoskeletal performance assessment is critical for decreasing injury risk.The objective of the study was to evaluate back range of motion (ROM), strength, endurance and hamstring flexibility of physiotherapy students.

Methodology: An observational study was conducted on 150 Physiotherapy students aged 18-24 years selected using convenience sampling. Modified Modified Schober test was used for assessing back flexion and extension ROM. Manual Muscle testing (MMT) was done to assess strength of upper and lower trunk flexors and extensors. Endurance of trunk extensor muscles was found by Sorenson's test and endurance of trunk flexor muscles by holding time of prone forearm plank position. Active knee extension (AKE) test was used to measure hamstring flexibility. Presence of low back pain and physical activity levels were also taken.

Results: Mean back flexion range was(6.84+1.54)cm, back extension range was(3.52+1.19)cm. Median MMT of upper back flexorswas 4, lower back flexors was 3, upper back extensors was 4 and lower back extensors was 3. Mean back flexor endurance by holding time was(58.73+36.25)sec, mean back extensor endurance was(93+46.01)sec. Mean hamstring flexibility right was (149.59+13.81) degrees and left was (150.94+13.4) degrees.

Conclusion: Trunk flexibility was within normal limits. Strength and Hamstring flexibility on both sides was found to be less than normal. Endurance was found to be below average. This implicates development of low back pain among physiotherapists, as at a young age there is a decreased endurance of trunk muscles and hamstrings tightness.Therapists need to take steps to prevent future back pain.

KEYWORDS

Trunk, muscle endurance, flexibility, physiotherapy students

Introduction

Musculoskeletal disorders (MSDS) are defined as injuries and disorder of the muscles, nerves, tendons, ligaments, joints, cartilage,and spinal disc (1).The causes of musculoskeletal disorders are awkward position (50.2%), strenuous forces (28.2%), and repetitive work (16.8%).(2) Low back pain is a common and leading cause of disability and huge costs associated with lost productivity and treatment. Musculoskeletal complaints are the second largest health problems in the world and nearly two- third of them are due to work related diseases and disorders. Musculoskeletal disorders are only secondary to frequent traumas suffered on a worldwide basis.(3)

Studies have reported MSDs were common among PTs; the body parts most often affected was the low back and neck.MSDs among physiotherapists are an area of concern as physiotherapists spend most of their time in physical efforts for their treatment purpose and work. A survey on musculoskeletal disorder in physiotherapist done by Carta A et al. illustrated that physiotherapists have a high prevalence of 84 % of MSD.(5)

The common categories of musculoskeletal assessment include range of motion, endurance and strength. The results of previous studies show that more number of physiotherapistsare exposed to musculoskeletal disorder due to their work.So the aim of this study was to evaluate back flexibility, strength, endurance and hamstring flexibility of physiotherapy students.

Methodology

An observational study was carried out in 150 students of a physiotherapy college in Ahmadabad using convenience sampling. Healthy young individuals, both males and femaleswere taken who were students of the physiotherapy collegein the age group 18 -24 years were included in the study. Subject who had current back injury orsurgery, were currently injured, had ongoing menstruationor not willing to participate were excluded from the study. The nature and purpose of the study was explained to the participants. Depending on the inclusion and exclusion criteria, informed consent was obtained from the participants. Demographic data and daily activities were filled in a questionnaire. A demonstration of the tests was given to them and they were then asked to perform the tests. Relevant scores were noted. After giving detailed instructions and brief demonstrations, participant were tested individually.

To measure the back muscle endurance the modified Sorenson test (6) (7) was used. The participant was asked to lie in the prone position. The position adopted for the test was a variation of Bering Sorenson test as described and implicated by the Canadian society for exercise physiology, Canadian physical fitness and lifestyle approach test (8) (9) In Bering Sorenson test the subject has to lay prone on an examination table and maintain an unsupported trunk (from the upper border of the iliac crest) horizontally. The buttocks and legs are fixed to the table with three, three inch straps. Any variations from described method is called modified Sorenson test. After stabilizing the lower extremity, thesubject was asked to cross both the hands against thechest and the holding time was noted in seconds with a standard stopwatch. The test was terminated if subject wanted to stop, any ill effect due to test was noted, or subject complained of fatigue. During the test the instructor encouraged the subject for correct alignment. Two corrective cues were given after which the test was terminated and time was noted.

The prone forearm planktest was used to assess back flexor endurance. The test procedure for the prone forearm plank (10) was as follows: the subjects assumed the forearm plank position with the elbows are in the contact with the ground, such that the humerus formed a perpendicular line to the horizontal plane, directly beneath the shoulders. The forearms were in natural position and hands were directly in front of elbows. The participant assumed a rigid anatomical position so that only their forearm and toes supported the body. This position is characterized byphalangalextension, neutral ankle position, knee and hip extension, and neutral spinal positions.The participants were instructed to statically hold this position as long as possible and the verbal cues were provided to the participant. When the subject assumed the proper position, the investigator started the stopwatch. The test was terminated whenthe participant felt fatigue or voluntarystopped the test, failed to maintain the proper position, reported ill effects of the test (e.g. headache, dizziness, pain not associated with fatigue, etc.) or the instructor noticed signs of ill effects from test. Participants were provided cues during the test as technique falterd away from the accepted position. Test was terminated by the investigators when two consecutive correction cues given to the participants did not form any adequate correction. At the conclusion of the test all participants gave the primary reason for discontinuation and duration time of the nearest tenth of a second was recorded. Each subject only performed once the test once.

