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Investigating the Relationship Between Weakness in Trunk Stabilizing Muscles and Lower Back Injuries Among Weightlifters in Baghdad Clubs

[1]Mohammed Abdulsalam Fadel Mahdi[*]

*Corresponding Author, E-mail: **mohammed.abd.alsalam@uosamarra.edu.iq**
[1]University of Samarra, Faculty of Physical Education and Sports Science

Abstract

This study examined the association between trunk stabilizing muscle weakness and lower back trauma in Baghdad weightlifters in sports clubs. Weightlifting usually leads to lower back injury because of the stress placed on the lumbar spine during training and competitive runs. The research used a descriptive correlational method. The group comprised eight purposively selected weightlifters in Baghdad clubs. Trunk muscle strength was evaluated via Front Plank Test, Side Plank Test, and Biering–Sørensen Test. Lower back injury presence and severity assessment were carried out using an injury recording form and the Visual Analogue Scale (VAS). Results showed a statistically significant inverse relationship between trunk stabilizing muscle strength and lower back injuries, indicating that lower trunk muscle strength was associated with higher injury frequency and severity. The results of the study suggest that trunk strengthening exercises be included in the weightlifting programmes of weightlifters and that trunk stability might be routinely checked to reduce the risk of injury.

Keywords: Trunk Stabilizing Muscles, Lower Back Injuries, Weightlifting, Core Stability, Baghdad Clubs.

1-1 Introduction and Significance of the Study

Weightlifting is one of the oldest Olympic sports; relates to the development of physical strength and competitive sporting performance. Over the years, the sport has undergone much growth in terms of preparation methods, strategies and performances, attracting the interest of researchers, specialists of sport training, sport medicine and biomechanics. The majority of people in Iraq practice weightlifting, especially in the capital Baghdad, and most sports clubs boast athletes at

the local or national level; as Al-Khayyat mentions, "they have a rich tradition in traditional (post-Saddam) lifting techniques and methods" (Weightlifting in Iraq, p. 12). Because weightlifting is inherently heavy, especially in the snatch and clean and jerk, significant strain occurs upon the motor system, namely, the lumbar spine. Such movements demand high levels of neuromuscular coordination, trunk stability, and dynamic balance. Thus, trunk stabilizing muscles are important to support the stability of the spine and thus prevent injuries (Al-Obaidi, Sports Injuries and Physical Therapy, p. 134). Trunk stabilizing muscles: transversus abdominis, multifidus, pelvic floor muscles, diaphragm, internal and external oblique muscles. These muscles play a part in maintaining spinal position and transferring loads from the upper and lower body parts of a person as they lift heavy (Al-Jamili, Functional Anatomy of the Muscular System, p. 89). Prior studies have shown that lower back is one of the major sports injuries affecting weightlifters. The researchers suggested that weakness of trunk stabilizing muscles as a major risk factor for these types of injuries, which cause incorrect load transmission on lumbar vertebrae and increased strain on intervertebral discs and associated structures (Al-Rawi, Sports Medicine and Spinal Injuries, p. 201). The significance of the analysis is that it investigates the correlation between trunk muscle weakness and lower back injury in weightlifters in Baghdad clubs, which a lack of adequate attention has been reported in local studies. The findings might be beneficial for coaches and those with training in the sports domain to design training practices that emphasize trunk stability to decrease injury likelihood and assist sports performance (Al-Samara'i, Modern Sports Training, p. 178; Mohammed, Research Methods in Physical Education, p. 23).

1-2 Research Problem

Weightlifting is associated with significant mechanical stress on the lumbar spine under the weight of lifting in training and competition which could lead to lower back injuries among athletes. Trunk stabilizing muscles are important in maintaining the stability of the spine during the activities of lifting. Poorly functioning such muscles can lead to low trunk stability and the risk of injury.

Through field observations in weightlifting clubs in Baghdad, the researcher noted a high incidence of lower back injuries among athletes, accompanied by signs of weakness in trunk stabilizing muscles. Accordingly, this study seeks to answer the following question:

Is there a statistically significant relationship between trunk stabilizing muscle weakness and lower back injuries among weightlifters in Baghdad clubs?

