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13. ABSTRACT (Maximum 200 Words)

Two projects are being conducted under this funding award. The cross-sectional survey study (project #1) lays the ground work to better understand the impacts of ARNG jobs on health by examining current and former MA ARNG soldiers as they remain State-side; are deployed for combat, peacekeeping, or civilian emergency duties; and after they leave the military. The objectives are to: 1) describe the current health status of this ARNG cohort, 2) examine to what extent the job strain of ARNG service affects the relationship between civilian job strain and health and job performance outcomes and, 3) examine whether retention in the ARNG is related to current health status. The study cohort includes current Massachusetts (MA) ARNG members and prior members who have left ARNG service within the past 3-4 years. A prospective deployment health field study (project #2) involving a MA ARNG group that deployed to Bosnia in 2001 and a comparison group (non-deployed) is being carried out to examine cognitive readiness and potential changes in health related to deployment. Data collection phases for the two research projects are complete; data analyses are in progress. These research projects represent some of the first to focus on the role that one's ARNG job plays on health status and quality of life.

14. SUBJECT TERMS

functional health status, National Guard, second job, job strain, fatigue symptomatology, job performance, retention, deployment health, cognitive readiness, neurobehavioral test batteries

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INTRODUCTION

Recently, epidemiological studies have demonstrated increased health symptomatology and lower functional status in troops returning from Gulf War (GW) in 1990-91 compared to other GW-era veterans (e.g., non-deployed personnel (Iowa Persian Gulf Study Group or Iowa et al., 1997; Haley et al., 1997; Fukuda et al., 1998; Unwin et al., 1999) or troops deployed to Germany during the same time period (Proctor et al., 1998; Proctor et al., 2001)). However, lack of information about GW veterans' pre-deployment health status has made it difficult to fully evaluate the role that deployment experiences play in soldiers' health (PRD5, 1998, p. 34). Two projects are being conducted under this funding award. The cross-sectional survey study (project #1) addresses three research objectives and lays the ground work to establish a cohort of current Massachusetts Army National Guard (MA ARNG) members whose health status can be followed longitudinally as they remain State-side; are deployed for combat, peacekeeping, or civilian emergency duties; and after they leave the military. The primary objective is to describe the current health status of this National Guard cohort using methods that will permit comparison to other population norms (e.g., Medical Outcomes Study Short Form Health Survey, SF36 (Ware 1993, 1994); SF36V (Kazis et al., 2000)) and current surveillance system parameters (e.g., US Army Health Risk Appraisal). The second objective is to examine to what extent the job strain (Karasek 1979; Karasek and Theorell, 1990) of National Guard service as a 'second job' affects the relationship between the job strain of the service members' civilian jobs and health and job performance outcomes (functional health status, fatigue symptomatology, job performance). The third objective is to examine whether retention in the National Guard is related to current health status by additionally surveying a cohort of persons who have left National Guard service within the past 3-4 years. The study cohort includes all current Massachusetts (MA) ARNG members and former members who have left ARNG service within the past three years (as of October 2000). Each participant is asked to complete a mail survey about his/her current health and deployment and occupational characteristics (both civilian and military). A prospective deployment health field study (project #2) involving a MA ARNG group deploying to Bosnia in 2001 and a comparison group (non-deployed) is being carried out to examine cognitive readiness and potential changes in health related to deployment. These two research studies are some of the first to focus exclusively on the role that one's Army National Guard job plays on health status and quality of life. Identification of specific occupational factors that relate either negatively or positively to health status is an important step towards designing and implementing effective strategies that will protect and improve the health of National Guard members in the current military environment (cf. PDR5, 1998; CDC Conference- Prevention Working Group Recommendations, 1999). Recent efforts in the area of deployment health and force health protection appear largely focused in the Active duty arena. As has been identified by the Institute of Medicine (2000), there is a need to focus research efforts on National Guard and Reserve forces in order to learn more about their specific issues and concerns in the current military climate.

BODY

Two projects are being conducted under this funding award. The survey study (project #1) was initiated in January 2000 and the deployment health field study (project #2) was initiated in June 2001.

The progress made during this funding period (January 2003- January 2004) is described below for each task outlined in the approved Statements of Work (SOW) for each project.

This funding award has been extended (on a no-cost extension), so the approved end date for these projects is July 23, 2005.

PROJECT #1. Health Status of Current National Guard Members: Role of Civilian and Military Jobs

The survey study was initiated in January 2000 and therefore a progress report for Years 1-3 of the funding award was reported in the previous Annual Reports.

Approved SOW tasks for the Year 1 funding period (Jan. 24, 2000- Jan. 23, 2001)

Year 1		
Task 1	Months 1-3	Hiring of project staff; Organize Advisory Group
Task 2	Months 4-10	Finalize the survey instrument, via:
Task 2a		Telephone and in-person interviews with current ARNG members
Task 2b		Conducting structured telephone interviews with ARNG members
Task 2c		Pilot the survey instrument on group of 20 volunteers.
Task 2d		Convene a meeting of the Advisory Group to finalize survey instrument
Task 3	Months 11 & 12	Request updated list of current ARNG members from DMDC
Task 4	Months 11 & 12	Determine number of persons who have left ARNG in past 3 years
Task 5	Months 11 & 12	Pre-notification of study, at the unit level throughout MA
Task 6	Months 11 & 12	Printing of final survey instrument and mailing materials

Approved SOW tasks for the Year 2 funding period (Jan. 24, 2001- Jan. 23, 2002) (*NOTE #1)

Year 2		
Task 1	Months 1	First wave mailing to current ARNG members and group who have left
Task 2	Months 2 & 3	Three follow-up reminders, including one re-mailing of survey
Task 3	Months 1-4	Set up of data entry procedures
Task 4	Months 1-6	Data entry completed
Task 5	Months 6	Convene Advisory Group to discuss response rates and analytic plans
Task 6	Months 6-10	Data checking and cleaning completed
Task 7	Months 9 & 10	Initiate and carry out linkage to HRA database
Task 8	Months 11 & 12	Preliminary data analyses and descriptive analyses

Approved SOW tasks for the Year 3 funding period (Jan. 24, 2002- Jan. 23, 2003)

Year 3	Jan '02	
Task 1	Months 1-6	Re-initiation of survey plan (same format as proposed for year 2), but under new administrative procedures and with human subjects modification to include subject reimbursement plan. (**NOTE #2)
Task 2	Months 1-12	Carry out analytic plans to test study hypotheses.
Task 3	Months 7-9	Telephone interviews with subsample of survey non-responders (***NOTE #3)
Task 4	Months 10-12	Analysis of telephone interview responses.
Task 5	Month 12	Convene Advisory Group to discuss results and manuscript preparation

Approved SOW tasks for the Year 4 funding period (Jan. 24, 2003- Jan. 23, 2004) (*NOTE #4)**

Year 4	Jan '03	
Task 1	Months 1-12	Complete analyses; Manuscript preparation for publication submissions.
Task 2	Month 6-12	Write final study report.

