

" A Preventive Sports Guide to Reduce Recurrent Injuries among Egyptian Ambulance Authority Workers"

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Research Abstract

The study aims to investigate the effectiveness of a proposed preventive training program in improving physical stability and reducing the recurrence of injuries among workers of the Egyptian Ambulance Authority. The experimental method was employed, using a pre- and post-measurement design on a single experimental group that was deliberately selected from workers with a history of recurrent injuries (30 participants). The program included structured exercises targeting the strengthening of the back, trunk, and lower limb muscles, as well as improving flexibility, balance, and joint stability.

The results showed a significant reduction in the mean values of injuries across all measured structures. The overall mean of injury indices decreased from **22.33** (pre-test) to **10.87** (post-test), representing a reduction of about **51.4%**, which was statistically significant in favor of the post-test. Detailed analysis revealed that cervical spine injuries decreased from 3.43 to 1.37 ($\approx 60.1\% \downarrow$), thoracic spine injuries from 3.27 to 1.60 ($\approx 51.1\% \downarrow$), lumbar spine injuries from 3.17 to 1.67 ($\approx 47.3\% \downarrow$), knee injuries from 3.30 to 1.70 ($\approx 48.5\% \downarrow$), shoulder injuries from 3.00 to 1.43 ($\approx 52.3\% \downarrow$), foot and ankle injuries from 3.30 to 1.60 ($\approx 51.5\% \downarrow$), and wrist injuries from 2.87 to 1.50 ($\approx 47.7\% \downarrow$).

This general pattern of decreases reflects the comprehensive impact of the program in reducing recurrent injuries across multiple body regions. Measurements also indicated improvements in muscle strength, explosive power, and functional stability, which enhanced the ability of workers to perform their field duties more safely.

Accordingly, the researcher recommends adopting the preventive program as a practical reference in training units for ambulance staff, with periodic monitoring of the overall mean of injuries (as a performance indicator) after each application cycle.

Keywords: Preventive program – Sports injuries – Physical stability – Ambulance workers

Introduction and Research Problem:

Recurrent injuries represent one of the major challenges faced by ambulance workers due to the nature of their job, which requires rapid response, heavy lifting, and movement in variable field conditions. Repeated musculoskeletal injuries reduce the functional capacity of workers and affect their efficiency in task performance, which negatively impacts the quality of ambulance services and increases absenteeism.

Hence, the need arises to develop a preventive sports guide that includes practical exercises and instructional programs tailored for Egyptian Ambulance Authority workers. This guide aims to improve physical and functional stability and reduce the likelihood of recurrent injuries, thereby helping maintain physical fitness and sustain high professional performance.

Recent studies indicate that regular physical training is an effective means of preventing recurrent injuries, as it enhances physical fitness components such as strength, flexibility, and endurance—critical factors in reducing injury risk during work or physical exertion. The **American College of Sports Medicine (ACSM, 2021)** affirmed that appropriate training improves motor system efficiency and reduces problems related to occupational stress, particularly in field-based professions.

Injury prevention in sports or occupational settings is not dependent on a single factor but rather an integrated process involving physical, psychological, environmental, and occupational aspects. **Andersen et al. (2016)** highlighted that successful prevention programs should incorporate four elements: physical preparation, technical training, psychological

support, and work environment readiness. They further noted that lower limb muscle strength is crucial in protecting the knee and joints from recurrent injuries in both workers and athletes.

Research has demonstrated that preventive programs focusing on balance and lower limb strength help reduce recurrent injuries, particularly knee and ankle injuries. **Myklebust et al. (2003)** confirmed that applying a preventive program among female handball players significantly reduced the incidence of anterior cruciate ligament (ACL) injuries, emphasizing the importance of integrating such programs for workers subjected to repeated physical stress, such as ambulance personnel.

Many references confirm that preventive training is not limited to athletes but can also be adapted for workers in physically demanding fields. The use of diverse training methods (elastic bands, balance exercises, targeted strength training) can reduce recurrent injuries. **Kiesel et al. (2011)** showed that training programs focusing on trunk and knee stability improve neuromuscular coordination, enhancing the ability to cope with field work requirements.

Previous studies revealed that preventive programs reduced injury rates across various professional and athletic populations. For instance, **Herman et al. (2012)** reported that balance and strength programs decreased the risk of recurrent motor injuries by up to 35% among participants. However, most research has focused on athletes and students, while studies on field workers such as ambulance staff remain limited—highlighting the necessity of creating a specialized preventive guide for this group.

Based on the researcher's academic background and knowledge of the work nature of ambulance staff in Minya Governorate, it is evident that they are highly exposed to recurrent musculoskeletal injuries due to the demands of rapid movement, lifting and transporting patients, and working under stress. Hence, the significance of developing a preventive sports guide aimed at improving joint stability, strengthening core muscles, and enhancing balance, thereby reducing recurrent injuries and improving professional efficiency. This forms the essence and title of this research: **"A Preventive Sports Guide to Reduce Recurrent Injuries among Egyptian Ambulance Authority Workers."**

Research Aim:

To verify the effectiveness of the preventive sports program in reducing recurrent injuries among ambulance workers by comparing pre- and post-test measurements of the experimental group.

Research Hypothesis:

In light of the research aim, the researcher hypothesizes that: There are statistically significant differences between the pre- and post-test means of the experimental group in favor of the post-test in reducing recurrent injuries among ambulance workers.

