International Journal of Physical Education, Sports and Health 2023; 10(3): 410-412

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.38
IJPESH 2023; 10(3): 410-412

www.kheljournal.com
Received: 03-04-2023
Accepted: 06-05-2023

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Assessing and comparing the muscular endurance of the major spine-stabilising muscles of jumpers

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DOI: https://doi.org/10.22271/kheljournal.2023.v10.i3f.2977

Abstract
The aim of the present study was to assess and compare the muscular endurance of the major spine-stabilising muscles of jumpers. A total of 50 male jumpers were chosen as samples (n = 50) for data collection. The subjects are jumpers who represented and competed in intercollegiate and interuniversity championships. The selected subjects are between the ages of 18 and 25, and the study is restricted to the Dakshina Kannada district. For the purpose of data collection McGill's torso muscular endurance test battery was used to measure the major spine stabilizing muscles. Using an advanced Excel workbook and a significance level of 0.05, the collected data was treated by mean, standard deviation, and t test. The study concluded that there is no difference in muscular endurance between the trunk flexion and trunk extensor muscles in male jumpers. The findings were represented using appropriate figures and tables.

Keywords: Muscular Endurance, Spine stabilizing muscles, Jumpers, etc

Introduction

Muscular Endurance

Muscular endurance is the ability of a muscle to repeatedly exert force against resistance (Eric Brown, 2019). Endurance can be defined as the ability to withstand stress over prolonged periods of time. An endurance sport is therefore any sport in which there is a prolonged physical stress. The main requirement is the ability to sustain a fast pace over a prolonged period, without sustaining undue fatigue through the build-up of lactic acid (Teemu Virtanen, 2019)

When a person is able to accomplish or withstand a higher amount of effort than their original capabilities their endurance is increasing which too many personnel indicates progress. In looking to improve one's endurance they may slowly increase the number of repetitions or time spent, if higher repetitions are taken rapidly muscle strength improves while less endurance is gained. Increasing endurance has been proven to release endorphins resulting in a positive mind. The act of gaining endurance through physical activity has been shown to decrease and stress. Although a greater endurance can assist the cardio muscular system it does not imply Muscular strength relates to the ability to move and lift objects. It's measured by how much force the individual can exert and how much weight the person can lift for a short period of time.

Spine stabilization muscles

Optimal spinal stabilization can be achieved by strengthening the deep back and abdominal muscles. These include the transversus abdominus, quadratus lumborum, oblique abdominals, multifidus and erector spinae Stabilization is also called immobilization, and for good reason. Stabilization training is an active form of physical therapy designed to strengthen muscles to support the spine and help prevent lower back pain. Through a regimen of exercises prescribed by a physical therapist, the patient is trained to find and maintain his/her "neutral spine" position.

Delimitations

1. The study was delimited to the Dakshina Kannada district only.
2. The study was delimited to the jumpers who have been undergoing training for the last 5

years.
3. The study was delimitation to the jumpers who participated in intercollegiate, and interuniversity competitions.
4. The study was delimited to the subject's age range of 18 to 25 years.
5. The study was delimited to only the male jumpers.

Limitation of the study
1. Although the muscular endurance factor will be assessed during this study, the related factors of the subject during the assessment testing period cannot be controlled.
2. The study did not control the daily routine and lifestyle of the subjects.
3. The researcher doesn't have control over selected subjects' training. Each one differs from the other.

Significance of the study
1. The research will aid in determining the muscular endurance of jumper athletes' major spine stabilising muscles.
2. The study may help with further research in sports biomechanics and kinesiology.
3. The study will help coaches to understand their trainee's spine stabilising muscular endurance.
4. This study will help the athletes self-evaluate the muscular endurance of their spine stabilising muscles.
5. The study may help trainers to construct a good training program.

Selection of the subjects
A total of 50 male jumpers were chosen as samples (n = 50) for data collection. The subjects are jumpers who represented and competed in intercollegiate and interuniversity championships. The selected subjects are between the ages of 18 and 25, and the study is restricted to the Dakshina Kannada district.

Selection of test items
For the purpose of data collection McGill's torso muscular endurance test battery was used to measure the major spine stabilizing muscles. It is a timed test involving a static, isometric contraction of the muscles, stabilizing the spine until the individual exhibits fatigue and can no longer hold the assumed position.

Table 1: Following table showing the variables and test were used for Present investigation

Sl.no	Test item	Variables
1	Trunk Lateral Endurance Test	R/L oblique & Quadratus lumborum
2	Trunk flexor endurance test	Trunk Flexor muscle
3	Trunk extensor endurance test	Trunk Extensor Muscle

Procedure for test administration and collection of data
The researcher personally met the coaches and obtained consent for the data collection. All the subjects were briefed about the purpose and importance of the investigation before being administered different tests and measures. The test items were explained and demonstrated to the selected subjects by the investigator herself, and the subjects quickly adapted to the way of performing different test items.
All the tests will be taken with care and precision. The investigator was taking the co-operation of coaches and experts to collect the data. The investigator was to give thanks to the subjects as well as concerned authorities after the completion of the data collection.