*NOTE #1: When the additional project (#2, see below) was proposed and funded in June 2001, the funding award period was extended to 3 ½ years.

**NOTE #2: The survey-mailing schema was initiated in Year 2 but not completed as scheduled in our original timeline as we requested to make some administrative procedural changes and needed to obtain

IRB approval to include subject reimbursements. The BU IRB and Army Human Subjects Research Review Board (HSRRB) approved these changes December, 2001. The survey plan was re-initiated in early Year 3.
***NOTE #3: A request for supplemental funds was made and received in June 2002 to include telephone interviews with a subset of survey non-responders (revised SOW approved) and the project timetable for both project # 1 (and #2) was extended so that the end date for these projects is January 23, 2004.
****NOTE #4: Delays in the initiation of the telephone interview phase with survey non-respondents (due to IRB-related issues and approvals) and thus the completion of subsequent data analyses has required an extension to the award period. A request for a no-cost extension for this funding award was made and approved and thus the approved end date for this funding award is July 23, 2005.

Year 4-Summary Status of Tasks
Task 1 Telephone interviews with subset of survey non-responders **[STATUS: COMPLETED October 2003]**
Task 2 Analysis of telephone interview responses. **[STATUS: COMPLETED]**
Task 3 Carry out analytic plans to test study hypotheses. **[STATUS: IN PROGRESS]**
Task 4 Manuscript preparation for publication submissions. **[STATUS: IN PROGRESS]**
Task 5 Write final study report. **[STATUS: IN PROGRESS]**

In the past year, we have completed all data collection aspects set forth for this project and have initiated all aspects of the analytic plan (see summary below for Year 4).

Over the complete mailing and survey collection period (between April 2001 and September 2002) a total of 1,970 completed surveys were returned for a 16.6-18.2% response rate, depending on the denominator used. (A discussion of survey response rates was included in last year's Annual Report.)

In the past year we have taken additional steps to try and understand why the response rate to the mail survey was lower than we anticipated. Also, although we will have sufficient power to test the study hypotheses with the current respondent sample size, we are aware that there may be differences between the survey respondents and non-respondents that may affect the validity and generalizability of the survey study results to the MA ARNG population. So, we have taken additional steps to examine the potential response bias.

Task 1 Telephone interviews with subset of survey non-responders **[STATUS: COMPLETED October 2003]**

In the past year, we conducted a brief telephone interview with a subset of survey non-responders to ascertain whether or not they ever received the mailed survey and to evaluate whether there may be differences between survey responders and non-responders that may affect the validity and generalizability of the survey study results. Final BU IRB and HSRRB approvals were made in April 2003.

The subject pool from which the targeted subset was selected for the telephone interview included those subjects who we believe received the mail survey but we are not sure (n=8,375). The pool did not include those non-responding persons who we know never received the mail survey (i.e., the mailings came back as undeliverable upon repeat mailings to supposedly current addresses), those who indicated to us that they did not want to participate, and those who are deceased. Thus, a stratified, random sample of 500 persons were selected and invited to participate in the telephone interview. This subset was selected so that it was of similar proportion in terms of gender as the larger group from which it was sampled (~10%)

and was oversampled for the younger age group so that 50% will be less than 35 years of age. Our aim was to interview ~50% of the selected subset. (Note: In the 2003 Annual Report, we noted that we would also stratify by education. However, as the overall sample was only ~10% female, we were not able to stratify both by gender and education and still obtain a representative number of women with high and low levels of education within a sample of 500. Therefore, to select the sample of 500, we oversampled on age but only stratified by gender.)

The Non-Response (NR) telephone interview was carried out in the summer of 2003 by trained interview staff at John Snow Institute (JSI). A total of 230 persons participated in the NR telephone interview. The survey datafile was provided to us in October 2003.

Task 2 Analysis of telephone interview responses. **[STATUS: COMPLETED]**

Conducting the telephone interview and analysis of the results has provided important information about the reasons for the observed low response rate in the mail survey and about potential respondent bias. In summary, we discovered that greater than 30% reported never receiving the mail survey. This was the primary reason noted for why people did not participate in the mailed survey study. We also found that there were no substantial differences in the health status and ARNG or civilian job characteristics between the NR telephone interview responders compared to our mail survey responders, suggesting there is little or minimal response bias with our mail survey responders. And, 86% of NR telephone interview responders said they felt it was important for health researchers to study health and job characteristics of ARNG members.

A total of 230 persons completed the NR telephone interview, representing a 56% (230/412) response rate with those persons who could be located. Approximately 25% of those persons located declined to participate in the NR telephone interview. Almost 7% of the targeted sample was deployed or mobilized at the time of the interview, so the response rate achieved with those persons who were both located and able to be contacted was about 62%.

As described above, there were 2 purposes for conducting the telephone interview with survey non-responders: 1) to ascertain whether the survey non-responders remember receiving the mail survey that was mailed, and 2) to ascertain whether there may be differences in current health status and current civilian and ARNG job differences between the survey responders and the group of non-responders that would affect the generalizability of study results.

<u>Assessment of mail survey process.</u>
As part of the telephone interview, we asked a series of questions about receiving the mail survey and if participants answered 'yes' they did remember receiving it, what was the reason why they did not participate (**Table 1**). Of the 31% that stated they never remembered receiving our mail survey, the reasons why can be explained by either a recent change of address, having been activated or deployed, or living in an apartment with centralized mail delivery.

TABLE 1. Question #1: Do you remember receiving the [mail] survey?69% Yes (n=157) 31% No (n=72)
If No, then asked Q# 2-4.
Question#2: Has your address changed since Spring 2002? 49% Yes (n=40)
Question #3: Have you recently been activated or deployed? 25% Yes (n=19)
Question #4: Do you live in an apartment or condo complex with central mail delivery? 13% Yes (n=10)
Question #5 (asked of all): Is there a reason why you did not participate in the original mail survey?
<u>Top 5 reasons given</u>: 30% never received survey in the mail
17% were too busy and had no time to complete it
7% had done it and said mailed it back to us
5% didn't think it applied to them as no longer in the NG

Assessment of response bias and generalizability of mail survey results to larger MA ARNG population. No significant differences in demographic-type information were observed between the 230 Telephone interview responders and the 270 non-responders from the stratified random sample selected. (That is, there were no differences in age, gender, # years served in the military, rank (officer vs. other), education level, marital status (married vs. other), race/ethnicity (white, Caucasian vs. other), or prior deployment on any major mission (such as Vietnam, Persian Gulf, Bosnia, Kosovo) based on information obtained from DMDC at the outset of the study). When comparing the 230 NR telephone interview responders to the larger pool of mail survey non-responders (n=8,654), the only significant differences between these groups were age, years since entry into the service, and marital status. The NR telephone interview responders were slightly older (35.8 (SD=10.6) vs. 33.4 (SD=10.0) years). However, when the comparison analyses of marital status and years since entry into the service were re-run adjusting for age differences, the differences between the groups on these two variables were no longer significant.