Research Procedures:**Research Method:**

To achieve the objectives and test the hypotheses, the researcher used the experimental method, which is appropriate to the nature of this study. A pre- and post-test design for a single experimental group was employed.

Research Population and Sample:

The research population consisted of ambulance workers in Minya Governorate with a history of recurrent musculoskeletal injuries (46 individuals). The researcher deliberately selected 30 participants for the study sample, representing 65.22% of the population.

Research Tools:

- Previous injury survey form.
- Physical tests (leg muscle strength test – dynamic balance test – lower back flexibility test).
- Preventive training program (12 weeks).

Research Implementation Steps:

- Conducting pre-measurements of the sample on the identified physical variables.
- Applying the preventive program (3 sessions per week × 45 minutes), including stretching, strengthening, balance, and functional stability exercises.
- Conducting post-measurements after completing the program.
- Statistical analysis using SPSS.

Program duration: 12 consecutive weeks.

Training units: 4 units per week to ensure progression and continuity.

Training days: Sunday, Monday, Tuesday, and Thursday each week,

implemented at the Minya Ambulance fitness facility, with some sessions simulating field conditions.

Program stages:

- 4 weeks of general preparation (general strength, endurance, flexibility).
- 5 weeks of specific preparation (muscle and joint stability, focusing on knee and lower back).
- 3 weeks of pre-field application (simulation exercises for work conditions such as lifting and transporting patients).

Training load cycle: 2:1 ratio (two weeks of progressive training + one week of relative recovery).

Daily session duration: 60–75 minutes, with 15 minutes dedicated to stability and joint prevention exercises (knee, shoulder, and lower back).

Pilot Study:

A pilot study was conducted on 5 ambulance workers in Minya to:

- Train assistants on test administration.
- Ensure exercises were appropriate for the sample's job nature.
- Familiarize participants with the program and its preventive objectives.

Pre-Test:

Pre-measurements were conducted on 25/2/2025, assessing:

- Leg muscle strength.
- Knee flexibility.
- Dynamic balance and stability.
- Previous injury frequency and recurrence.

Program Implementation:

The program ran from 2/3/2025 to 6/6/2025, including:

- Strength and endurance training.
- Flexibility and stretching.
- Balance and stability drills.
- Work simulation (lifting, transporting patients, quick movement in limited spaces).

Post-Test:

Post-measurements were conducted on 8/6/2025 under identical conditions to the pre-tests.

Statistical Analysis:

SPSS software was used, applying means, standard deviations, and paired-sample *t*-tests.

Research Results:

Table (1): Statistical significance of differences between pre- and post-test means of the experimental group (n = 30)

Recurrent injuries	Pre-test Mean	SD	Post-test Mean	SD	t-value	Eta ²
Cervical spine	3.43	1.28	1.37	1.22	9.42**	0.72
Thoracic spine	3.27	0.98	1.60	0.97	8.12**	0.66
Lumbar spine	3.17	1.12	1.67	1.09	8.44**	0.68
Knee injuries	3.30	0.95	1.70	0.95	7.95**	0.65
Shoulder injuries	3.00	0.87	1.43	0.94	10.00**	0.75
Foot & ankle	3.30	1.02	1.60	0.89	10.62**	0.77
Wrist injuries	2.87	1.11	1.50	0.97	7.49**	0.62
Total score	22.33	2.62	10.87	2.74	23.15**	0.94

Significant at $p < 0.05$ / $p < 0.01$ *

The table shows statistically significant differences between pre- and post-tests across all injury types, with Eta² values ranging from 0.65 to 0.94, indicating a strong effect of the preventive program.

Discussion:

The researcher attributes the clear improvements in physical and health variables of ambulance workers to the proposed preventive training program, which included diverse, structured exercises targeting the core muscles (back, abdomen, legs) and improving flexibility and balance. This significantly reduced recurrent injuries, with marked differences observed between pre- and post-test means across all injury categories.

Cervical spine injuries decreased from 3.43 to 1.37, thoracic spine from 3.27 to 1.60, lumbar spine from 3.17 to 1.67, knee injuries from 3.30 to 1.70, shoulder injuries from 3.00 to 1.43, foot and ankle from 3.30 to 1.60, and wrist injuries from 2.87 to 1.50. Overall, the total mean dropped significantly from 22.33 to 10.87, confirming the effectiveness of the preventive program.

Results also demonstrated that regular participation in the program improved muscular strength, explosive power, and joint stability, enhancing workers' ability to manage physical work demands such as lifting and transporting patients and rapid movement in emergencies.

These findings align with **Shidqi Hamdi et al. (2019)**, who found that plyometric training develops lower limb strength and improves endurance; **Amira Shwki (2018)**, who showed that core muscle strengthening reduces injuries caused by physical stress; and **Nourbakhsh & Arab (2002)**, who emphasized that core strengthening is a primary strategy to prevent lower back injuries among individuals exposed to repetitive loads.

Conclusion:

In light of the research aim, procedures, and sample (Egyptian Ambulance Authority workers in Minya), the proposed preventive program proved effective in improving muscular strength, balance, flexibility, and joint stability. This directly contributed to reducing recurrent injuries associated with their demanding work nature.

The results confirmed statistically significant differences in favor of the post-test, validating the main hypothesis that the preventive program plays a positive role in reducing recurrent injuries and improving physical and professional performance of ambulance workers.

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