Active knee extension test (11), (12) was used to assess hamstring flexibility. Each participant performed AKE test twice on both legs. A

standard universal goniometer was used for all measurements and all measurements were completed by the principal investigator and recorded ona data collection sheet. The participants were positioned supine on a plinth so that the leg not be tested was flat on the plinth with knee extended and stabilized byanother therapist. The participant was asked to flex the hip of the test leg. The goniometer was used to ensure 90degree hip flexion, with the axis of the goniometer placed over the greater trochanter, the stationary arm parallel to the midaxillary line of trunk and movable arm parallel to the femur in line with the lateral femoral condoyle. The participant was then asked to straighten the leg at the knee as far as possible maintaining the thigh in position with thehand. The axis of goniometer was kept over the lateral knee joint line, the movable arm was aligned at lateral malleolus of ankle and the stationary arm was placed to greater trochater of femur. The goniometer measured the angle of knee extension in degrees giving an indication of hamstring muscle length. The other leg was also tested by the same method.

Results

Among 150 participants there were 21 males and 129 females. All participants completed all the tests. The mean age of the participants was 20.92±1.50 year. Moderate to hard level of physical activity was being done by 26 students in the form of regular exercise or house work. History of mildlow back pain was present in 19 students.Mean and SD of all outcome measures is shown in table 1.

Table 1: Mean and SD of all outcome measures

Outcome measures	Mean/ Median	Standard deviations	Normal alues
Back flexion (cm)	6.84	1.54	6-8
Back extension (cm)	3.52	1.19	2-3
MMT of upper flexors	4	-	5
MMT of lower flexors	3	-	5
MMT of upper extensors	4	-	5
MMT of lower extensors	3	-	5
Active knee extension test on right (degree)	149.59	13.81	More than 160
Active knee extension test on left (degree)	150.94	13.41	More than 160
Sorenson test (sec)	92.99	46.01	113 + 46.01
Prone forearm plank (sec)	58.73	36.25	60-120 average

Discussion

The present study was conducted on physiotherapy students to assess the parameters related to backpain problems. Mean back flexion range was (6.84±1.54) cm, back extension range was (3.52±1.19) cm. Median MMT of upper back flexorswas 4, lower back flexors was 3, upper back extensors was 4 and lower back extensors was 3. Mean back flexor endurance by holding time was (58.73±36.25) sec, mean back extensor endurance was (93±46.01) sec. Mean hamstring flexibility right was (149.59±13.81) degrees and left was (150.94±13.4) degrees.

Mean back flexion range was (6.84±1.54) cm; back extension range was (3.52±1.19) cm Present study shows that back flexibility of physiotherapy students measured by modified modifiedSchober test was within normal limits. So at a younger age the back movements are not affected whether the student had or did not have backpain.

In present study mean back extensor endurance was (93±46.01) sec according to the modified Sorenson test. The mean base line of endurance of back extensors musculature is reduced according to results of a study done by Adedoyin RA et al. (7) Modified Bering Sorenson tests report that the low back endurance is related to the potential for developing low back pain. Also the study conducted by Ganer Naveen et al. on correlation of trunk extensors endurance with pain and disability in patients with non radiating chronic low back pain concluded that decreases in trunk endurance can be correlated with increase in low back pain and disability or vice versa. (13)

In present study mean back flexor endurance by holding time was (58.73±36.25) sec, which means that isometrics muscle endurance of anterior back musculature is decreased. These results are similar to study done by Sarah L. strand.(10) Musculoskeletal performance assessment is critical in analysis of physical training programs in order to prioritize goals for decreasing injury risk and focusing performance goals.

Mean hamstring flexibility right was (149.59±13.81) degrees and left was (150.94±13.4) degrees among the participants. Active knee extension according to the test was reduced which indicates reduced hamstring flexibility. There was significant difference of hamstrings flexibility between patients having chronic low back pain and age and gender matched normal individuals in a study by Mistry GS et al. (14) Another study by Gopi S. Mistry et al concluded that decreased hamstrings flexibility is correlated with low back pain. (11) Tightness may be one of the causes for development of the low back pain and LBP can become chronic if hamstrings tightness is left untreated.(15)Koley S et al predicted that prolonged tight hamstring muscles can cause back pain. (16)

In present study overall both back flexors and extensors strength are decreased with a median strength of 4. These result are similar to study done by Joshua Samule et al .(4) . Also while moving or lifting patients, there was only rare use of special equipment, and this decreased in cases of overweight patients. Having weaker muscles predisposes to backpain in future. Statistical analysis in a study done on Greek physiotherapists revealed that there was a strong correlation between the workplace and the use of special work equipment (17)

A study done by Gopi S. Mistry studied various factors like increased lumbar lordosis, reduced abdominal muscle length and strength, decreased back extensors muscles endurance and back extensors flexibility and reduced hamstring flexibility were responsible for developing of LBP .(11) Other risk factors like performing the same task over and over, adopting awkward body positions, abrupt responses, posing significant forces, psychosocial issues, working environment and anthropometric characteristics like BMIwere not assessed.

Conclusion

These study finding have implications for developing future low back pain among physiotherapists ,as a young age there is a decreased endurance of trunk muscles and hamstrings tightness which is in future be a cause for work related low back pain. Therapist need to take step to prevent future back pain .

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