No substantial differences in current health status or military/civilian job characteristics were found between the NR telephone interview and mail survey participants (**TABLE 2**). By over-sampling on age design, the NR telephone interview targeted a younger pool of MA ARNG members, and thus the two groups did differ in age.

TABLE 2.

	NR Telephone Interview Responders (n=230)	Mail Survey Responders (n=1,970)	
Age	36.6 (10.6) [range: 20-66]	39.6 (11.7) [range: 18-65]	p< 0.001
			Age-adjusted, * p<.05
Education	14.2 (2.2)	14.1 (2.4)	
Physical Component Summary score (V/SF36)	53.1 (7.4)	52.8 (7.8)	
Mental Component Summary score (V/SF36)	54.4 (9.3)	53.2 (9.3)	
Job Demands-NG job (Karasek scoring, 1985)	31.6 (5.4)	30.9 (5.9)	
Job Control- NG job (Karasek scoring, 1985)	64.6 (12.7)	66.3 (14.1)	
Job Demands- Civ. Job (Karasek scoring, 1985)	32.6 (6.0)	31.7 (5.9)	
Job Control-Civ. Job (Karasek scoring, 1985)	72.4 (12.9)	71.3 (13.5)	
# Hours worked/week- Civ. Job	45.4 (11.6)	43.1 (23.9)	
% Female	9.1%	13.1%	
% Non-White, Caucasian	16.6%	21.8%	
% Married	51.3%	61.1%	
% In MA ARNG in 2000	68.7%	68.8%	
% Current Officer	10.8%	18.7%	
% Retired Officer	9.9%	14.1%	
% Satisfied with NG job	79.4%	74.4%	
% Satisfied with Civ job	87.4%	83.9%	
% Have Civ. Job	83.5%	80.1%	
% Limits on Physical Activity	16.7%	14.0%	
% Current Smoker	21.7%	22.3%	
% Current Chewing Tobacco use	3.9%	4.2%	
% Health rating of fair or poor	5.2%	6.0%	
% Deployed (> 1 month overseas) with ARNG	34.3%	29.3%	

Task 3 Carry out analytic plans to test study hypotheses related to the mail survey. **[STATUS: IN PROGRESS]**

We have created a master database that contains all the mail survey response data and linked available HRA data. A total of 89% of the survey responders provided specific consent for us to access their recent HRA data. We obtained available HRA data (i.e., it existed), primarily through collaboration with the MA ARNG, for 462/1738 of the survey responders. Additionally, through a separate request to COL Rubertone (AMSA, CHPPM), we obtained HRA data for an additional 109 persons, for a total of 570 (or 29% of the survey responders).

A series of initial data management steps (see below) have been carried out in preparation for the carrying out the analytic plans to test the Study Hypotheses.

Survey scale characteristics and internal consistency estimates.
Estimates of internal consistency reliabilities for selected survey scales are presented in **TABLE 3**. As shown, estimates were quite good, with 13 out of 21 of the reliabilities 0.85 or higher and 18 out of 21 greater than 0.80.

TABLE 3.

		N	# items in scale	Alpha
SF36V Subscales	Ware, 1993, 1994; Kazis 2000			
Physical Functioning		1,958	10	0.93
Role-Physical		1,950	4	0.94
Bodily Pain		1,951	2	0.91
General Health		1,967	5	0.82
Vitality		1,955	4	0.83
Social Functioning		1,957	2	0.85
Role-Emotional		1,949	3	0.91
Mental Health		1,956	5	0.83
JCQ	Karasek, 1985			
NG job- Decision Latitude		1,845	9	0.86
NG job- Job Demands		1,853	5	0.63
Civ. job- Decision Latitude		1,565#	9	0.87
Civ. job- Job Demands		1,541#	5	0.66
Cognitive Functioning Scale	Beurskens et al., 2000	1,943	4	0.90
CIS Fatigue		1,805	20	0.92
BSI-18	Derogatis, 2000	1,882	18	0.92
Somatization		1,908	6	0.76
Depression		1,906	6	0.90
Anxiety		1,906	6	0.83
PTSD Checklist	Weathers et al., 1993; Blanchard et al., 1996	1,867	17	0.94
Family Support of Work Inventory	Adapted from King et al., 1995			
NG job		1,446 #	10	0.86
Civ. job		1,228 #	10	0.88

sample sizes are lower, as not everyone had a civilian job and/or family group

Analyses of respondent characteristics and responses between those who completed the survey pre- and post-September 11, 2001.

Because of the potential for changes in MA ARNG soldiers' working lives post-September 11, 2001, we examined whether there were differences between mail survey responders pre-September 11 and post-September 11. A total of 611 persons responded before September 11 and 1,359 responded to the mail survey after September 11, 2001. No major differences between the responder groups were noted. Overall, those persons responding pre-September 11 did report significantly higher levels of civilian and ARNG job decision latitude (that is, more job control) compared to those responding post-September 11. However, these differences were not present when restricted to those currently in the MA ARNG at the time of the mail survey.

Military Occupational Specialty codes.

As part of this project, we are in the process of constructing a two-dimensional demand/control matrix depicting the distribution of high and low strain and active and passive jobs based on ARNG military occupation specialties, in a manner similar to the JCQ occupational score standardization system (Karasek and Theorell, 1990) and the occupational linkage system (Schwartz et al., 1988).

For this, we plan to graph a four-quadrant matrix distribution that displays different jobs according to whether they are classified as high or low strain jobs and active or passive jobs, with axis split at the median (See **Figure 1A** and **1B**). For example, in civilian setting, the *active job* quadrant (upper right) includes jobs with high demands and high control, such as public officials, physicians, and engineers; the *high strain* quadrant (lower right) includes jobs with high demands and low control, such as assembly line workers, waiters, and freight handlers. We are not aware that a similar standardization of JCQ scores exists for military occupation codes overall nor for National Guard service jobs specifically. Such a system would be useful as a categorization scheme of higher or lower ARNG job strain that may, in turn, influence job performance and health. Also, development a MOS linkage system that permits military job content scores to be linked with other military health surveillance databases for the purposes of epidemiologic research would prove informative.

