

Normative Data of Trunk Muscle Endurance for Male Long-Distance Runners of Vadodara: An Observational Study

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Abstract

Introduction: Over last two decades, Importance of trunk core muscle exercise has gain major interest in clinical as well as in profession athletes. Trunk muscle endurance and strength are routinely used measures in clinical evaluation, but lack of normative data is a limitation for measuring physical function of trunk in athletes.

Aim: Aim of the study is to find out normative data of trunk muscle endurance for male long-distance runners of Vadodara.

Objectives: To Establish normative data of Trunk flexors, extensors and side flexors endurance using McGill's Endurance Test.

Methodology: 80 male participants of 18-35 years were taken randomly from various sports ground of Vadodara. Study Design: Cross sectional Observation study. Outcome Measures: McGill's Endurance Test Procedure: Participants was selected based on Inclusion Criteria and McGill's Endurance test was used to examine trunk muscle endurance. These tests consist of four positions: 1) Trunk anterior flexor test, 2) Trunk posterior extensor test, 3) Latera side plank (Right) and 4) Lateral side plank (left). Statistical analysis: Descriptive statistics were used to summarise the data of all participants. Endurance levels between 25 and 50 consider low, between 50 and 75 consider medium and between 75 and 100 consider high.

Result: The mean value of trunk anterior flexor test was 148 sec, Trunk posterior extensor test was 108 sec, Lateral side plank (Right) was 83.2 sec and Lateral side plank (Left) was 81.5 sec.

Conclusion: This study was done to find out the normative data for endurance of trunk muscle in long distance runners of 18–35 age group. The reference value of trunk muscle endurance found in this study can be helpful for the quantitative evaluation, Rehabilitation programme and for the research purpose in the long-distance runners.

Keywords: *Trunk muscle endurance, Normative data, McGill's endurance test, Long distance runners.*

Introduction

Good muscle Endurance is necessary to maintain postural control. Sustain postures require continuous, small adaptations in the stabilizing muscle to support the trunk against fluctuation forces. Large repetitive motions also require muscle to respond so as to control activity. In either case, as muscle fatigue, the mechanics of performance change and the load is shifted the inert tissue supporting the spine¹. So, with poor muscular

support and sustained load on the inert supporting tissue, creep and distention occur, causing mechanical stress. In addition, injuries occur more frequently after a lot of repetitive activity or long periods of work and play when there is muscle fatigue. Core strengthening has play very important role in sports training as a method to condition athletes for the injury prevention to the spine and/or lower extremities. The main emphasis of core strengthening is focused on muscular stabilization of the

abdominal, Multifidus, paraspinal and gluteal muscles to provide better stability and control for activity of sports². Past studies have shown the importance of pelvic stabilization in training the lumbar extensor muscles. Pollock et al. showed that resistance exercise training with pelvic stabilization improved development of lumbar extension strength³. Jeng et al. reported that the occurrence of LBP may be decreased by strengthening the back, legs and abdomen to improve muscular stabilization⁴.

Over last two decades, exercise and testing of trunk core muscle has gain major interest in the field of sports physiotherapy and professional athletes^{5,6}. Injuries in the back muscle remains concern in professional athletes. The practice of measuring trunk muscle endurance has been widely used to identify athletes who may be at risk of muscle injuries, to evaluate rehabilitation outcomes and to enhance performance of athletes⁷. But still back literature contains limited normative data for trunk muscle endurance specially in the India. This lack of normative data is a limitation in the quantification of physical function of spine and is the impetus for this study.

When evaluating muscle performance in the trunk, an examiner can compare the normal and abnormal sides to quantify diminished muscle performance. This type of intrinsic control is not available for evaluation of the trunk muscle endurance. It is necessary to reference a normative data in order to find alternations of Trunk Musculature from Normal that is the main need of the study.

Core stability did not become popular in previous century, with the idea developing from the study of spinal stability by individuals, such as Punjabi⁸. Although lack of core stability associated with low back pain² and injuries⁹⁻¹⁰.

Methodology

A total of 80 male participants of 18-35 years were taken from various sports ground of Vadodara. Verbal explanation of study was given to all participants and written consent was taken. Ethical clearance was taken from institutional ethical committee.

Inclusion Criteria: Healthy Male Timed Long-Distance Runners (10km, 21 km and 42.195 km), Age group 18 to 35 Years.

