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EPIDEMIOLOGY

Risk Factors for Back-Related Disability in the US Army and Marine Corps

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Study Design. Matched case-control epidemiological study.

Objective. To identify pre-enlistment, demographic, and service-related risk factors for back-related disability in enlisted US soldiers and Marines comparing those who were deployed with those who did not deploy during the service term.

Summary of Background Data. Back conditions are a major cause of morbidity and lost work days in both the US working population and military. Back-related conditions are among the most prevalent causes of military disability discharge but little research has been conducted to identify risk factors for back-related disabilities in this population.

Methods. Cases included enlisted Army and Marine Corps service members evaluated for back-related disability. Controls, frequency matched by year of military entrance and service, were selected from the enlisted service member population. Pre-enlistment demographic and medical characteristics, deployment, and ambulatory care data collected from existing military databases were used. Crude and adjusted odds of back-related disability were modeled using conditional logistic regression.

Results. In adjusted models, service members who were overweight (odds ratio [OR]: 1.17; 95% confidence interval [95% CI]: 1.12–1.23) and obese (OR: 1.35; 95% CI: 1.26–1.44), between ages 25 and 29 years (OR: 1.23; 95% CI: 1.16–1.31), or 30 years or older (OR: 1.43; 95% CI: 1.34–1.52) at military entrance were at increased odds of a back-related disability. History of a back diagnosis at the pre-enlistment medical examination (OR: 1.94; 95% CI: 1.50–2.50) and deploying once (OR: 1.09; 95% CI: 1.05–1.14) were also associated with increased odds of a back-related disability.

Conclusion. Enlisted soldiers and marines with back-related disabilities were more likely to be older, have a higher body mass index, have a history of pre-enlistment back conditions, and were deployed once, compared with controls without a back-related disability. Additional research is necessary to further examine the complex relationship between deployment to combat zones, onset of musculoskeletal symptoms, and back-related disability in soldiers and marines.

Key words: disability discharge, military personnel, back injury, epidemiology.

Level of Evidence: 4

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Back pain is a major cause of morbidity and lost work days in the US population. In 2010, the back was the most commonly identified body part associated with occupational illness/injury leading to lost work days, with 75% of these resulting from sprains, strains, or tears.[1] Approximately, 18% of US workers experience back pain, mostly attributable to occupational duties, specifically repetitive activities.[2] Occupations with the highest back pain prevalence include construction among males and nursing among females.[2] Workers with occupational back pain account for the majority of lost workdays, missing an average of 6.8 workdays per year.[3] Low back pain, in particular, is associated with recurrent pain years after injury and long-term disability.[4–7]

Military disability research has emphasized musculoskeletal disability.[8–11] Analysis of work-related musculoskeletal conditions in soldiers identified back-related disorders among the most prevalent causes of discharge due to disability.[9] Further study of the same population found lumbosacral strain and intervertebral disc syndrome were the most common back-related diagnoses.[12] Occupations involving heavy physical demands had the highest rates of back-related disability discharge, with infantrymen and wheeled vehicle drivers most at risk.[12] In a review of musculoskeletal conditions requiring hospitalization in the US Army, back conditions were associated with the highest 5-year cumulative risk of disability discharge.[13] More recent studies of disability and deployment during the military conflicts in Iraq and Afghanistan have shown battlefield orthopedic injuries are an important cause of disability[14,15] and back pain has been a common reason for disability discharge during these wars.[16]

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Pre-enlistment assessment for military service includes physical examination, medical history, and screening tests.[17] Military service applicants with disqualifying medical conditions may seek a medical waiver if their conditions are unlikely to impact their ability to perform military duties.[18] Musculoskeletal conditions commonly identified during the pre-enlistment medical examination include joint conditions/injuries, curvature of the spine, and shoulder dislocation.[19] During the past 5 years, overweight/obesity has remained a leading reason for military service disqualification.[19] A large body of literature examining the military basic training period has demonstrated musculoskeletal injuries, elevated body fat, and low fitness are important predictors of premature discharge from basic training.[20–27]

The primary purpose of this report is to identify pre-enlistment risk factors for back-related disability in enlisted US soldiers and Marines, including demographic and medical characteristics. The study time period spans recent military conflicts in Iraq and Afghanistan. In addition, this study examines relationships among initial back diagnosis, back disability discharge, and deployment. These analyses may allow for identification of at-risk populations prior to enlistment for further medical evaluation and targeted interventions pre- and post-deployment to reduce the burden of back-related disability in military personnel.