Figure 1C displays in the ARNG job strain matrix with the 19 most prevalent MOS categories within the mail survey responders who were currently serving in the MA ARNG as enlisted soldiers. The four MA ARNG MOSs depicted in the high job strain quadrant are 11B (infantry), 12B (combat engineer), 95B (military police), and 91B (medical specialist).

Figure 1A

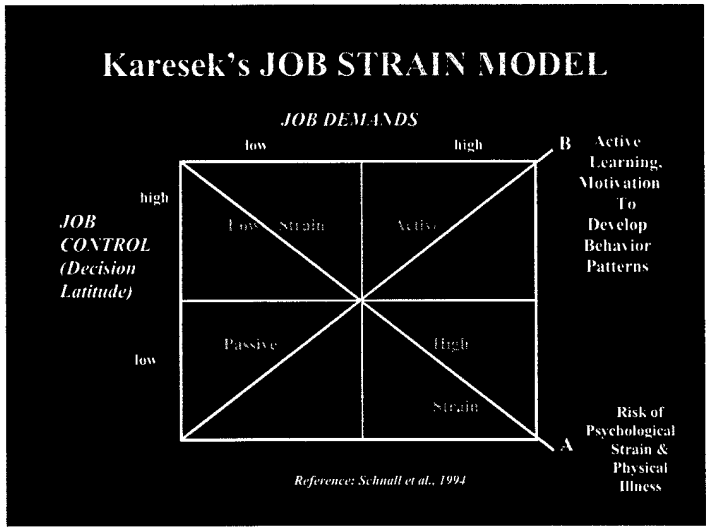
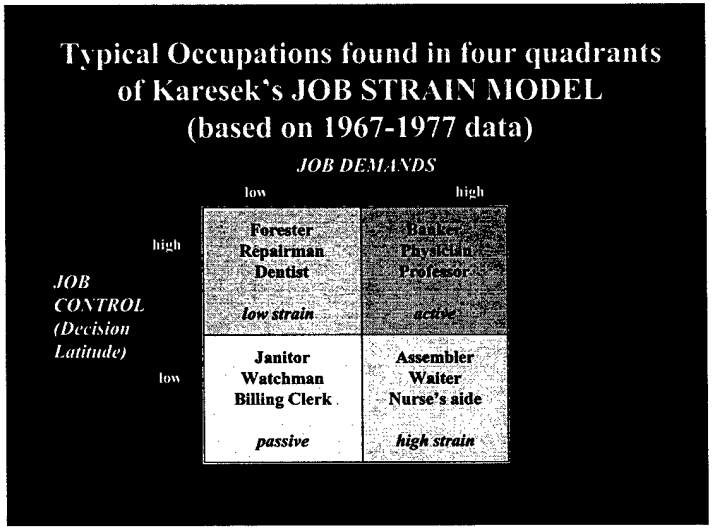
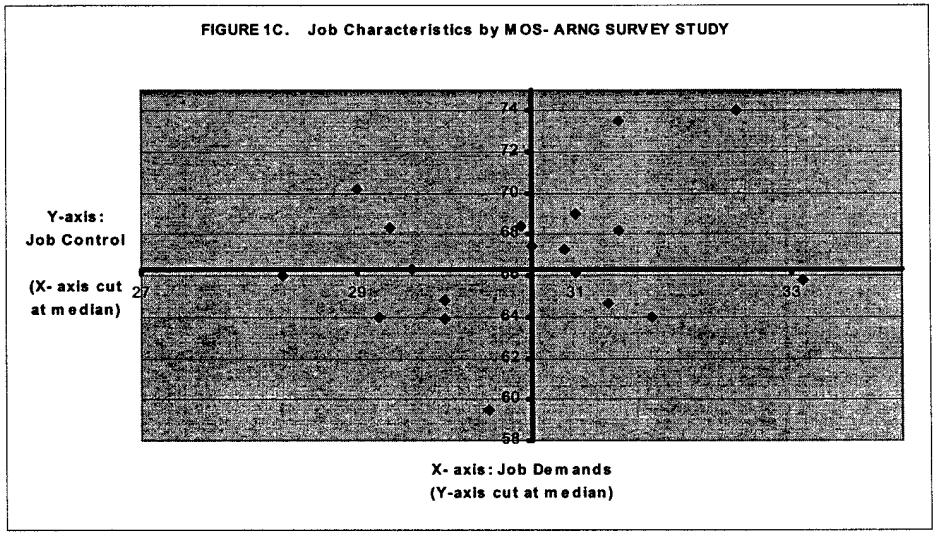


Figure 1B





Status of analytic plans to test study hypotheses.
Results from the testing of **Hypotheses #1 and #7** have been reported in prior Annual Reports, so we will not reiterate the findings again in this report. We are in the process of addressing each of these hypotheses as part of our data analytic plan. A summary of some descriptive aspects related to the Hypotheses is presented below. A timetable for the projected analyses and manuscript preparations is presented on page 14 below.

Study Hypotheses
✓ ***Hypothesis #1***: Overall, the functional health status of current ARNG members will be similar to or better than other US healthy population norms, adjusted or stratified by age and gender.
Hypothesis #2: The Physical Functioning and Role-Physical subscales and the Physical Component Summary (PCS) from the SF36 will be significantly correlated to the health risk appraisal parameter, assessed within the past five years as part of the HRA, adjusted or stratified by age, gender and prior deployment. ***Hypothesis #3***: Increased job strain of one's military and civilian job is related to lower functional status and increased fatigue symptomatology. ***Hypothesis #4***: National Guard job strain characteristics (high job demands, low decision latitude or control) along with job insecurity, lower coworker and supervisor support, and a hazardous work environment will predict poorer military job performance. ***Hypothesis #5***: National Guard job strain will confound or modify the relationship between the effect of civilian job strain and adverse functional health status. ***Hypothesis #6:*** Job strain of one's civilian and National Guard job will be highly correlated with increased frequency of occupational stress (as recorded on the HRA within the past five years). And, it is predicted that NG job strain will be more highly correlated with the HRA response than civilian job strain.
✓ ***Hypothesis #7:*** Those ARNG members that have left the service within the past three years will have significantly lower functional health status compared to those who have remained in the service.
Hypothesis #8: Those persons in high strain NG jobs would be more likely to leave the ARNG.