Statistical treatment
Using an advanced Excel workbook and a significance level of 0.05, the collected data was treated by mean, standard deviation, and t test. The findings were represented using appropriate figures and tables.

Analysis and interpretation of the data

Table 2: Table showing comparison of R/L oblique & Quadratus lumborum spine stabilizing muscles endurance in men jumpers.

Sl.no	variables	Mean	SD	t-test
1	R oblique &Quadratus lumborum	0.059	0.0298	0.311
2	L oblique &Quadratus lumborum	0.0598	0.0285	

The above table compares the R/L oblique and Quadratus lumborum spine stabilising muscle endurance in male jumpers. The mean and SD of the right oblique and quadratus lumborum are 0.0590, 0.0298 and the left oblique and quadratus lumborum are 0.0598, 0.0285, respectively. The t-value is 0.311. It shows that there is no significant difference in muscular endurance between the right and left oblique quadratus lumborum spine stabilising muscles in men. The low standard deviation means data points are clustered around the mean.

Table 3: Table showing comparison of trunk flexor and trunk extensor spine stabilizing muscles endurance in men jumpers

Sl.no	variables	Mean	SD	t- test
1	Trunk flexor muscle	0.05987	0.0402	2.026
2	Trunk extensor muscle	0.0855	0.051	

The above table compares the trunk flexor and trunk extensor spine stabilizing muscles endurance in men jumpers. Mean and S D of trunk flexor is 0.05987, 0.040 and trunk extensor is 0.0855, 0.0510 respectively. The low standard deviation means data are clustered around the mean.t statistical value is 2.026, it indicates that there is no significant difference in muscular endurance between trunk flexor and trunk extensor spine stabilizing muscle in men.

Discussion on findings
After data analysis, the researcher found that there was no significant difference in the calculated mean value of all the selected major spine stabilising muscles. The mean difference is very less when compared within each other. The t test also clears the above stated statement. It assumes that male jumpers have a good level of muscular endurance in their major stabilising muscles.

Discussion on Hypothesis
After statistical analysis, the calculated value is less than the table value, hence the formulated null hypothesis is accepted. Hence, the study concludes that there is no significant difference in muscular endurance between major spine stabilising muscles in male jumpers.

Summary
According to Mesquita Marceli Matos Andrade, *et al*., (2019), the trunk muscles have an important role in the stabilization of the trunk in the elderly, however it is not known how much they can influence in the functional performance the specific population. Strength, muscular endurance and flexibility are

important component of healthy back function. Lack of endurance of trunk muscles is an important factor in aetiology of low back pain. Injury to the low back can cause significant pain and dysfunction, which can affect an athlete's performance and result in time lost from sport. Jason Brumitt, *et al*., (2013).

To elaborate a little more on stability of spine, another way to think about the function of a 'stable' spine is its ability to resist certain position. The spinal stabilizing muscles not only allow athlete to move in safe ways but they also allow athlete to resist dangerous positions.

Stabilization should happen automatically, without thinking about it. Think about all the different positions move into through a sports activity. Running, take off, twisting, walking, lifting, landing, etc. On top of this athlete do these with different intentions and at different speeds. Having adequate stability is about how the spine acts when athletes are NOT thinking about it. How efficient is the spine at responding to changes in direction, speed or intention? Many athletes complain of chronically tight hamstrings, calf's or traps. When the body lacks adequate spinal stability, the brain will use our prime movers (Our larger muscles) to stabilize. This is what creates chronic tight muscles that won't let up.

Core stability training, operationally defined as training focused to improve trunk and hip control, is an integral part of athletic development, and yet little is known about its direct relation to athletic performance. This systematic review focuses on identification of the association between core stability and sports-related performance measures. A secondary objective was to identify difficulties encountered when trying to train core stability with the goal of improving athletic performance. Trunk bridging exercises are often used as therapeutic exercises for lumbopelvic stabilization. These exercises focus on the retraining of muscle coordination patterns in which optimal ratios between local segmental stabilizing and global torque producing muscle activity are assumed to be essential. Chidozie, *et al*., (2011) stated that stabilizing muscles' endurance assessment provides an objective indicator of the functional capacity of the back.

The present investigation aims at assessing and comparisons of muscular endurance of major spine stabilizing muscles of Jumpers. For the collection of the data total 60 male jumpers were selected as samples (n=60). Jumpers who represented and participated in intercollegiate and interuniversity championship are selected as subjects. The selected subjects age ranges between 18-25 years and the study restricted to Dakshina Kannada district. McGill's torso muscular endurance test battery was used to measure the major spine stabilizing muscles.

Conclusion

1. The study concluded that there is no difference in muscular endurance between the left and right oblique and quadratus lumborum in male jumpers.
2. The study concluded that there is a significant difference in muscular endurance between the right oblique and quadratus lumborum in male jumpers.
3. The study concluded that there is no difference in muscular endurance between the trunk flexion and trunk extensor muscles in male jumpers.

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