

Effect of Core Strength of Knee Proprioception in Female Wrestlers

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Abstract

Background and Objectives: The “core” is defined as a box with the abdominals in the front, paraspinals and gluteals in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom. Core serves as a muscular corset that works as a unit to stabilize the body and spine. Frequent bouts of tournaments of wrestling cause core weakness which can result from core muscles instability that can lead to pain and altered dynamic balance. The objective of this study is to investigate the effects of stability training on isokinetic core strength parameters and knee proprioception in female wrestlers.

Methods: Thirty female wrestlers were taken in the study with age ranging from 15 to 25 years of age. Study group was given 4 weeks of core muscle strengthening program. The tools used to assess the outcome were Trunk endurance test and Star Excursion Balance Test.

Result and Discussion: The results of the study show that participants in the study group revealed a significantly greater improvement in core strength as well as knee proprioception. So adding a core muscle-strengthening program to the training of the wrestlers improves their performance in the tournaments they play.

Keywords: Core strength, Knee stability, proprioception.

Literature Survey: The “core” has been described as a box with the abdominals in the front, paraspinals and gluteals in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom (Richardson C, Jull G, Hodges P & Hides J 1999).

Stability of the lumbar spine requires both passive stiffness, through the osseous and ligamentous structures, and active stiffness, through muscles. A bare spine, without muscles attached, is unable to bear much of a compressive load (Lucas D & Bresler B 1961; McGill S. 2004). Spinal instability occurs when either of these components is disturbed (Akuthota et al 2004).

Core stability training affects and improves proprioception by involving the core body muscles and joints and putting ligaments under the stress. As all body segments are correlated through kinetic chain, muscles, and fascia, it seems that conducting core stability exercises affects lower limb joints proprioception like the knee (.Behm DG, Drinkwater EJ, Willardson JM & Cowley PM 2010).

Many studies have reported increased trunk muscle activity when performing exercises with unstable environments. On the other hand, there is little research regarding the effect of unstable surface exercises on core strength. A number of studies have conducted IT protocols measuring physiological, functional and athletic performance, but did not measure changes in trunk strength. Other studies are of quite short duration (3-6 weeks) showing positive adaptations for lordotic curve stability, postural control and trunk power (Lee J.H., Ooi Y. & Nakamura K.1995)

Thus based on the dearth of studies and the contradictory results in the few training studies that examined trunk strength, it would be important to investigate if the reported instability exercises effects on knee proprioception in female wrestlers.

Description: The two common categories of muscular assessment include strength and endurance testing where muscular endurance is defined as the ability to sustain a given level of force production over time while muscular strength is defined as the maximum torque exerted by a muscle or muscle group.

To perform the test, there are three tests to assess core strength.

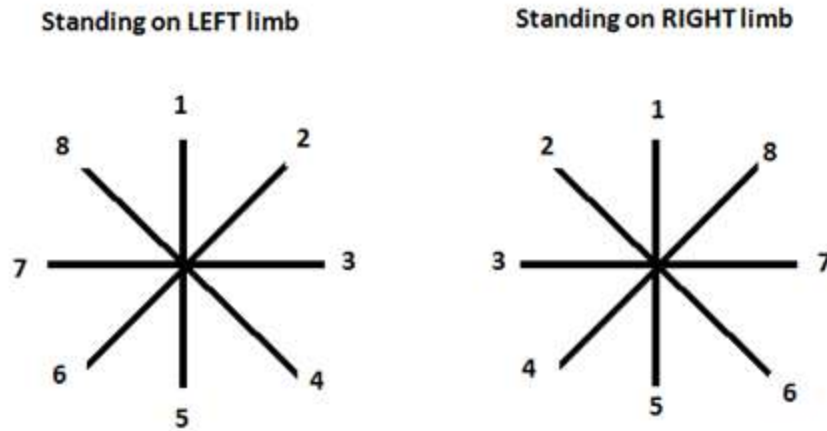
These are:

Trunk flexor endurance test,

Trunk lateral endurance test and

Trunk extensor endurance test (MCGILL'S TORSO MUSCULAR ENDURANCE TEST BATTERY by CMES © 2015)

The Star excursion balance test or SEBT for the lower quarter is a functional screening tool, commonly used to examine the balance of the lower extremity.



Therefore the purpose of the study was to identify the effect of core strength on knee stability and proprioception in female wrestlers.

Methods:

Number of Subjects were 30. Subjects were recruited from Sir Chhoturam Stadium Rohtak;

Method of selecting subjects: The study subjects were thirty female wrestlers who were inpatients at an academy. The experiment was conducted after the study objectives and methods had been explained to the subjects and they had signed a consent form agreeing to participation in the study in accordance with the ethical principles of the research (Hertel J, Miller SJ, Denegar CR.2000)

The physical characteristics of the subjects were as follows.