Table 2 above **(column 3)** presents the descriptive characteristics for all survey responders. As might be expected, the group of former ARNG members is significantly older than the current members group. This observation is most likely related to the fact that former members have reached an age and/or cut-off number of years of service in order to retire from the ARNG. The group of former members is also less likely to have been an officer or deployed previously, and a significantly higher number of former ARNG members report to be in poor or fair (versus good, very good, or excellent) health compared to current ARNG members. There are no significant differences in education level, gender, race/ethnicity, and marital status between the current and former ARNG members completing the survey.

As described in last year's Annual Report, we initiated preliminary analyses to examine whether increased job demands or low job control as distinct independent variables and job strain (defined as high job demands divided by low job control; according to Karasek, 1985) in one's military and civilian job are related to lower functional health status, increased fatigue symptomatology ***(Hypothesis #3***) and poorer ARNG and civilian job performance ***(Hypothesis #4***). Correlations between these independent and dependent variables suggest that ARNG job demands or degree of job control are not strongly correlated with worse physical functional health. However, higher levels of ARNG job control was significantly correlated with better mental functional health and lower fatigue levels. Increased ARNG

job demands and less ARNG job control was significantly correlated with poorer ARNG job performance measures (e.g., missing work, injury on the job). Initial efforts to examine ***Hypothesis #5*** have been carried out and an abstract describing this work was presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health Conference in March 2003 (Rosenman et al., 2003, see attached). In summary, civilian job strain was significantly associated with increased civilian job performance problems [regression coefficient =2.44 (SE=0.65), $p<0.001$], after adjusting for age, gender, education, marital status, rank, and civilian job satisfaction. However, participants with higher civilian job strain have more job performance problems with increasing amounts of ARNG job strain [regression coefficient for the ARNG/civilian job strain interaction variable=3.875 (SE=1.605), $p=0.016$]. In a separate model, ARNG job strain was significantly associated with increased ARNG job performance problems [regression coefficient =3.45 (SE=0.70), $p<0.001$], after adjusting for age, gender, education, marital status, rank, and ARNG job satisfaction, but there was no evidence of an interaction effect between ARNG and civilian job strain on ARNG job performance.

Additionally, over the past year, we have examined the role that reported exposure to hazardous environments in one's military or civilian jobs may have on health status. Almost 30% of survey responders report a problem with exposure to dangerous chemicals at their current ARNG job as well as at their civilian job. About 13%, 67%, and 23% report having been exposed to pesticides, organic solvents, and metals, respectively, while working their ARNG jobs. As might be expected, those MOS categories reporting the highest rates of exposure to organic solvents include jobs that involve machine/engine repair and motor transportation operators (for example, 88M (motor transport operator), 62B (construction equipment repairer), 63B (light wheel vehicle mechanic), 12B (combat engineers)).

Currently, we are working to prepare a manuscript that will describe the complete series of results from ***Hypotheses*** #1, 2, 3, 4, & 5 (Working Title: Occupational Health of Army National Guard Members: Relationship between Job Demands and Health Status and Job Performance Measures).

As described above, we obtained HRA data for 570 of the survey responders and will utilize these data to address ***Hypotheses #2 and #6***. As part of ***Hypothesis #6***, we have examined whether reported job stress on the HRA was correlated with ARNG and civilian job strain scores from the mail survey. We predicted that HRA reported occupational stress would be associated with ARNG job strain characteristics and would correspond more with ARNG job strain compared to civilian job strain. Of the 541 persons with HRA data and who answered the question "How often do you feel your present work situation is putting you under too much stress?", 5.4% reported often, 26% reported sometimes, 44% reported seldom, and 25% reported never.

Figure 2. ARNG Work Stress

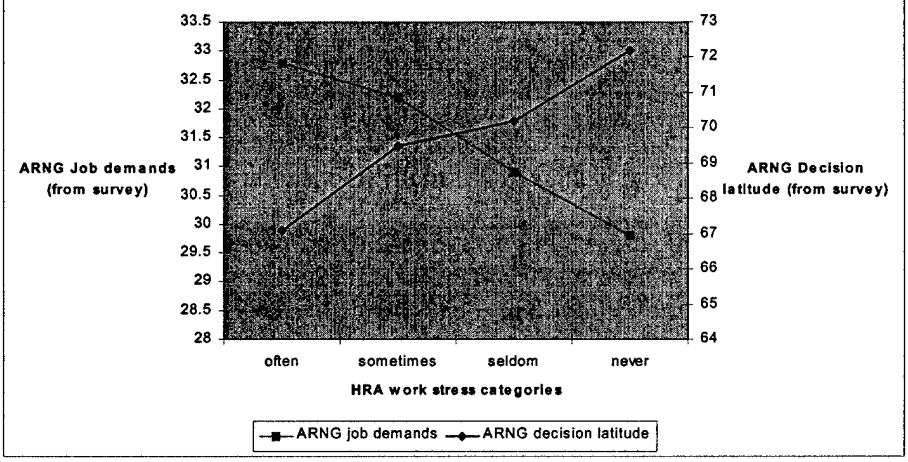


Figure 2 presents the mean ARNG job demands and decision latitude (job control) scores by HRA work stress categories. As predicted, those who report a higher frequency of work stress on the HRA report higher ARNG job demands ($F=4.2$; df 3, $p=0.006$), lower levels of job control ($F=1.8$; df 3, $p=0.15$), and higher job strain (ARNG job demands divided by decision latitude, ($F=7.9$; df 3, $p<0.001$, data not graphed). HRA work stress is also associated with higher levels of civilian job demands but does not correspond with civilian job decision latitude scores.

Work to calculate the 'MOS-assigned job strain' scores in order to address ***Hypothesis #8*** are in progress. We predict that those persons in high strain ARNG jobs would be more likely to leave the ARNG. But, rather than relying on the retrospective recall of National Guard job characteristics in those persons who have left the service, we will utilize the developed matrix and the 'MOS-assigned job strain' scores for current ARNG members to test this hypothesis.

Task 4 Manuscript preparation for publication submissions. **[STATUS: IN PROGRESS]**
Task 5 Write final study report. **[STATUS: IN PROGRESS]**

Aspects of Tasks 4 & 5 are underway. The upcoming Study Advisory Group meeting is scheduled for February 24, 2004. The primary purpose is to discuss the results from the NR telephone interviews, data analyses, and manuscript preparation plans.

PLANNED DATA ANALYSES & TIMETABLE

For the purposes of manuscript preparation analyses, our first focus is testing ***Hypotheses #1, 2, 3, 4, & 5***. We anticipate completing the review of results and drafting a manuscript for submission by Summer 2004. As described above, the working title for this paper is 'Occupational Health of Army National Guard Members: Relationship between Job Demands and Health Status and Job Performance Measures'.

