

Scoliosis & Musculoskeletal injuries: A Nationwide Cohort of 114047 Israeli Combat Military Recruits



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Introduction

- Background:** AIS is a recognized cause of military attrition. Screening policies traditionally assume spinal asymmetry increases MSKI and SF risk via eccentric loading.
- The Gap:** Current standards lack large-scale epidemiological evidence to determine role eligibility and operational fitness based on scoliosis severity.

Aim

- To evaluate how scoliosis presence and severity influence MSKI and SF incidence across varying combat intensity levels using a nationwide cohort (n = 114,047).

Methods

- Study Cohort:** This retrospective cohort study included Israeli combat recruits (2019-2024) aged <25 years without pre-enlistment evidence of MSKIs or SF (n = 114,047).
- Scoliosis Severity:** Classified during standardized pre-enlistment medical assessments as mild ($\leq 20^\circ$ Cobb angle) or moderate (21° - 45° Cobb angle).
- Combat Role Intensity:** Roles were categorized by operational demands into higher-intensity (infantry) and lower combat-intensity (non-infantry) positions.
- Statistical Analysis:**
 - Baseline cohort was assessed independently of sample size using two-tailed p-value ($p < 0.05$) and SMD ($SMD \geq 0.1$).
 - Kaplan-Meier curves and multivariable Cox proportional hazards models to evaluate time-to-event profiles for MSKIs and SFs.

Disclaimer: This study was conducted by the listed researchers. Statements and opinions published in this abstract are solely those of the individual abstract authors and not the Israel Defense Forces (IDF). This study did not receive external funding or support. All authors had access to the data utilized in this study.



Results

- Study Population:** Out of 114,047 active combat recruits, 56,037 were assigned to low-intensity roles (19,723 females; and 36,314 males), including 623 females and 1,208 males with mild scoliosis, and 68 females and 292 males with moderate scoliosis.

Table 1: Baseline characteristics of the study participants

		Low Combat Intensity					
		Males (n=36314)			Females (n=20414)		
Scoliosis severity status		No Scoliosis (n=34814)	Mild Scoliosis (n= 1208)	Moderate Scoliosis (n=292)	No Scoliosis (n=19723)	Mild Scoliosis (n=623)	Moderate Scoliosis (n=68)
Age, years (Mean $\pm$ SD)		18.35 $\pm$ 1	18.25 $\pm$ 1	18.35 $\pm$ 1	18.21 $\pm$ 1	18.20 $\pm$ 1	18.24 $\pm$ 1
Socioeconomic Status, n (%)	Low (0–3)	2997 (8.62%)	101 (8.37%)	23 (7.88%)	1406 (7.4%)	58 (9.32%)	6 (8.82%)
	Medium (4–7)	19429 (55.91%)	739 (61.28%)	177 (60.62%)	11627 (61.18%)	382 (61.41%)	42 (61.76%)
	High (8–10)	12322 (35.46%)	366 (30.35%)	92 (31.51%)	5973 (31.43%)	182 (29.26%)	20 (29.41%)
BMI ($\frac{\text{kg}}{\text{m}^2}$), n (%)	Under-weight (≤ 17.9)	1615 (4.64%)	103 (8.53%)	31 (10.62%)	144 (0.76%)	18 (2.89%)	2 (2.94%)
	Normal (18.0–24.9)	25350 (72.83%)	922 (76.32%)	227 (77.74%)	14043 (73.79%)	504 (80.9%)	55 (80.88%)
	Over-weight (25.0–31.9)	6978 (20.05%)	145 (12%)	31 (10.62%)	4516 (23.73%)	97 (15.57%)	9 (13.24%)
	Obese (≥ 32)	862 (2.48%)	38 (3.15%)	3 (1.03%)	327 (1.72%)	4 (0.64%)	2 (2.94%)