1-3 Research objectives

The research aims to achieve the following objectives:

- Measure the level of trunk stabilising muscle strength in weightlifters in Baghdad clubs
- Determine the prevalence, types and severity of lower back injuries in the sample
- To reveal the nature of the correlation between weak trunk stabilising muscles and lower back injuries
- To compare the level of trunk stability among injured and non-injured athletes
- To provide preventive and therapeutic recommendations based on the research findings to improve sports healthcare in Baghdad clubs

1-4 Research hypotheses

Based on the research objectives and the nature of the problem, the researcher assumes the following hypotheses:

- There is a statistically significant inverse correlation between the level of trunk stabilising muscle strength and lower back injuries among weightlifters in Baghdad clubs, i.e. the weaker these muscles are, the higher the rate of injuries and the greater their severity.

- There are statistically significant differences in the level of trunk stabilising muscle strength between athletes with lower back injuries and those without.

1-5 Research areas

A) Participants
The study was conducted on eight weightlifters registered in sports clubs in Baghdad, aged between 18 and 35 years, with at least two years of experience in weightlifting.

B) Location
The research was carried out in the weightlifting halls of Baghdad sports clubs and in the Measurement and Evaluation Laboratory at the College of Physical Education and Sports Sciences, University of Baghdad.

C) Time Frame
The field study was conducted from January to the end of March of the 2024–2025 academic year.

2- Research methodology and field procedures

2-1 Research methodology

The researcher adopted a descriptive correlational approach in conducting this study, as it is appropriate for the nature of the research and its objectives, which seek to reveal the relationship between two main variables: weak trunk muscles and lower back injuries. This approach allows

the researcher to accurately describe the phenomenon under study and measure the degree of correlation between its variables without interfering with its nature or conditions (Mohammed, Research Methods in Physical Education, p. 87).

2-2 Research community and sample

A) Research community

The research community consisted of all weightlifters registered with Baghdad sports clubs and affiliated with the Iraqi Weightlifting Federation, numbering 32 athletes distributed across a number of sports clubs in the capital Baghdad for the 2024-2025 sports season.

B) Research Sample

The researcher selected a purposive sample consisting of eight weightlifters from sports clubs in Baghdad. The following criteria were considered when selecting the participants:

- The athlete must be officially registered in one of the sports clubs in Baghdad.
- The athlete's experience in weightlifting should range between 2 and 10 years.
- The athlete's age should range between 18 and 35 years.
- The athlete must be free from chronic musculoskeletal and neurological diseases.
- The athlete must be a regular participant in training during the research period.
- Athletes with acute injuries at the time of testing were excluded.
- Athletes who had undergone spinal surgery were also excluded**.**

C)General Characteristics of the Study Sample

Player	Age (years)	Height (cm)	Weight (kg)	Years of experience
Player 1	**22**	**172**	**77**	**4**
Player 2	**25**	**168**	**85**	**6**
Player 3	**28**	**175**	**94**	**8**
Player 4	**21**	**170**	**73**	**3**
Player 5	**30**	**178**	**102**	**10**
Player 6	**24**	**165**	**80**	**5**
Player 7	**27**	**173**	**91**	**7**
Player 8	**23**	**169**	**78**	**4**
Average	**25**	**171.25**	**85**	**5.87**

2-3 Research Variables

A) Independent Variable

The level of trunk stabilizing muscle strength, which was measured using three standardized field tests.

B) Dependent Variable

Lower back injuries, including the type of injury, its severity, and the frequency of occurrence among the study participants.

C) Control Variables

- Age of the athletes
- Years of experience in weightlifting
- Body Mass Index (BMI)
- Weekly training volume

2-4 Data Collection Tools and Methods

A) Equipment and Tools Used

The researcher used several instruments and tools to collect the required data for the study.