MATERIALS AND METHODS

Study Design

A matched case-control study was conducted to examine risk factors for back-related disability discharge among active duty-enlisted US Army and Marine Corps personnel. This study was performed under a protocol approved by the Walter Reed Army Institute of Research Institutional Review Board, Silver Spring, Maryland.

Study Population

Cases were individuals with back-related disability discharges between October 1, 2002, and September 30, 2010, by the US Army Physical Disability Agency for Soldiers or the US Navy Council of Review Boards for Marines. Back-related disabilities included conditions with a Veterans Affairs Schedule of Rating Disability code indicating a back-related condition (Table 1).[28] Controls, randomly selected from enlisted soldiers and Marines with no history of disability evaluation as of September 30, 2010, were frequency matched to cases based on entry year and branch of service at a 5:1 ratio. For all subjects, a unique service term was selected on the basis of the first active duty-enlisted entry during the study period and either discharge date (when available) or the end of the study period.

Measures

Demographic and service characteristics included age, sex, race, education, service, and military occupation at entrance. Military occupation was categorized as combat arms (including infantry, armor, and artillery units), combat support (including intelligence, military police, and chemical units), or combat service support (including adjutant general, logistics, medical, legal, and chaplains). Combat support and combat service support were combined into the category combat support/combat services support. A service member was categorized as having been deployed if they were deployed in support of conflicts in Iraq and Afghanistan following enlistment but prior to the end of the study period; deployments occurring before or after this period were excluded.

Data from study subjects' medical examination prior to military entry were included, specifically examination dates, medical diagnoses, and height and weight measurements. Body mass index (BMI), in kg/m^2, was calculated using pre-enlistment height and weight, and was categorized as underweight, normal, overweight, or obese, according to National Institutes of Health guidelines.[29] During the pre-enlistment examination, some applicants are disqualified when they have a medical condition that does not meet medical standards and they may receive a medical waiver to allow enlistment if it is determined the condition is unlikely to affect military duty performance.[17,18] Service members were identified as having a pre-existing medical diagnosis if either a medical disqualification or a waiver was present. Pre-existing medical conditions

TABLE 1. Distribution of Back-Related Disability Discharges in Cases

	Army (n = 9181)		Marine Corps (n = 863)		All Cases (n = 10,044)	
Back-Related Disability	**n**	**%**	**n**	**%**	**n**	**%**
Lumbosacral or cervical strain	4141	45.1	421	48.8	4562	45.4
Degenerative arthritis of the spine	2102	22.9	87	10.1	2189	21.8
Intervertebral disc syndrome	1763	19.2	119	13.8	1882	18.7
Spinal fusion	600	6.5	126	14.6	726	7.2
Vertebral fracture or dislocation	359	3.9	70	8.1	429	4.3
Spondylolisthesis or segmental instability	323	3.5	35	4.1	358	3.6
Sacroiliac injury and weakness	175	1.9	11	1.3	186	1.9
Spinal stenosis	82	0.9	3	0.3	85	0.8

were classified as either back-related or other musculoskeletal based on *International Classification of Diseases, Ninth Edition, Clinical Modification* codes and were compared with service members with no pre-existing conditions (Supplemental Digital Content Table 1 available at http://links.lww.com/BRS/A857).

Data on ambulatory encounters at military medical facilities included encounter dates and *International Classification of Diseases, Ninth Edition, Clinical Modification* medical diagnosis codes. Encounters that occurred during deployments were not available for this study. All diagnostic codes per record were captured for cases and controls, and those classified as back-related were analyzed (Supplemental Digital Content Table 1 available at http://links.lww.com/BRS/A857). Time in service from enlistment to initial diagnosis was based on date of military entry and date of the first ambulatory care encounter with a back-related diagnosis. All events, including deployments and ambulatory encounters, between the first active duty-enlisted entry and either the discharge date or the end of the study period were defined as within the service term.

Data Analysis

Demographic, medical, and deployment characteristics of the study population were described using frequencies and proportions. Distribution of first back-related diagnosis within the service term for the first, second, and after second year of service were calculated for both cases and controls stratified by deployment. To compare distribution of these characteristics between matched cases and controls, odds ratios and associated 95% confidence intervals (95% CI) were calculated using bivariate and multivariate conditional logistic regression models. The primary risk factors evaluated with conditional logistic regression models were pre-existing back conditions, BMI at enlistment, and deployment. Adjusted models controlled for demographic characteristics at accession: age, sex, race, and education and were stratified by deployment. Deployment rates by time in service prior to first diagnosis were calculated and occurrence of diagnosis was stratified by deployment. Analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC).

