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U.S. Army physical demands study: Prevalence and frequency of performing physically demanding tasks in deployed and non-deployed settings

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ABSTRACT

Objectives: To compare percentages of on-duty time spent performing physically demanding soldier tasks in non-deployed and deployed settings, and secondarily examine the number of physically demanding tasks performed among five Army combat arms occupational specialties.

Design: Job task analysis.

Methods: Soldiers ($n = 1295$; over 99% serving on active duty) across five Army jobs completed one of three questionnaires developed using reviews of job and task related documents, input from subject matter experts, observation of task performance, and conduct of focus groups. Soldiers reported estimates of the total on-duty time spent performing physically demanding tasks in both deployed and non-deployed settings. One-way analyses of variance and Duncan post-hoc tests were used to compare percentage time differences by job. Two-tailed t -tests were used to evaluate differences by setting. Frequency analyses were used to present supplementary findings.

Results: Soldiers reported performing physically demanding job-specific tasks 17.7% of the time while non-deployed and 19.6% of the time while deployed. There were significant differences in time spent on job-specific tasks across settings ($p < 0.05$) for three of five occupational specialties. When categories of physically demanding tasks were grouped, all soldiers reported spending more time on physically demanding tasks when deployed ($p < 0.001$). Twenty-five percent reported performing less than half the physically demanding tasks represented on the questionnaire in the last two years.

Conclusion: Soldiers spent more time performing physically demanding tasks while deployed compared to non-deployed but spent similar amounts of time performing job-specific tasks.

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1. Introduction

Soldiers perform many physically demanding tasks as part of their job, including combinations of lifting, carrying, lowering, pushing, pulling, climbing, digging, walking, marching or running.¹ The U.S. Army classifies military occupational specialties (MOS)

according to these physically demanding tasks, particularly those pertaining to heavy lifting, indicating that only soldiers possessing physical capabilities to safely perform their required job tasks should be assigned to physically demanding jobs.² Soldiers who are not physically capable of completing their MOS-specific critical physically demanding tasks (CPDTs) may be at increased risk to injure themselves and those around them.^{3,4} Soldiers in heavily demanding jobs, including infantrymen cavalry scouts infantrymen-indirect fire, were found to be at increased risk for any-cause injury, on-duty injuries, any-cause hospitalizations, and any-cause disability injury rates.^{5,6}

To optimally prepare soldiers, it is critical to fully understand the types of tasks they perform as well as the amount of time they spend performing these tasks. The distribution of task types and performance times may be very different in a deployed or combat setting versus a non-deployed or garrison (i.e., a military station where

Abbreviations: MOS, military occupational specialty; CPDT, critically physically demanding tasks; 11B, numerical designator for infantryman; 19D, numerical designator for cavalry scout; 11C, numerical designator for infantryman-indirect fire; TRADOC, U.S. Army Training and Doctrine Command; JAQ, Job Analysis Questionnaire; 12B, numerical designator for combat engineer; 13B, numerical designator for cannon crewmember; 13F, numerical designator for fire support specialist; 19K, numerical designator for armor crewman.

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training is often conducted) setting and may vary greatly across jobs. In a group of non-combat female U.S. Army soldiers it has been reported that the occupational physical demands increased from garrison to deployed settings.⁷ It is important to ensure soldiers are physically prepared to perform the CPDTs of their MOS while deployed in combat environments by providing them with appropriate training in garrison environments. The primary purpose of this paper is to characterize the percentages of on-duty time soldiers spend performing physically demanding tasks in garrison and while deployed. A second purpose is to examine the prevalence with which soldiers completed a number of CPDTs over the past two years.

2. Methods

Within a larger study conducted with the U.S. Army Training and Doctrine Command (TRADOC), a rigorous process was used to develop an initial list of 32 tasks for combat arms MOSs.^{8,9} The task list, along with items based on input from soldier focus groups and training manuals, were used to design a set of web-administered job analysis questionnaires (JAQs). Best practices for survey development were used to design these JAQs, including the writing and scaling of items based on the combined experience of 20 subject matter experts and observations of job performance conducted by several research scientists. These JAQs were designed to collect information concerning a wide variety of physically demanding tasks performed by soldiers in specific combat arms MOSs, including how much time was spent on physically demanding tasks both in garrison and deployed settings.