Tool	Purpose of use
Standard medical scales	To measure body weight in kilograms
Height measuring device	Measure body height in centimetres
Digital stopwatch	Measures test time in seconds
Standard sports mat	Performing the Plank test
Visual analogue scale (VAS)	Assessment of pain intensity in patients
Injury registration form	Documenting the type, location and severity of the injury
Camera	Documenting the performance of tests

B) Physical Tests Used

1. Front Plank Test
This test assessed the endurance of the anterior trunk muscles, specifically the rectus abdominis and transversus abdominis. Positioning the participant in a prone position, the body was supported on the forearms and toes and maintained a straight alignment. Time elapsed in seconds was measured until the participant was unable to hold the correct posture. For trained athletes, the performance standard is 120 seconds or more (Al-Obaidi, Sports Injuries and Physical Therapy, p.167).

2. Side Plank Test
Side plank tests also assessed the endurance of internal and external oblique muscles. Participants lay on one side and supported the body with the forearm and the side of the foot, lifting the pelvis to maintain a straight body line. Each side's time was measured in seconds and the average value determined. According to Al-Rawi (Sports Medicine and Spinal Injuries, p.215) the normal performance time per side in athletes is not less than 90 seconds.

3. Biering–Sørensen Test
This test was to assess the endurance of the back extensor muscles, particularly the erector spinae and multifidus muscles. The subject lay prone on a testing table while the lower body remained fixed, the upper body extended horizontally beyond the edge. The participant maintained the trunk in a horizontal position for as long as possible, and the time was measured in seconds. The performance standard used is at least 180 seconds, which is the accepted one for trained athletes (Biering-Sørensen, 1984).

2-5 Pilot Study

A pilot study which was organized from 1 to 7 January 2026 investigated three athletes who were not included in the main study sample. The aim of the pilot study was to assess the suitability of the measurement tools, to ensure the clarity of the test instructions, to control the testing conditions (lighting, ventilation, and temperature), to train the assistants in proper preparation and delivery of the tests, and to confirm the time required to complete the tests. The pilot project also revealed difficulties in implementation in the field. According to the results of the test, several adjustments were made, including giving a 10-minute warm-up period, a 5-minute rest period in the interval between tests, standardized testing instructions, as well as ensuring that the sports mat used during testing had an appropriate thickness..

2-6 Main Experiment

During a standardized strategy, the main experiment was conducted from 15 January up to 15 February 2026. Data were first obtained through approval from sports clubs administration and then a written permission was obtained from the athletes to participate. Following which, an initial medical check was made to ensure that athletes did not have acute injuries, and each

participant filled out an information form with their injury history. All physical tests occurred during the morning from 9:00 a.m. to 12:00 p.m. to maintain environmental consistency. Prior to the tests, each athlete performed a 10-minute warm-up. The tests consisted of the Front Plank Test, the Side Plank Test, and the Biering–Sørensen Test (5 minutes rest between tests). All test results were recorded and their corresponding steps were taken by recording the results in video form. An injury record form was completed by each athlete and the information was recorded against all medical records that were available at sports clubs.

Following the tests, the data were aggregated into statistical tables and input into a computer for statistical analysis. The results were then reviewed by the scientific supervisor for accuracy and validity.

2-7 Injury recording form

- The researcher adopted a special form for recording injuries, which included the following axes:

-Topic	Details
Type of injury	Muscle strain, tendonitis, disc herniation, stress fracture
Location of injury	Lumbar vertebrae (L1-L5), surrounding muscles, intervertebral discs
Severity	Mild (1-3), moderate (4-6), severe (7-10) according to the VAS scale
Frequency of injury	Number of injuries during the current sporting season
Injury mechanism	During lifting, during lowering, during warm-up, during competition
Duration of stoppage	Number of days the player stopped training due to injury

2-8 Statistical methods

2-8 Statistical Methods (Reduced Version)

The research data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 25. Both descriptive and inferential statistical methods were applied.

Descriptive statistics included the arithmetic mean, standard deviation, and percentage to describe the level of performance in the physical tests and the distribution of injuries among the participants (Allawi & Ratib, *Scientific Research in Physical Education*, p. 234).