Results from the construction and analyses of the MOS matrix and testing ***Hypotheses #8*** will be the second analytic focus. We anticipate completing the review of results and drafting a manuscript for submission by Fall/Winter 2004.

Descriptive analyses of the reasons provided for joining, remaining in, and leaving the ARNG, along with testing ***Hypotheses #7*** and examining ARNG retention predictors, will be reviewed in Fall 2004.

Summary of Year 4 Work Tasks for Project #1 (survey study)

At the end of this fourth year of funding, we have made progress on all the tasks set forth this year. For those issues that we have identified along the way as needing specific attention, we have taken specific actions (see below). We anticipate completion of all the SOW tasks at the conclusion of the approved grant period.

Specific actions taken:

- Efforts to understand survey response and generalizability of results.
  As described above, we have initiated several avenues to better understand the reasons for participating or not deciding to participate in this mail survey study and to address the generalizability of study results. By conducting the NR telephone interview study, we are better able to address and describe study generalizability and response rate issues.

- Continued publicity and communication with research subjects and ARNG personnel.

  1) The study website (www.nationalguardstudy.org) has been created to provide a more efficient way to provide information to potential subjects about the two related ARNG research projects. In the latter part of this past year, we have made plans to update the website with study results. These updates are in various stages of obtaining IRB approvals before posting.

  2) Throughout the year, the PI has maintained email correspondence or met with the Adjutant General MG Keefe and COL Zimelman (MA ARNG State Surgeon) and unit commanders of the MA ARNG as well as COL Gaffney (NG Surgeon) to update them on the study's progression.

  3) Additional methods to communicate study results are scheduled to be discussed at the upcoming Study Advisory Board meeting.

- Recognition of need for long-term health and wellness surveillance automated database systems within ARNG.

  Throughout the course of this study the PI has been involved in conversations with several ARNG leaders about the nature of the current ARNG and total Army medical surveillance database systems, particularly in order to maintain and document medical readiness and longer-term chronic health issues within this military population. Several newer automated data systems exist (such as MEDPROS), but continued attention is needed to assess the capability and utility of these data systems to track prospective health issues pertaining to medical readiness research and surveillance.

PROJECT #2. Health Status of Current National Guard Members: Deployment Health Issues

In February 2001, it came to our attention that a group of MA ARNG members were due to be deployed to Bosnia in August/September 2001. We submitted a request for supplemental funds to conduct a prospective field study (pre- and post-deployment) with these ARNG members and a comparison group (request submitted 2/13/01). The request was approved and funding was awarded June 2001.

The project has 3 primary objectives:
1) Characterize and descriptively analyze selected outcome variables concerning functional health, cognitive abilities (in terms of attention and concentration) as measured by computer-assisted tests from the Neurobehavioral Evaluation System, Inc. (NES3, Letz 1990, 1999; Proctor et al., 2000), and general well-being (such as the HRA risk index score, diastolic and systolic blood pressure that are collected as part of routine ARNG medical evaluations) in a group of MA ARNG before deployment and compare the results to those obtained from comparison group of MA ARNG members who are undergoing their routinely scheduled ARNG training exercises and/or medical examinations over the same time period (pre-deployment comparisons).
2) Compare differences in the various outcome variables over time within the Bosnia deployed group (e.g., pre-, during-, and post- deployment) and within the comparison group.
3) Contrast the differences over time between the Bosnia-deployed group and the non-deployed group.

An additional request and amended SOW was submitted in June 2001 to include a during-deployment assessment (with the support and assistance of MAJ Ness, US Army Medical Research Unit-Europe) and to additionally include selected cognitive tests from the Automated Neurocognitive Assessment Module (ANAM, Reeves et al., 2000) in order to validate in comparison to NES3 tests. The ANAM is a computer-assisted cognitive test battery that has been developed over the past 20 years within the military setting. This amended SOW was approved in July 2001. (BU IRB and HSRRB approvals for this project were made in July 2001.) Thus, the secondary objective of this study is to assess the feasibility and construct validity of administering selected ANAM tests in an operational environment.

The approved study protocol involves asking members from both the deployed and non-deployed comparison groups to participate in an interview to examine current health and ARNG job characteristics, complete a brief survey of concerning current health status, and perform a cognitive test battery (to examine attention and concentration abilities) with a combination of computer-assisted tests (i.e., NES3 and ANAM tests). For those participating subjects who are being deployed to Bosnia, they are being assessed pre-deployment, during-deployment, immediately post-deployment, and one-year post-deployment. The participants in the comparison group are being assessed at three timepoints within a time frame comparable to the deployed group's pre-deployment, post-deployment, and one-year post-deployment testing sessions.

[Summary of Year 1 SOW-shaded in gray; Year 1 of project #2 was actually June 2001- June 2002]

Approved SOW tasks for deployment health study project (Year 1) (*NOTE #1)

	01-start date	
Task 1	Month 1	Orient project staff to project tasks
Task 2	Months 2-7	Interview and test group of both MA ARNG deployed and control groups: pre-deployment Set-up subject tracking procedures
Task 3	Months 4-12	Plan and test group of Bosnia-deployed subjects during-deployment
Task 4	Months 8-12	Analyze collected data

Year 2 SOW; Year 2 of project #2 was actually July 2002-June 2003
Approved SOW tasks for deployment health study project (Year 2) (NOTE #2)**

Task 1	Months 1-4	Continue analyses and plan scheduling logistics for immediate post-deployment testing and interviewing.
Task 2	Months 5-8	Interview and test group of MA ARNG deployed and control groups: immediate post-deployment
Task 3	Months 5-12	Carry-out longitudinal data analyses (examining hypotheses)
Task 4	Months 11-12	Plan & conduct the 1-year post-deployment follow-up.

Year 3 SOW; Year 3 was originally June 2003-Jan 2004 but has been revised (*NOTE #3)**
Approved SOW tasks for deployment health study project (Year 3)

Task 1	Months 1-6	Complete analyses; Write final report; Manuscript preparation for publication submissions.

* NOTE #1: When this funding award was initially made in June 2001, the timetable in terms of the award was altered to end July 2003.
** NOTE #2: When a supplemental funding award was made in May/June 2002, the award timetable was revised to end January 2004 in order to complete the 1-year post-deployment follow-up testing and prospective analyses. As the start date for this project does not coincide with the annual cycle date of project #1, the annual reporting on this project is off-cycle by 6 months.
** NOTE #3: We have requested and been approved for a no-cost extension to this funding award to complete all statement of work tasks by July 23, 2005.

In this past year, we have completed all data collection aspects of project #2 and have initiated all aspects of analytic plan (see summary below for Year 3).