RESULTS

Overall trends in the rate of back-related disability showed significant increases during the study period in both the Army ($P < 0.001$) and Marine Corps ($P < 0.001$) (data not shown). The most common back-related disabilities among cases were lumbosacral or cervical strain (45.4%), degenerative arthritis (21.8%), and intervertebral disc syndrome (17.8%) (Table 1). Enlisted soldiers accounted for 91% of the population; 9% were enlisted Marines. The study population was composed of primarily Caucasian males younger than 25 with a high school diploma at accession (Table 2). Combat Arms military occupation was significantly associated with increased back-related disability (OR: 1.10; 95% CI: 1.05–1.15). Deployment (OR: 0.97; 95% CI: 0.93–1.01) was not significantly associated with back-related disability. Deploying once was significantly associated with increased risk of back-related disability (OR: 1.18; 95% CI: 1.13–1.23) while deploying 2 or more times was protective (OR: 0.65; 95% CI: 0.62–0.69).

In adjusted models, service members who were overweight (OR: 1.17; 95% CI: 1.12–1.23), obese (OR: 1.35; 95% CI: 1.26–1.44), between ages 25 and 29 years (OR: 1.23; 95% CI: 1.16–1.31), or 30 years and older (OR: 1.43; 95% CI: 1.34–1.52) at accession were at increased odds of back-related disability (Table 3). History of back diagnosis during the pre-accession medical examination (OR: 1.94; 95% CI: 1.50–2.50) and deploying once (OR: 1.09; 95% CI: 1.05–1.14) were also associated with increased odds of back-related disability. Significantly reduced odds of back-related disability were seen in those who were deployed multiple times (OR: 0.59; 95% CI: 0.56–0.63). Adjusted models were stratified by deployment and only minor differences between unstratified and stratified models were observed. However, pre-existing back conditions were a stronger predictor of back disability in those with no history of deployment (OR: 2.19; 95% CI: 1.54–3.10) than in the deployed population (OR: 1.65; 95% CI: 1.13–2.41). Also, combat arms occupation was significantly associated with back disability in those who were deployed (OR: 1.15; 95% CI: 1.08–1.22) but protective in those who did not deploy (OR: 0.86; 95% CI: 0.79–0.93).

Proportions of cases and controls that were deployed were examined by years in service prior to first back-related diagnosis (Table 4). Cases whose first back-related condition occurred during first service year (35%) had the lowest deployment rates. In both cases and controls, the percentage of individuals who were deployed increased with time in service, although the proportion that were deployed among controls was consistently higher than among cases.

Years in service prior to first diagnosis of a back-related condition, based on ambulatory care encounters, were described for those who were deployed versus those who did not deploy (Table 5). Nearly half of cases who were deployed were first diagnosed with a back-related condition after the second year of service, whereas most nondeployed cases (65%) were first diagnosed within the first year. In controls, similar patterns in timing of first diagnosis during the service term were observed but a higher percentage of controls had no diagnosis. Diagnosis in the second service year was significantly associated with increased back disability relative to diagnosis in the first service year in those who were deployed (OR: 1.34; 95% CI: 1.24–1.44) and those who did not deploy (OR: 1.18; 95% CI: 1.09–1.27). Diagnosis after the second service year was associated with significantly decreased odds of back-related disability only for those who did not deploy (OR: 0.89; 95% CI: 0.81–0.98).

DISCUSSION

This matched case-control study of enlisted soldiers and Marines identified overweight/obese BMI, age 25 or older, history of back conditions, Caucasian race, being married, and education less than college as pre-enlistment risk factors for back-related disability during the recent period of military conflict in Iraq and Afghanistan. Deployment was

TABLE 2. Demographic, Medical, and Deployment Characteristics of the Study Population at Accession With Crude Odds Ratios for Disability Discharge