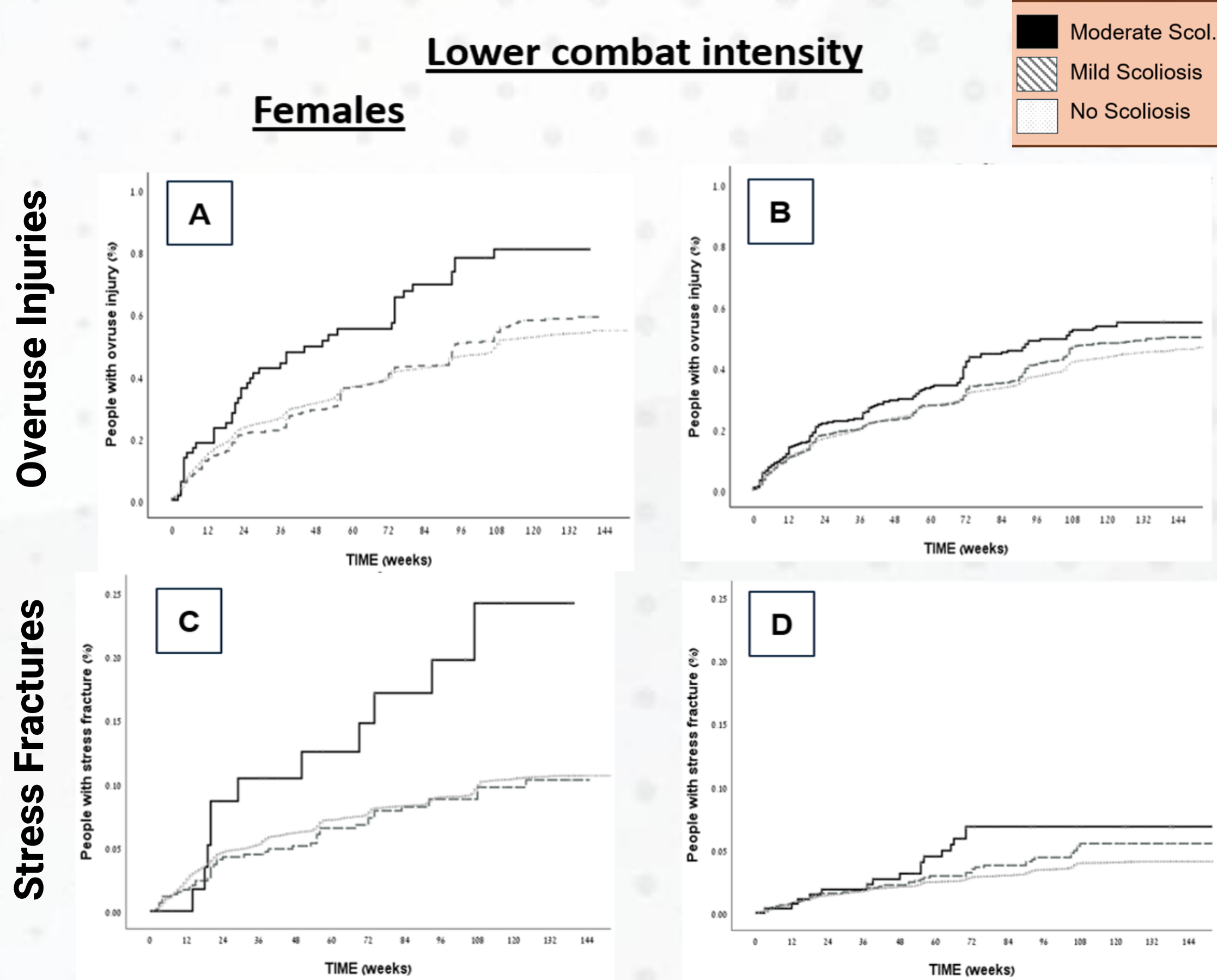
Conclusion

- Moderate scoliosis is associated with a modestly elevated injury risk among combat personnel, particularly in females. Mild cases follow a benign course, suggesting a severity threshold that does not warrant routine combat role restrictions.

Main Analysis:

- Mild Scoliosis showed no association with either MSKIs or SFs in either sex, confirming a benign clinical course.
- Moderate Scoliosis was associated with a significant risk for both injury types in both genders, stronger in females.

Figure 1: Kaplan-Meier curves demonstrating the cumulative incidence of musculoskeletal overuse injuries and stress fractures, stratified by scoliosis severity and sex, within lower-intensity combat roles.



- Screening should focus on moderate scoliosis for risk-stratified, proactive load management. Future research should track long-term pain and attrition to refine safe thresholds.



References

- Li M et al. *Front Pediatr.* 2024;12:1399049.
- Kuznia AL et al. *Am Fam Physician.* 2020;101:19.
- Dunn J et al. *JAMA.* 2018;319:173.
- Dantas MGB et al. *J Chiropr Med.* 2021;20:97.
- Newman M et al. *Arch Phys Med Rehabil.* 2023;104:1314.
- Negrini A et al. *Eur J Phys Rehabil Med.* 2023;59:222.
- US DoD. *DoDI 6130.03, Vol 1.* 2018 (Rev 2025).
- Bedno SA et al. *Mil Med.* 2011;176:519.

Abbreviations

AIS, Adolescent Idiopathic Scoliosis;
MSKI, Musculoskeletal injury;
SF, Stress Fracture;
IDF, Israel Defense Forces;
SMD, standardized Mean Differences;