Year 3-Summary Status of Tasks
Task 1. Plan & conduct the 1-year post-deployment follow-up. **[STATUS: COMPLETED September 2003]**
Task 2. Carryout longitudinal data analyses. **[STATUS: In Progress]**
Task 3. Write final report; Manuscript preparation for publication submissions. **[STATUS: In Progress]**

Current status of study.
Figure 3 presents the Deployment Health Study timeline. To date, we have completed all planned assessment phases with both the deployed and comparison groups.

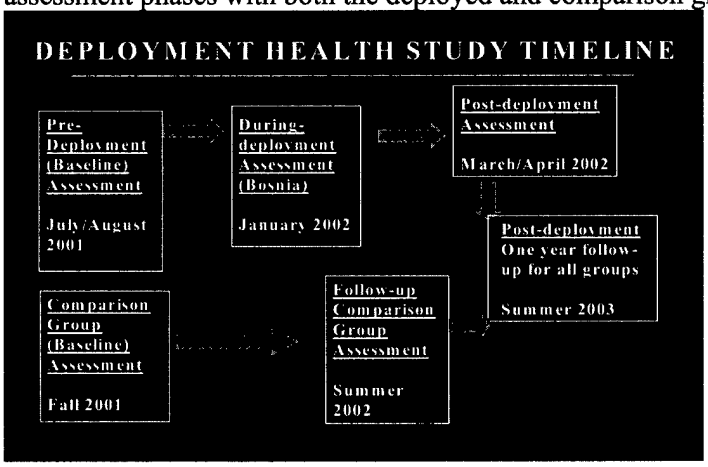


Figure 3.

A total of 171 Massachusetts ARNG soldiers are participating in this prospective study: 93 Bosnia-deployed and 78 non-Bosnia-deployed soldiers.

For purposes of discussion in this Report, we refer to the initial pre-deployment, baseline assessment with both groups in the Summer of 2001 as the "Time 1: Baseline" phase, the during-Bosnia-deployment assessment with the deployed group in January of 2002 as the "Time 2: During-deployment" phase, the immediately post-deployment (with deployed group) and follow-up with the comparison group in the Spring/Summer 2002 as the "Time 3: 1-year Follow-up" phase, and the final follow-up assessment with both groups in the Summer of 2003 as the "Time 4: 2-year Follow-up" phase.

Cohort tracking.
Over the study period, we have been able to track all cohort members in order to ascertain who has left the ARNG or remained in the ARNG over the course of the study. Almost 80% of the group has remained in the MA ARNG over this 2-year study period (**TABLE 4**), but about the majority of those still in the MA ARNG have been activated and serving on homeland security missions (**Figures 4A-C**). A significantly larger proportion of the comparison group (23%) compared to the Bosnia-deployed group (9%) has left the MA ARNG.

TABLE 4.

	Status at TIME 4: 2-year Follow-up				
At TIME 1: Baseline	Currently, in MA ARNG	Mobilized/activated, serving on homeland security missions	Transferred to other state ARNG	Retired/ No longer in ARNG	On Active duty-Deployed
Overall (n=171)	23% (n=40)	56% (95)	3% (5)	15% (26)	3% (5)
Deployed Group (n=93)	27% (25)	59% (55)	2% (2)	9% (8)	3% (3)
Comparison Group (n=78)	19% (15)	51% (40)	4% (3)	23% (18) *	3% (2)

*p <0.05, significant difference between Deployed vs. Comparison-group at TIME 4.

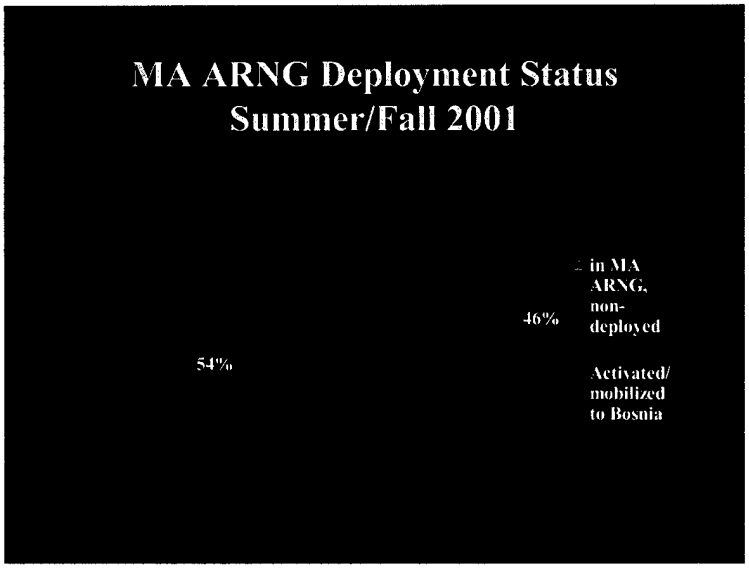
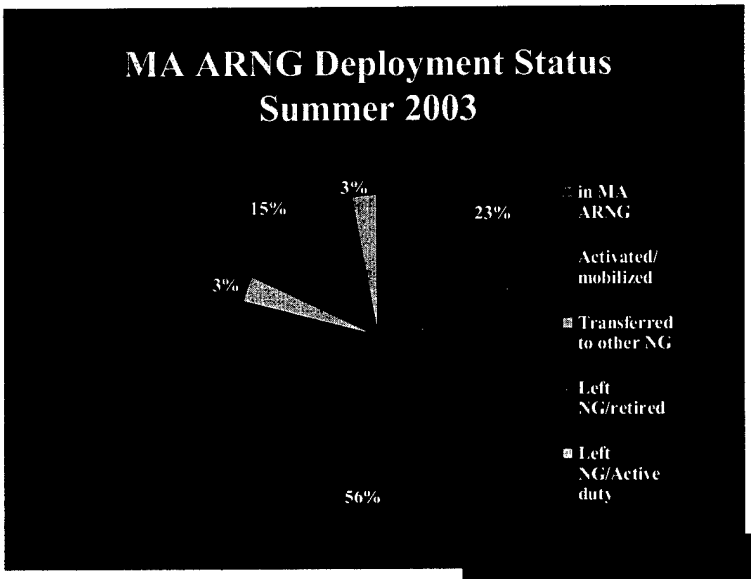
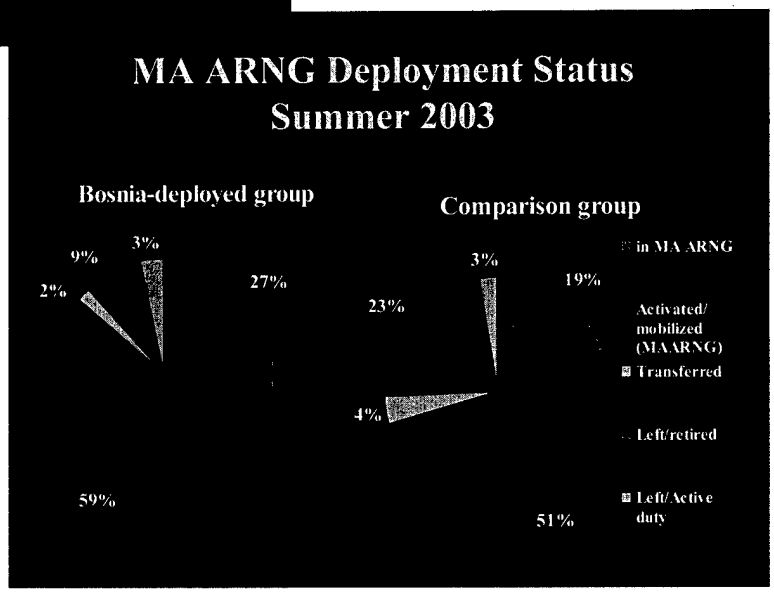