	Cases (n = 10,044)		Controls (n = 50,220)		Crude	
	n	%	n	%	OR*	95% CI
Diagnosis type at MEPS						
No diagnosis (ref)	8323	82.9	43,247	86.1	1.00	…
Back-related	59	0.6	100	0.2	2.25	1.74–2.90
Other musculoskeletal	192	1.9	837	1.7	1.13	0.98–1.30
BMI category						
Underweight	213	2.1	1644	3.3	0.80	0.70–0.92
Normal (ref)	4742	47.2	28,577	56.9	1.00	…
Overweight	3858	38.4	15,955	31.8	1.36	1.30–1.42
Obese	1162	11.6	3838	7.6	1.63	1.53–1.74
Sex						
Female (ref)	1768	17.6	9166	18.3	1.00	…
Male	8276	82.4	41,054	81.7	0.96	0.92–1.02
Race						
Caucasian (ref)	7965	79.3	38,269	76.2	1.00	…
African American	1287	12.8	8145	16.2	0.79	0.75–0.84
Other	647	6.4	3088	6.1	1.00	0.92–1.09
Marital status						
Unmarried (ref)	7229	72.0	42,066	83.8	1.00	…
Married	2779	27.7	8012	16.0	1.77	1.70–1.85
Age						
<20	3468	34.5	26,060	51.9	0.63	0.60–0.66
20–24 (ref)	3510	34.9	15,453	30.8	1.00	…
25–29	1486	14.8	4812	9.6	1.28	1.21–1.36
≥30	1580	15.7	3891	7.7	1.59	1.50–1.69
Education						
Less than HS	334	3.3	5678	11.3	0.35	0.32–0.38
HS Diploma/GED (ref)	8704	86.7	40,271	80.2	1.00	…
Some college	556	5.5	2324	4.6	1.07	0.99–1.15
Bachelor's or Higher	441	4.4	1900	3.8	1.02	0.94–1.11
Military occupation at enlistment*						
Combat arms	2820	28.1	12,282	24.5	1.10	1.05–1.15
CS/CSS (ref)	5835	58.1	25,545	50.9	1.00	…
Other	351	3.5	4390	8.7	0.40	0.36–0.45
Missing (Army)	175	1.7	3688	7.3	…	…
Missing (Marine Corps)	863	8.6	4315	8.6	…	…

(*Continued*)

TABLE 2. (*Continued*)

	Cases (n = 10,044)		Controls (n = 50,220)		Crude	
	n	%	n	%	OR*	95% CI
Deployed						
No (ref)	4427	44.1	21,687	43.2	1.00	…
Yes	5617	55.9	28,533	56.8	0.97	0.93–1.01
Deployment count						
Not deployed† (ref)	4427	44.1	21,687	43.2	1.00	…
1	3978	39.6	15,781	31.4	1.18	1.13–1.23
≥2	1639	16.3	12,752	25.4	0.65	0.62–0.69

**All Marine Corps personnel are assigned a military occupation of general service/basic marine at enlistment and have been excluded.*

†Participant was not deployed during the term of service.

OR indicates odds ratio; CI, confidence interval; Ref, referent group; CS/CSS, combat support/combat services support; BMI, body mass index; HS, high school; MEPS, military entrance processing station; GED, general education development.

found to have no association with back disability. However, when deployment frequency was examined a single deployment was associated with a modest increase in back disability, whereas deployment more than once showed a decreased risk of back disability. Subsequent analysis showed disability cases whose back conditions were first diagnosed within the first year of military service had lower deployment rates than controls. Stratification by deployment history showed those who were deployed had increased odds of back disability after the first service year, whereas those who did not deploy were less likely to experience back disability after the second service year. This analysis suggests service members with back disabilities may be more likely to be injured early in service, and subsequently do not deploy. This study may also indicate service members who deploy have greater incidence of later career, likely postdeployment, back problems.

Findings from this study are consistent with previous research, specifically that elevated BMI, increasing age, and history of back conditions are associated with back disability.[30,–32] Because musculoskeletal conditions, including back problems, are a common cause of disqualifying pre-enlistment medical conditions,[19] this study supports strict application of existing pre-enlistment screening policy for back conditions. Exceeding military accession medical standards for weight and body fat is the most frequent pre-enlistment medical disqualification from service and has historically accounted for 15% to 20% of applicant disqualifications.[19] In addition, musculoskeletal injuries, elevated body fat, and low fitness have been shown to be significantly associated with premature discharge from military basic training.[20–27] Overweight and obesity are even more common in US adults than among recruits; more than two-thirds of adults are overweight or obese, and nearly 25% are physically inactive.[33] Taken together, these studies suggest increased BMI and pre-existing musculoskeletal conditions in the civilian population from which military recruits are drawn are not only substantial barriers to developing a medically qualified force, but also are important preventable and modifiable factors in the development of back-related disability throughout the military career and in civilian life.