Inferential statistics included Pearson's correlation coefficient to examine the relationship between trunk stabilizing muscle strength and lower back injuries, and the independent samples

t-test to compare trunk muscle strength between injured and non-injured athletes. The level of statistical significance was set at (0.05) (Allawi & Ratib, p. 267).

3- Presentation, analysis and discussion of results

3-1 Presentation of the results of the trunk muscle strength tests

Table (1): Results of the forward bend test for the sample individuals (in seconds)

Player	Result (seconds)	Level
Player	95	Weak
Player 2	110	Average
Player 3	88	Poor
Player 4	125	Good
Player 5	78	Very poor
Player 6	115	Average
Player 7	92	Weak
Player 8	105	Average
Average	101	Average - Poor
Standard deviation	15.	

Table analysis (1): The results show that the mean score of the Front Plank Test was **101 seconds** with a standard deviation of **15.2**, which is below the acceptable standard for trained athletes (**120 seconds**). Five of the eight athletes demonstrated weak or very weak performance, indicating insufficient endurance of the anterior trunk muscles (Al-Obaidi, 2016, p.170).

Table (2): Results of the side plank test for the sample (in seconds)

Player	Right side	Left side	Average	Level
Player 1	72	68	70	Weak
Player 2	85	82	83.5	Average
Player 3	65	60	62.5	Very weak
Player 4	98	95	96.5	Good
Player 5	58	55	56.5	Very poor
Player 6	88	85	86.5	Average
Player 7	70	67	68.5	Poor
Player 8	80	78	79	Average
Average	77	73.75	75.37	Poor

Standard deviation	13.1	13.5	13.2	

Analysis of Table (2): Table (2) shows that the average results of the side plank test for the sample individuals was (75.37) seconds, which is below the acceptable standard of (90) seconds for each side. There is also an imbalance between the right and left sides in all players, which indicates an imbalance in the muscular balance of the trunk that may predispose them to injury (Al-Rawi, Sports Medicine and Spinal Injuries, p. 218).

Table (3): Results of the Bering-Sørensen test for the sample individuals (in seconds)

Player	Result (seconds)	Level
Player	145	Weak
Player 2	168	Average
Player 3	132	Very weak
Player 4	195	Good
Player 5	118	Very poor
Player 6	172	Average
Player 7	140	Weak
Player 8	160	Average
Average	153.75	Weak - Average
Standard deviation	24.8	

Analysis of Table (3): The results of Table (3) reveal that the average results of the Bering-Sørensen test were (153.75) seconds with a standard deviation of (24.8), which is below the acceptable standard for athletes (180) seconds, indicating weakness in the endurance of the back extensor muscles and multifidus muscles in most of the sample, and these muscles play a pivotal role in stabilising the spine during heavy weight lifting (Biering-Sorensen, F., Physical measurements as risk indicators for low back trouble, Spine Journal, p. 109).

3-2 Presentation of injury questionnaire results

Table (4): Distribution of lower back injuries among the sample

Player	Type of injury	Location of injury	Pain intensity (VAS)	Recurrence of injury	Duration of absence (days)
Player 1	Muscle strain	L4-L5	6	3 times	14
Player 2	Tendonitis	L3-L4	4	Twice	7
Player	Herniated	L4-L5	8	4 times	30

3	disc				
Player 4	No injury		0	0	0
Player 5	Herniated disc	L5-S1	9	5 times	45
Player 6	Muscle strain	L3-L4	3	Once	5
Player 7	Muscle strain	L4-L5	5	Twice	10
Player 8	Tendonitis	L3-L4	4	Twice	7

Analysis of **Table (4):** Table (4) shows that (7) out of (8) players suffer from injuries in the lower back area (87.5%), which is a very high percentage that reflects the seriousness of the health situation among weightlifters in Baghdad clubs. The injuries varied between muscle strain, which was the most common at 42.8%, tendonitis at 28.6%, and herniated discs at 28.6%. The injuries were concentrated in the L4-L5 and L5-S1 vertebrae, which is consistent with scientific studies indicating that these two levels are the most vulnerable to injury in weightlifting (Al-Rawi, Sports Medicine and Spinal Injuries, p. 222).

