International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 3 May-June 2024, pp: 2351-2355 www.ijprajournal.com ISSN: 2456-4494

Core Endurance: A Comparative Study among Genders

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Date of Submission: 15-06-2024 Date of Acceptance: 25-06-2024

ABSTRACT
Background – Core endurance is crucial for physical performance because it gives the body support and stability as it performs a variety of tasks and movements. Core stability is required for the pelvis, spine, and kinetic chain to balance properly under stress. Data has shown that injury chances are influenced by multiple factors such as activation, decreased muscle recruitment, delayed reflex responses, impaired proprioception, and neuromuscular imbalance.
Method – Thirty young individuals between the ages of 18 and 26 gave their consent to participate in the study. They performed three distinct, randomized core endurance tests. the tests of side planking, 60° flexion endurance, and Biering-Sorensen. A stopwatch was used to record the subjects' holding periods, the participant's inability to maintain proper posture indicated the end of the test.
Results -The holding time for each test was compared between males and females. The mean holding time of females was 46.47 ± 21.21 secs and males was 45.53 ± 21.18 secs for 60° flexion test ($p > 0.05$). Females held right side plank for 22.73 ± 10.78 secs and males for 33.13 ± 11.79 secs ($p < 0.05$), while for left side plank test, males held 34.00 ± 8.90 secs and females held for 24.27 ± 10.76 sec ($p < 0.05$). For the Biering-Sorensen endurance test, the mean holding time of males was 62.40 ± 25.97 secs while the mean holding time of females was 53.60 ± 26.96 secs ($p > 0.05$)
Conclusion – In conclusion, males achieved greater endurance time both to the right and left lateral trunk endurance tests as compared to females. There is no difference in holding time of males and females on the 60° flexion endurance test and Biering-Sorensen endurance test.
Keywords : Core, Core Endurance, Core Stability, McGill Core Endurance Tests, Genders, Risk of Injury

I. INTRODUCTION

Core endurance is crucial for physical performance because it gives the body support andstability as it performs a variety of tasks and movements. Proper balance of the spine, pelvisand kinetic chain under stress requires core stability. The risk of injury has beendemonstratedtobe influenced by activation, diminished neuromuscular balance, impaired proprioception, delayed reflex responses, and decreased muscle activation. Injuries may also be caused by fatigue of these muscles, particularly in the case of athletes[6].

The core has received special study since it is the hub of the functional kinetic chain[5]. Core can be described as a muscular 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. Within this box are 29 pairs of muscles that help to stabilize the spine, pelvis, and kinetic chain during functional movements. When compressive loads were less than the weight of the upper body without these muscles, the vertebral column would become mechanically unstable[2]. Particularly during intense physical activity, it is crucial for stabilizing the peripheral joints and lowering the chance of damage[1]. The core is known as the "powerhouse" in the field of alternative medicine as it serves as the basis or motor for all limb movement[3].

The trunk musculature's active contributions and the passive thoracolumbar spine and pelvic components make up the core of the body[16]. The muscle fibers of the core consist of both slow- and fast twitchvarieties. The deep muscular layer of the local muscle system is predominantly composed of slow-twitch fibers. Because of their shorter length, these muscles are more adapted to reacting to extrinsic loads and alterations in posture as well as managing intersegmental motion. An important set of local muscles include the multifidi, internal oblique, deeptransverse spinal, and transversusabdominus. Conversely, the global muscular system, or superficial muscle layer, is made up of fast-twitch fibers. The lengthy and wide lever arms of these muscles allow them to produce a great deal of torque and make substantial movements. The rectus abdominis muscles, quadratuslumborum, external oblique, anderector spinae are important global muscles[2].

Given that the core musculature is multidirectional,to have a complete understanding of the core function, it is imperative to conduct several

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Volume 9, Issue 3 May-June 2024, pp: 2351-2355 www.ijprajournal.com ISSN: 2456-4494

experiments on different planes[6]. The TFE test (60-degree flexion test), TLE test (right and left side planktest), and TEE test (Biering-Sorensen test) are McGill's core muscle endurance tests that are included in this study.

MCGILL TESTS

A common and useful clinical test to evaluate the isometric muscular endurance of the core muscle is the McGill test. These are low-tech, free, and safe isometric methods that anypractitioner may use. According to reports, the reliability of endurance testing varies from good to moderate to high[8].