Back pain is a common cause for treatment at pain management clinics among deployed personnel.[34,35] Return to duty rates among personnel with back pain medically evacuated out of a theater of operations have been reported to be remarkably low (about 13%).[36] Recent study of disability among soldiers showed back pain is one of the most common disabilities in both war and peacetime.[16] This study shows deployment within the service term is not associated with back disability when examined as a dichotomous variable (*i.e.*, Yes/No). However, when deployment frequency was analyzed, distinguishing between single and multiple deployments, deployment once was associated with increased odds of back disability, whereas multiple deployments were shown to be associated with decreased odds of back disability. This analysis indicates the relationship between pre-enlistment factors, deployment, and back-related disability discharge among military personnel requires further study. Nonetheless, these studies considered together argue for focused screening for existing back conditions and improved management of service members with back conditions early in service and during deployment to allow for successful deployment and prevention of disability.

Service members with back conditions severe enough to warrant disability discharge were substantially less likely to deploy more than once than controls. Consequently, deployment rates were lower among those with back disabilities when diagnosed in the first year of service. Therefore, back disability may involve 2 distinct populations: those with early career injuries/illnesses preventing deployment, and those injured/diagnosed later in service, likely post-deployment. Although previous studies have found a healthy warrior effect with respect to deployment and disability finding those who deploy are less likely to become disabled,[37,38] this study did not support a healthy warrior effect for back-related disabilities when deployment was analyzed as a dichotomous factor.

TABLE 3. Adjusted Odds Ratios of Disability Discharge for Demographic, Medical, and Deployment Characteristics of the Study Population at Accession

	Full Population		Deployed		Nondeployed	
	OR*	95% CI	OR*	95% CI	OR*	95% CI
Diagnosis type at MEPS						
No diagnosis (ref)	1.00	…	1.00	…	1.00	…
Back-related	1.94	1.50–2.50	1.65	1.13–2.41	2.19	1.54–3.10
Other musculoskeletal	1.07	0.92–1.23	1.04	0.86–1.25	1.13	0.91–1.41
BMI category						
Underweight	0.86	0.75–0.99	0.82	0.68–0.99	0.91	0.75–1.10
Normal (ref)	1.00	…	1.00	…	1.00	…
Overweight	1.17	1.12–1.23	1.16	1.10–1.23	1.20	1.12–1.28
Obese	1.35	1.26–1.44	1.36	1.24–1.48	1.38	1.25–1.52
Military occupation at enlistment						
Combat arms	1.03	0.99–1.08	1.15	1.08–1.22	0.86	0.79–0.93
CS/CSS(ref)	1.00	…	1.00	…	1.00	…
Other	0.39	0.35–0.44	0.59	0.50–0.69	0.28	0.24–0.32
Race						
Caucasian (ref)	1.00	…	1.00	…	1.00	…
African American	0.76	0.72–0.81	0.78	0.72–0.85	0.75	0.69–0.82
Other	0.91	0.84–0.99	0.74	0.65–0.85	1.09	0.97–1.23
Sex						
Female (ref)	1.00	…	1.00	…	1.00	…
Male	1.05	0.99 -1.11	1.06	0.97–1.16	1.09	1.02–1.17
Marital status						
Unmarried (ref)	1.00	…	1.00	…	1.00	…
Married	1.25	1.19–1.32	1.24	1.16–1.33	1.22	1.14–1.32
Age						
<20 yr	0.73	0.69–0.76	0.72	0.68–0.77	0.72	0.67–0.78
20–24 (ref)	1.00	…	1.00	…	1.00	…
25–29	1.23	1.16–1.31	1.22	1.12–1.33	1.26	1.15–1.38
≥30	1.43	1.34–1.52	1.55	1.42–1.70	1.33	1.21–1.46
Education						
Less than HS	0.48	0.43–0.54	0.66	0.56–0.76	0.37	0.31–0.44
HS diploma/GED (ref)	1.00	…	1.00	…	1.00	…
Some college	0.94	0.86–1.02	0.88	0.78–0.99	0.98	0.87–1.12
Bachelor's or higher	0.84	0.77–0.93	0.63	0.54–0.73	1.07	0.94–1.21
Deployment count						
Not deployed (ref)	1.00	…	…	…	…	…
1	1.09	1.05–1.14	…	…	…	…
≥2	0.59	0.56–0.63	…	…	…	…

**Odds ratios adjusted for all listed demographic, medical, and service-related variables.*

OR indicates odds ratio; CI, confidence interval; Ref, referent group; CS/CSS, combat support/combat services support; BMI, body mass index.