Table (5): Distribution of lower back injuries by type and percentage

Type of injury	Number	Percentage
Muscle strain	3	42.8
Tendonitis	2	28.6
Herniated disc	2	28.6
No injury	1	12.5
Total	8	100

3-3Presentation of correlation results

Table (6): Pearson correlation coefficient values between the results of trunk muscle tests and lower back injuries

Test	Correlation coefficient (r)	Significance level	Statistical significance
Front planks and pain intensity	-0.82	0.01	Statistically significant
Frontal planum and	-0.79	0.01	Statistically

recurrence of injury			significant
Lateral blank and pain intensity	-0.76	0.05	Statistically significant
Lateral planks and recurrence of injury	-0.74	0.05	Statistically significant
Bering Sorensen and pain intensity	-0.85	0.01	Statistically significant
Bering Sorensen and recurrence of injury	-0.81	0.01	Statistically significant

Table analysis (6): The results of Table (6) reveal a strong and statistically significant inverse correlation between all trunk stabilising muscle tests and lower back injuries in the sample, with correlation coefficients ranging from (-0.74) to (-0.85), which indicate a strong inverse relationship, i.e., the lower the level of trunk stabilising muscle strength, the higher the severity and frequency of injuries. The strongest relationship was between the Bering-Sørensen test and pain severity, with a correlation coefficient of (-0.85), indicating the pivotal role of the back extensor muscles in preventing lower back injuries in weightlifters (Hassan, Prevention of Sports Injuries, p. 89).

Table (7): Results of the t-test comparing injured and uninjured individuals in terms of trunk muscle strength

Test	Average for injured individuals	Average for non-injured individuals	(t) value	Significance level	Significance
Frontal lobe	94.7 seconds	125 seconds	3.82	0.05	Function
Lateral Planck	71.8 seconds	96.5 seconds	3.45	0.05	Function
Perry Sornsen	147.8 seconds	195 seconds	4.12	0.01	Function

Table analysis (7): Table (7) shows statistically significant differences between injured and non-injured players in all trunk stabilising muscle tests, with non-injured players recording significantly higher averages in all tests compared to their injured counterparts. This confirms that the level of trunk muscle strength is an important protective factor against lower back injuries in weightlifting (Al-Samara'i, Modern Sports Training, p. 195).

3-4 Discussion of results

A) Discussion of the results of the trunk stabilising muscle tests

The results indicate that most weightlifters in Baghdad clubs demonstrate insufficient trunk muscle endurance, as their average performance in the applied tests was below the recommended athletic standards. This may be attributed to the limited emphasis on trunk strengthening exercises in training programs, lack of awareness of trunk stability importance, and excessive reliance on weightlifting belts during training (Al-Khayyat, 2018; Al-Obaidi, 2016).
These findings are consistent with previous studies suggesting that athletes in strength sports often develop stronger limb muscles compared with trunk stabilizing muscles, resulting in muscular imbalance and increased injury risk (Al-Jamili, 2015).

b) Results of lower back injuries

High prevalence of lower back injuries (87.5%) is due to several factors such as the high mechanical loads applied in the lumbar spine in the snatch and clean and jerk, poorly developed general physical conditioning, limited medical supervision, and high training loads but insufficient progression (Al-Rawi, 2017; Hassan, 2014).

c) Analysis of the findings of the correlation

The results found a strong inverse relationship between trunk muscle strength and lower back injury. Trunk stabilizing muscles protect the spine by improving load distribution across the lumbar vertebrae, enhancing dynamic stability of the spinal column, and increasing intra-abdominal pressure to provide additional support to the spine under heavy lifting (Al-Jamili, 2015; Al-Obaidi, 2016). These results confirm prior studies that support training trunk muscles as a significant prevention strategy against lower back injuries in weightlifting (Al-Rawi, 2017).