The questionnaires were completed by enlisted Army combat engineers (MOS 12B), cannon crewmembers (MOS 13B), fire support specialists (MOS 13F), cavalry scouts (MOS 19D), and armor crewmen (MOS 19K) holding a rank of Private First Class through Sergeant First Class. These JAQs were administered over the internet and responded to anonymously. Each JAQ included two items that provided a means to compare the percentage of time spent conducting Army-related tasks in garrison (i.e., percentage of on-duty time in a typical year) to the percentage of on-duty time spent conducting similar tasks in deployed settings. Each of these two items contained seven sub-items addressing specific types or categories of tasks (i.e., seated tasks, less active tasks, loading and unloading supplies and equipment, tactical marches/patrolling, MOS-specific tasks, physically demanding combat arms tasks, and physical training). Another set of items on the JAQs (these items are listed in Supplementary Table S1) asked respondents how often they performed a number of work-related tasks (i.e., “frequency items”) over the past two years. These questions were different from the items described above in that they did not ask about task performance in garrison and deployed settings separately. They were included to examine the prevalence of task completion among the respondents in this study.

The two-year time frame used for the frequency items described above was selected for several reasons. First and primarily, we

wanted a common time frame for reference that would minimize the confounding factors of soldier tenure and experience in reports of task frequencies. Second, we desired a time frame that was long enough to include a reliable sample of behavior. Third, we needed a time frame that was short enough to minimize demand on memory and thereby reduce response distortion.¹⁰ Finally, the majority of deployments span one year, which would allow for time in both environments had the soldiers deployed within the past two years. The two-year time frame was selected as a reasonable balance to the trade-off posed by these requirements.

For survey responses to be included in the analyses, three inclusion criteria were used in this study in which (1) fifty percent or more of the survey items were required to be completed by each participant (excluding demographic data); (2) participants must have been deployed at least once since September 11, 2001; and (3) percentage time estimates were required to be provided to each of the 14 sub-items addressing the percentage of on-duty time spent on tasks in both garrison and deployed settings.

A one-way analysis of variance (ANOVA), Duncan post-hoc tests and two-tailed *t*-tests were used to compare differences across the MOSs pertaining to time spent performing job-specific tasks in garrison and deployment settings. To examine time spent performing all physically demanding tasks in each setting, all seven sub-items were summed. Simple frequency counts were used to analyze the prevalence of completing the 15 physically demanding tasks, many of which are generally required of enlisted soldiers in most or all of the MOSs represented in this study. The number of completed tasks in the last two years reported by the respondents was computed as an indicator of prevalence.

3. Results

The JAQs were sent to 35,372 soldiers and 2090 were returned, for a response rate of 5.9%. Applying the three inclusion criteria, the number of respondents in the final dataset was reduced to 1295 soldiers across five MOSs. There were 236 participants in the 12B MOS (18% of the sample), 271 13Bs (21%), 244 13Fs (19%), 492 19Ds (38%), and 52 19Ks (4%). Seventy-five percent of the soldiers ranged between 25 to 38 years of age and the modal response (14%) was age 33–34 years. All were enlisted soldiers, and 71% were senior enlisted (i.e., staff sergeants and above). Seventy-eight percent had been in the Army for at least seven years. Over 99% were serving on active duty, and 57% had been deployed at least three times since September 11, 2001. Further demographic information is provided in Supplementary Table S2.

Overall, soldiers reported spending an average of 17.7% of their time performing MOS-specific tasks in garrison and 19.6% in deployed settings. Difference scores across the MOSs pertaining to time spent performing physically demanding MOS-specific tasks in garrison and deployed settings did not meet the assumption of variance homogeneity needed for a typical one-way ANOVA. Thus, difference scores were converted to quintile scores and a one-way

Table 1
 Mean percentages of time spent performing military occupational specialty (MOS)-specific tasks in two settings.

MOS ¹	n	Garrison	Deployed setting	Average difference score	Average quintile score ^{2,3}
Combat engineers (12B)**	236	15.4%	21.3%	+5.9%	3.4 ^a
Cannon crewmembers (13B)*	271	22.5%	19.5%	−3.0%	2.8 ^b
Fire support specialists (13F)	244	21.1%	23.2%	+2.1%	3.2 ^a
Cavalry scouts (19D)**	492	14.7%	17.6%	+2.9%	3.3 ^a
Armor crewmen (19K)	52	16.3%	15.4%	−0.9%	2.9 ^c
All five MOSs**	1295	17.7%	19.6%	+1.9%	3.1

¹ MOSs with asterisks in this column spent statistically different mean percentages of time on MOS-specific tasks in garrison and deployed settings (**p* < 0.05; ***p* < 0.001).
² A one-way ANOVA using the Welch statistic was performed with quintiles of difference scores between percentages of time performing MOS-specific tasks in deployment and percentages of time performing the same types of tasks in garrison.
³ MOSs with alphabetical superscripts that differ in this column statistically differ at the *p* < 0.05 level of significance.

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