Exclusion Criteria: 1. Any Conditions affecting mobility or Balance 2. Any congenital and structural abnormalities 3. Any back, abdominal and lower limb surgical history, Hernia. 4. History of symptomatic low back pain within 6months of time.

Procedure: After taking informed consent participants' core endurance was examined using McGill's endurance test.¹¹⁻¹³. Participants were advised to do trial and then ask to perform Actual test. Time was recorded in seconds per position where the participants could hold a static position of maximum seconds. Participant Begin and end the test with word start and stop and time was recorded with Stopwatch. 5 minutes of rest was given between each position to facilitate recovery. To maintain uniformity all participants were ask to perform test in same sequence. 1) Trunk anterior flexion test 2) trunk posterior Extension test 3) Lateral side plank (Right) and 4) Lateral side plank (Left).



A. Trunk Anterior Flexor Test



B. Trunk Posterior Extensor Test



D. Lateral Side Plank (Left)



C. Lateral Side Plank (Right)

Statistical Analysis: Descriptive statistics analysis was used to summarize the data of all participants using SPSS Software Version 22. Endurance levels were defined by using percentiles as low (between 25 and 50th), medium (between 50 and 75th), high (between 75 and 100th) respectively.

Results

Detail of all participants are given in table 1. Mean age is 24.3 ± 3.28 Height is 164 ± 6.3 cm, weight 61 ± 6.8 kg and BMI are 23 ± 2.8kg/m². The mean values for Trunk Flexors, extensors, Rt Lateral and Lt Lateral Plank are 148 Sec, 108 Sec, 81.5 Sec and 83.2 Sec respectively. Percentile data of four position of McGill’s Endurance Test for trunk Flexor and Extensor Test, right and left lateral Planks for all the participants are in table 3 respectively.

Table 1: Detail of all participant

S.No.	Variable	Mean	SD
1.	Age (Years)	24.3	3.28
2.	Height (cm)	164	6.3
3.	Weight (kg)	61	6.8
4.	BIM (kg/m ²)	23	2.8

Table 2: The mean data for all position of McGill’s endurance test

S.No.	McGill’s Endurance Test	Mean	SD
1.	Trunk Anterior Flexor Test (sec)	148	14.3
2.	Left Lateral Plank (sec)	81.5	18.6
3.	Right Lateral Plank (sec)	83.2	21.8
4.	Trunk Posterior Extensor Test (sec)	108	26.3

Table 3: Trunk muscle normative percentile data

S.No.	McGill’s Endurance Test	25-50 %	50-75 %	75-100 %
1.	Trunk Anterior Flexor Test (sec)	78–128	128–151	151–212
2.	Trunk Posterior Extensor Test (sec)	75– 86	86– 118	118 – 149
3.	Left Lateral Plank (sec)	64.5– 72	72– 98	98 – 136
4.	Right Lateral Plank (sec)	65 - 76.5	76.5 – 113	113 -148

Discussion

Few studies have been done to find normative database for trunk flexor and extensor muscle endurance

in specific healthy individuals¹⁴⁻¹⁶ and athletes.^{17,18} A study done by Mbada et al (2010)¹⁹ on normative values of static and dynamic abdominal muscles endurance in healthy Nigerians shows mean value 34.9 sec for static

endurance and 15.6 rep for dynamic endurance. McIntosh et al²⁰ had done study on trunk and lower extremity muscle endurance: They conclude that normative data for adults age group 19-29 years, who had endurance more than 75th percentile was 25% of male and female for dynamic chest raise, 18% male and 14% female for bilateral straight leg raise, 68% male and 62% female for static chest raise, 47% male and 46% female for prone bilateral straight leg raise.

The Values shown in table 3 suggest that 151-212 Sec., 118-149 Sec. consider as a good endurance, 128-151 Sec., 86-118 Sec. are fair and less than 128 Sec., 86 Sec. are considered as poor endurance for trunk flexors and extensors respectively. Th Value 98-136 Sec., 113-148 are good, 72-98 Sec., 76.5-113 Sec. are fair and less than 72 Sec., 76.5 Sec. are considered poor left lateral and right lateral plank endurance.

Conclusion

This study was done to find out the normative data for endurance of trunk flexors, extensors and side flexors group of muscle in individuals of 18-35 years age group. Thus, the reference values in this study provide base for the rehabilitation program in runners and also as an outcome measure for quantitative improvement and can provide valuable insights for the other future researchers. Future Study can be performed with the larger sample size by including both male and female gender.

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