Transverse abdominis, QL, and erector spinae are among the deep core muscles whose muscular endurance is evaluated by the 60° flexion test. It has been recommended that the side plank test be used to assess the lateral trunk musculature. This particular test will best test the quadratuslumborum, transverse abdominals, obliques, and erector spine, as well as the muscles of the anterolateral trunk wall. The Biering-Sorensentest assesses the thoracic extensor muscles' muscular endurance and puts the multifidi, erector spinae, longissimus, and iliocostalis to the test[12].

II. MATERIAL AND METHODS

Thirty healthy young adults, males and females of the age group between 18 to 26 yearsvoluntarily participated in the study. They were recruited according to the inclusion criteria. The consent form was signed by each participant before the test. The procedure and instructions were explained to each participant and a demonstration test was done beforethe actual test to avoid any error.

The test started right away after the participants completed a five-minute warm-up by walking at their own pace.

They conducted three different core endurance tests in a randomized sequence. The tests included a 60° flexion endurance test, side planks (both right and left), and a BieringSorensen extensor endurance test. Verbal instructions and a demonstration weregiven before the test. For the duration of each test, the subjects were instructed to maintain their positions.

The 60° trunk flexion test (TFE)

A flat-to-neutral spine was maintained throughout the 60° trunk flexion test, the subject'sback was supported by a wedge while they were on a plinth. Their abdominals were alsoengaged during this time. The arms were folded across the chest, each hand touching the opposing shoulder and the head in a neutral posture, the knees and hips were flexed to 90° and 60°, respectively. During the test, the individual was told not to arch his or her back. After the wedge was taken out of the test, the participants were instructed to keep their posture for as long as they could. The test was over when the subject was unable to keep the stance.

The side plank test (LTE)

The participant began the side plank test with their feet either in tandem (heel-to-toe) or on top of each other, their knees completely extended. The subject placed the lower arm at shoulder height beneath the body and the upper arm on the side with the elbow bent 90 degrees. When the participant was prepared, they were told to assume a full side-bridgeposture, raising their hips off the plinth and arranging their head, neck, torso, hips, and legs in a straight line.

The participant's goal was to hold the position without bending or extending their hips for as long as possible. If the trunk position changed in any way, the test was over. On the opposite side, the same thing was done.

The Biering-Sorensen extensor endurance test (TEE)

The patient was placed prone on a plinth, with the arms resting on a chair to support their upper extremities and the crest of the ilium at the edge of the table. The therapist's body weight was used to support the subject's legs. The individual was instructed to stretch their body until it was parallel to the floor, crossing their arms over their chest, and remain in this straight, prone posture for as long as they could. After the individual was unable tomaintain the posture, the test was ended.

III. RESULTS

Statistical analysis involved Students t-testto determine whether there's any difference in the core endurance of male and female in different planes. The subjects demographic details were analysed using mean and standard deviation.

A total of thirty young individuals were chosen for this study based on inclusion criteria, and they participated willingly. All participants were 22.63 ± 2.61 years old on average. Table1. lists the individuals' ages: 15 men, 21.33 ± 2.55 years, and 15 females, 23.93 ±1.98 years.

The student's t-test showed overall holding time (in secs) of young adults for the 60° flexion test is 46 ± 20.83 secs; in the right-side plank test is 27.93 ± 12.3 secs; in the left side plank test is 29.13 ± 10.89

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secs; and for TEE test is 58 ± 26.39(Table 2)(Graph 1).