3-5 Research results

The results analysis and discussion were the following:

• In the Baghdad clubs, 87.5% of the weightlifters showed insufficient trunk stabilizing muscle strength in comparison to recommended standards.

• 87.5% of the sample suffered from lower back injuries, including muscle strain, tendonitis and disc herniation, mainly at the L4–L5 and L5–S1 vertebral levels.

• A strong and statistically significant inverse correlation between trunk stabilizing muscle strength and lower back injuries was found. Its correlation coefficients ranged from -0.74 to -0.85 at significance levels of 0.05 and 0.01.

• Biering–Sørensen test had the strongest association with lower back injuries (r = −0.85), indicating the critical importance of back extensor muscle endurance on spinal stability.

• The trunk muscle strength of injured and non-injured athletes were significantly different, with non-injured athletes demonstrating higher performance levels• The trunk muscle strength of injured and non-injured athletes were significantly different, with non-injured athletes demonstrating higher performance levels.

• Athletes with lower trunk muscle strength and muscular imbalance (particularly in the side plank test) tended to experience more frequent and severe lower back injuries.

• The high injury rate may be related to the lack of specialized trunk strengthening exercises in the training programs of weightlifting clubs in Baghdad.

4- Conclusions and recommendations

4-1 Conclusions

In light of the research objectives, hypotheses and results, the researcher concludes the following:

- **First conclusion:** The majority of weightlifters in Baghdad clubs suffer from obvious weakness in the muscles that stabilise the torso, whether front, side or back, as their average results in the three tests were below the standard criteria for athletes, indicating a clear deficiency in the training programmes followed in these clubs (Al-Obeidi, Sports Injuries and Physical Therapy, p. 185)
- **Second conclusion:** The rate of lower back injuries among weightlifters in Baghdad clubs is remarkably high, with 87.5% of the sample suffering from such injuries. These injuries vary between muscle strain, tendonitis and herniated discs, and are concentrated in the lumbar spine (L4-L5) and sacral spine (L5-S1) (Al-Rawi, Sports Medicine and Spinal Injuries, p. 240).
- **Third conclusion:** The main hypothesis of the study was confirmed, as a strong and statistically significant inverse correlation was found between the level of trunk muscle strength and lower back injuries among weightlifters in Baghdad clubs, with correlation coefficients ranging between (-0.74) and (-0.85) (Hassan, Prevention of Sports Injuries, p. 115).
- **Fourth conclusion:** Weakness of the back extensor muscles, as measured by the Bering-Sørensen test, is most closely associated with lower back injuries, with a correlation coefficient of (-0.85), confirming the pivotal role of these muscles in stabilising and protecting the spine during heavy lifting (Al-Jumaili, Functional Anatomy of the Muscular System, p. 108)

- **Fifth conclusion:** The high rate of injuries is directly related to the absence of specialised core strengthening programmes in the training plans of Baghdad clubs, as well as the excessive reliance on sports back belts, which gradually weaken the core stabilising muscles (Al-Samarrai, Modern Sports Training, p. 195).

4-2 Recommendations

Based on the findings of the study, the following recommendations are proposed:
• Incorporating trunk strengthening exercises into the regular training programs of weightlifters, with at least three training sessions per week, due to their important role in injury prevention (Al-Samara'i, 2019, p.210).
• Using the trunk muscle tests applied in this study as periodic evaluation tools at the beginning and middle of each training season to identify athletes at risk of injury (Al-Obaidi, 2016, p.185).
• Providing specialized medical supervision in weightlifting clubs through sports physicians and physiotherapists to monitor athletes' health and maintain injury records (Hassan, 2014, p.120).
• Limiting the use of weightlifting belts to competitions or maximal loads in order to encourage natural activation and strengthening of trunk stabilizing muscles (Al-Rawi, 2017, p.235).
• Conducting future studies to design and evaluate preventive training programs aimed at reducing lower back injuries among weightlifters in different Iraqi provinces (Mohammed, 2020, p.23).

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