The experimental group had a mean age of 17 years of average height of 150.2cm and average weight of 55kg. All of the athletes were female. No male were chosen.

The inclusion criteria were

- a) All subjects should be aged between 15 to 25 years.
- b) All subjects should be female wrestlers.
- c) Absence of neurological, cardiovascular, metabolic, rheumatic or vascular disease.
- d) No injuries or previous injuries on legs and
- e) Absence of knee instability.

Exclusion Criteria were

- a) Any type of neurological, cardiovascular , metabolic, rheumatic or vascular disease

- b) Any type of injuries on legs
- c) Any type of knee instability
- d) Any previous surgery around the knee, any spinal or lower extremity deformities

Dependent Variables were knee stability and core stability which was measured using SEBT test for proprioception and for core stability three tests were conducted. These were Trunk flexor endurance test, Trunk lateral endurance test and Trunk extensor endurance test

Training Programme: The core training program was performed in Sir Chhoturam Stadium Rohtak in Wrestling Hall. Following exercise program was performed.

Core exercise program:

Warm up Exercises: .consisting of low-intensity core strength exercises to prepare the neuromuscular system for the training loads and ending with a cool-down program (i.e., dynamic stretching) of 10 minutes (Granacher U, Schellbach J, Klein K, et al, 2014).

During the main part of the training, the “big 3” exercises as described by McGill (Juker, D., S.M. McGill, P. Kropf, and T. Steffen, 1998) were conducted. These include the curl-up, Side Bridge, and quadruped position.

Cross curl-ups: Subjects were made to lie in supine position, hands folded behind the neck, elbows pointed to the sides, knees in a flexed position, feet rested on a mat; subjects curled-up until the scapulae left the mat, and rotated to the left and right at a moderate velocity (Richardson, C., Jull, G. Hodges, P. and Hides J, 1999).

Side bridge (both sides): Subjects were told to assume a side lying position with knees flexed, the supporting shoulder superior to the respective elbow, the uninvolved arm held in akimbo (with hands on the hips and elbows tinned outwards), and the supporting forearm flat on the mat; subjects raised their hips until a straight line is reached from the knees up to the shoulders and they continuously raised and lowered their hips at a moderate velocity (Axler, C.T., and S.M. McGill., 1997).

Quadrupedal stance (Bird dog exercise): Subjects were made to stay in a quadrupedal stance, with both hands and knees flat on the surface; they lifted a leg and the contralateral arm in horizontal position at moderate velocity (Granacher U, Schellbach J, Klein K, et al, 2014).

Stretching exercises were also performed during the session and at the completion of each session. Rest intervals were approximately 30 seconds. All of the sessions were instructed and supervised by the same trainer. . These exercises have been described by Sekendiz et al in 2010

Frequency of Training

The training was carried for 3 sessions a week for a period of 4 weeks.

Statistical Analysis: A repeated measure design was used for this study.

All data was analysed using statistical tests, which were performed using SPSS 10.00 software package. Demographic data of patients including age, height, and body mass index were descriptively summarized to project the results. The dependent variables for statistical analysis were analysed using repeated measures ANOVA.

A 0.05 level of significance was used for all comparisons.

Results:

SEBT

The analysis revealed that there was significant improvement in all the direction during the study period * $p < 0.001$

TFET

The analysis revealed that core strength training influenced dynamic balance in flexor endurance during the study period * $p < 0.001$

TEET

The analysis revealed that core strength training influenced dynamic balance in extensor endurance during the study period. * $p < 0.001$

TLET

The analysis revealed that core strength training influenced dynamic balance in lateral flexors endurance during the study period. * $p < 0.001$

The result of this study revealed that there was a significant improvement in core strength as well as knee proprioception as * $p < 0.01$.

Discussion:

This study was conducted to assess the effectiveness of core muscle strengthening on reducing pain and improving dynamic balance in female wrestlers. Even though the effectiveness of core muscle strengthening has been proved by many previous studies in various other preconditions, there is no published study to analyze the effectiveness of core muscle strengthening for improving the pain and balance among the wrestlers. (Areeudomwong P, Puntumetakul R, Jirarattanaphochai K, et al, 2012; Cho HY, Kim EH, Kim J, 2014; Chang WD, Lin HY, Lai PT, 2015)

The results of this study indicate that female wrestlers in the study group showed a significant difference in terms of strengthening of core muscles as well as knee proprioception. This improvement could be achieved as an immediate effect, because strengthening of the core muscles must have rectified the improper recruitment of the muscles, in order to provide proximal stability, since patients with PFPS present a different

recruitment pattern. Rojhani Shirazi Z et al. in 2014 reported that improvement in core muscles could be an effective strategy in the rehabilitation of patients with PFPS.