TABLE 4. Percent Deployed by Timing to Incident Back-Related Diagnosis

	Cases		Controls		
Timing to First Diagnosis	n	Dep %	n	Dep%	χ^2 (*df*)
No diagnosis	91	49.7	19,089	52.8	0.71 (1)
First year	1501	34.9	3021	50.4	244.99 (1)*
Second year	1227	56.8	1503	66.5	44.48 (1)*
After the second year	2798	82.4	4750	85.7	5.62 (1)†

**P < 0.0001.*
†P < 0.05.
Dep indicates deployed.

However, because multiple deployments were associated with decreased odds of back disability, a smaller population with less back problems remains available for subsequent deployment. Additional research is needed to determine the temporal relationship between deployment and initial onset of back problems. Prospective studies examining progression of back conditions during basic training, early service, and deployment are necessary to distinguish unique risk factors for disability in each phase of the military career.

This study has several strengths, including the large number of cases and matched controls, inclusion of both soldiers and Marines, and extensive capture of demographic, health care, and disability information throughout the study period. Although findings were similar in soldiers and Marines, a potential weakness is the findings may be of limited applicability to other military services or civilian workers, as young Caucasian males who were medically screened comprised the population studied.[39] In addition, this study did not identify specific military occupations that might have different associated risks for back conditions and subsequent disability and lacked information on psychosocial factors such as social support, job satisfaction, and stress that have been previously identified as risk factors for back pain in other populations.[40–42] Similarly, medical encounters during deployment were not available; all ambulatory care encounters reflect diagnoses occurring pre- or postdeployment. Finally, disability codes used to identify cases were intended for rating and compensating disabilities, and are often not directly analogous to a specific medical diagnosis.[43]

Despite these limitations, this study provides hypothesis-generating findings that pre-enlistment characteristics, including elevated BMI and existing back diagnoses, are risk factors for back-related disability. In addition, this study shows the relationship between deployment, disability, and onset of back problems is not fully understood at this time. In the context of research showing back-related disability is prevalent in

TABLE 5. Odds of Disability Discharge Among Study Participants With an Ambulatory Encounter, by Timing to Incident Back-Related Diagnosis and Deployment Status

	Cases (N = 10,044)		Controls (N = 50,220)			
	n	%	n	%	OR	95% CI
Deployers						
No diagnosis	91	1.6	19,089	66.9	0.01	0.01–0.02
First year of service (ref)	1501	26.7	3021	10.6	1.00	…
Second year of service	1227	21.8	1503	5.3	1.34	1.24–1.44
After second year of service	2798	49.8	4920	17.2	1.06	0.99–1.13
Total deployed	5617	55.9	28,533	56.8		
Nondeployers						
No diagnosis	92	2.1	17,041	78.6	0.01	0.01–0.014
First year of service (ref)	2804	63.3	2975	13.7	1.00	…
Second year of service	935	21.1	757	3.5	1.18	1.09–1.27
After second year of service	596	13.5	914	4.2	0.89	0.81–0.98
Total nondeployed	4427	44.1	21,687	43.2		

both war and peacetime,[16] this study identifies a need for in-depth study of service, psychosocial (*i.e.*, social support, occupational stress, and job satisfaction), and occupational factors specific to combat-related back-related disability. These findings will be of interest to those who develop physical or medical qualification standards for persons entering occupations with strenuous physical demands, such as police, firefighters, and other occupations involving manual labor, including the military. Opportunities for directing older or overweight/obese individuals or those with a history of back problems into alternative career fields, or for targeted interventions to high risk individuals, may also be provided by these findings.

CONCLUSION

Because training and combat exposures vary substantially by military occupation, further research is needed to describe occupational groups at highest risk for back-related disability. In this study, although BMI was found to be a risk factor for back disability, it was measured only at military entrance. Prospective studies could be designed on the basis of the findings of this analysis to examine the effects of sustained overweight/obesity compared than weight management and investigate the potential contribution of physical fitness to back-related disability among military personnel. Nonetheless, this study offers evidence that enhancement of existing military screening procedures for elevated BMI and back conditions pre-enlistment and predeployment may improve deployment success and prevent back-related disability.

➢ Key Points

- ❑ Back conditions are a major cause of morbidity and lost work days in both the US working population and the military.
- ❑ Enlisted service members who were overweight, obese, or older than 24 years of age at military entrance were at increased odds of a back-related disability.
- ❑ History of a back condition during the pre-enlistment medical examination and deploying once were associated with increased odds of a back-related disability.

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