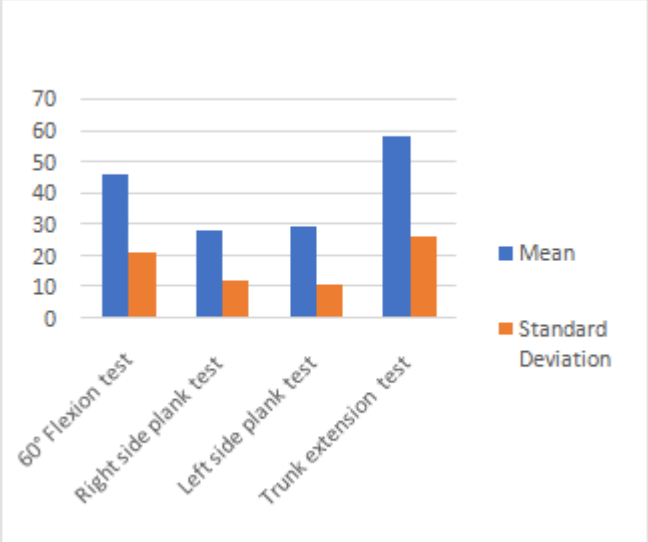
The study found that the endurance times of young people, both male and female, in the right and left plank tests differed significantly ($p < 0.05$). However, no statistically significant difference in holding times ($p > 0.05$) was observed between male and female young adults in the Biering-Sorensen TEE test or the 60° TFE test (Table 3)(Graph 2).

Table 1.Characteristics of participants

	Subjects	Male	Female
No. of participants	30	15	15
Age	22.63 ± 2.61	21.33 ± 2.55	23.93 ± 1.98

Table 2. Significant Means for Core Endurance

Core Endurance tests	Mean	Standard Deviation
60° Flexion test	46	20.83
Right side plank test	27.93	12.3
Left side plank test	29.13	10.89



Graph 1. Graph showing holding time of all subjects during core endurance

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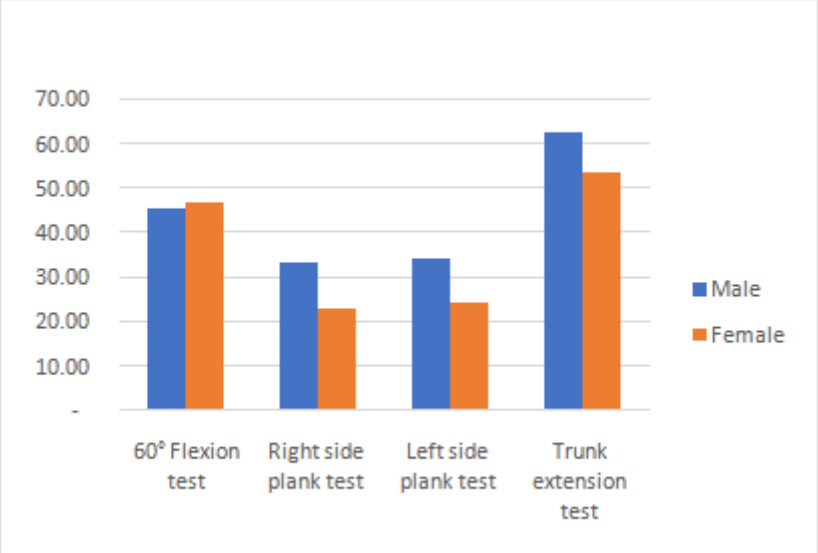
Volume 9, Issue 3 May-June 2024, pp: 2351-2355 www.ijprajournal.com ISSN: 2456-4494

Core Endurance tests	Male	Female	P value
60° Flexion test	45.53 ± 21.18	46.47 ± 21.21	> 0.05
Right side plank test	33.13 ± 11.79	22.73 ± 10.78	< 0.05
Left side plank test	34.00 ± 8.90	24.27 ± 10.76	< 0.05
Trunk extension	62.40 ± 25.97	53.60 ± 26.96	> 0.05

Table 3. Mean holding times of different core endurance tests for male and female



Graph2. Graph showing holding times of male and female young adults during different core endurance tests

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IV. DISCUSSION

The main aim of the research was to examine the variations in core endurance between young people who are male and female. The results showed that males did better in terms of endurance time on the left and right plank tests. However, they performed similarly on the TEE and TFE tests.

According to Evans, Refshauge, and Adams (2007), anatomical features or the distribution of muscle mass may be to blame for the observed differences in lateral muscular endurance. Notably, lateral trunk muscular endurance has also been reported to be lower in girls than in males in another research. Nonetheless, only a few studies of research on the non-athlete population have discovered that women had longer holding periods than men on the Biering-Sorensen EET.

In conclusion, core endurance workouts are essential for both men and women, but especially for women, to avoid injury. More attention ought to be paid to lateral muscularendurance. Better quality of motion and a lower risk of injury occur from strong coreendurance, whether in sports or daily activities.

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