The study findings showed that there was a significant improvement in the dynamic balance in the study group. The decrease in pain intensity must have influenced the increased distances in SEBT. The significant increase in dynamic balance is a confirmation of the proposed hypothesis, which suggested that strengthening in the core muscles provides a better stability for the lower limb movements allowing the occurrence of a smooth and stable movement. Strengthening the core could have resulted in a smaller displacement in the mediolateral center of pressure and also, in the center of mass. This means that, the motion at the level of the trunk and hip is properly controlled, resulting in the significant dynamic balance improvement that has been recorded in the study group. This outcome signifies that amelioration in the control of body balance may be related to an improved neuromuscular control, which occurs due to increased postural stability. Therefore, trunk strength and stability programs of the hip-lumbo-pelvic complex should be considered as a major treatment strategy in the improvement of the whole body balance.

Core muscle strengthening must have altered the sensory or motor pathways (or both), which in turn influenced the ability of the patient to maintain the postural control.

Limitations of the Study

- ▶ Larger sample size would have brought in more clarity in observed trends.
- ▶ Results cannot be generalized to male population.
- ▶ As compared to other randomized control trials, care seeking subjects in our study precluded the feasibility of using a control group on ethical grounds and neither subjects nor treating physiotherapists could be blinded to their treatment.
- ▶ Due to lack of funds and infrastructure, many of the resources like EMG and biofeedback could not be used to make the results more clear.
- ▶ The various activities of the subjects during the course of study were not completely under control. Though the subjects were instructed to continue only with their regular activity and were asked to report participation in any new activity.

Conclusion: The primary purpose of the study was to determine the effect of core strength on knee proprioception in female wrestlers. The overall results of the study showed that there was a significant improvement of core strength on knee proprioception in female wrestlers. The result is summarized as there was better improvement in core strength as well as knee proprioception in female wrestlers. Hence null hypothesis is rejected.

References:

- Akuthota V, Nadler SF. Core strengthening. Arch Phys Med Rehabil. 2004;85 (3)(suppl 1):S86-S92

- Areedomwong P, Puntumetakul R, Jirattanaphochai K, et al.: Core Stabilization exercise improves pain intensity, functional disability and trunk muscle activity of patients with clinical lumbar instability: a pilot randomized controlled study. *J Phys Ther Sci*, 2012, 24: 1007–1012.
- Behm DG, Drinkwater EJ, Willardson JM, Cowley PM The use of instability to train the core musculature *Appl Physiol Nutr Metab*. 2010 Feb; 35(1):91-10
- Cholewicki, J., and McGill. S.M. Mechanical stability of the in vivo lumbar spine: implications for injury and chronic low back pain. *Clin. Biomech* . 11: 1–15, 1996
- Hertel J, Miller SJ, Denegar CR. Intratester and intertester reliability during the Star Excursion Balance Tests. *J Sport Rehabil*. 2000; 9(2):104-111
- Hides JA, Richardson CA, Jull GA. Multifidus muscle recovery is not automatic after resolution of acute, first-episode low back pain. *Spine* 1996; 21:2763-9
- Knapik JJ, Bullock SH, Canada S, et al. Influence of an injury reduction program on injury and fitness outcomes among soldiers. *Inj Prev*. 2004;10(1):37-42
- Lee J.H., Ooi Y., Nakamura K. (1995) Measurement of muscle strength of the trunk and the lower-extremities in subjects with history of low-back-pain. *Spine* 20(18), 1994-1996
- Lucas D, Bresler B. Stability of the ligamentous spine. San Francisco: Biomechanics Laboratory, University of California; 1961 MCGILL'S TORSO MUSCULAR ENDURANCE TEST BATTERY by CMES © 2015 AMERICAN COUNCIL ON EXERCISE®
- Richardson C, Jull G, Hodges P, Hides J. Therapeutic exercise for spinal segmental stabilization in low back pain: scientific basis and clinical approach. Edinburgh (NY): Churchill Livingstone; 1999.
- Rojhani Shirazi Z, Biabani Moghaddam M, Motealleh A: Comparative evaluation of core muscle recruitment pattern in response to sudden external perturbations in patients with patellofemoral pain syndrome and healthy subjects. *Arch Phys Med Rehabil*, 2014, 95: 1383–1389
- Walden M, Atroshi I, Magnusson H, Wagner P, Hagglund M. Prevention of acute knee injuries in adolescent female football players: cluster randomized controlled trial. *BMJ*. 2012; 344:e3042.