Figure 4A.

Figures 4B &C.





<u>Follow-up rates.</u>
Over the course of the study, we have achieved a 73-79% follow-up rate (**TABLE 5**).

TABLE 5. Study Follow-up rates.

	At TIME 1: Baseline		
	Overall (n=171)	Deployed Group (n=93)	Comparison Group (n=78)
Time 2: During-deployment	*	76% (71)	
Time 3: 1-year Follow-up	79% (135)	84% (78)	73% (57)
Time 4: 2-year Follow-up	73% (124) §	78% (73)	65% (51)

§ At the Time 4 assessment phase, we achieved an almost 90% follow-up rate with the group that has remained in the MA ARNG over the 2-year period.

Ninety-two percent of the participants (157/171) provided consent to access their AFQT, APRT, and medical records (to document reported medical conditions). Of those persons, we have been able to obtain requested data (i.e., it exists) for approximately 70-82% of the group at the Time 1: Baseline phase We were able to obtain HRA data for 57% of the group. At the Time 4: 2-year Follow-up phase was rates of retrieval were quite low (~20-33%, (**TABLE 6**). The primary reason for this low record retrieval rate was that we were not able to obtain information for 1) most all of those who had left the MA ARNG, were in another state's ARNG, or were on Active duty and deployed (~21%), or 2) those currently serving on activated status (56%), as their records moved with them (out of state).

TABLE 6. Rates of Data Types Obtained

TIME 1: Baseline	
AFQT	135/157 (86%)
APRT	120/157 (76%)
Medical Records	140/157 (89%)
HRA	97/157 (62%)
TIME 4: 2-year Follow-up	
APRT	34/157 (20%)
Medical Records	57/157 (33%)

Generalizability of study results.

Over the past year, we have examined the degree of descriptive comparability between our deployed study group (n=93) and the larger group of 225 MA ARNG soldiers who did deploy to Bosnia for SFOR10, as well as between the comparison study group (n=78) and the larger pool of 545 MA ARNG soldiers from same or similar unit types. Analyses of descriptive data from Defense Manpower Data Center (DMDC; less or equal to 35 vs. greater than 35 years, high school education level v. less than HS, officer vs. enlisted) indicates that our study group is generally comparable to the larger group from which it came from. The exception is rank, as our Bosnia-deployed group included a higher proportion of officers (17%) compared to larger deployed group (8%). There were no significant differences between the proportion of officers in the non-deployed comparison group (4%) and the larger group of non-deployed soldiers (9%). The reasons for the higher proportion of officers in the deployed group were discussed in last year's AR.

Task 3. Carryout longitudinal data analyses. **[STATUS: In Progress]**

Two primary hypotheses have been proposed for analyses in this study. We are in the process of addressing each of these hypotheses.

Study Hypotheses

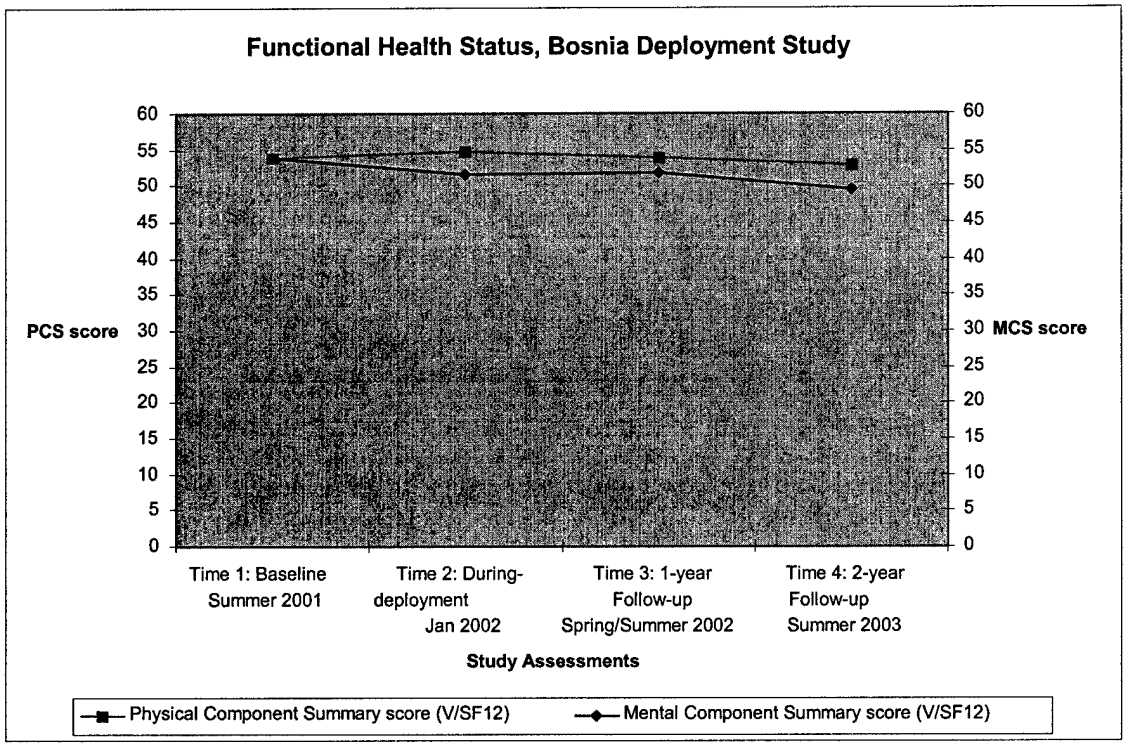
Hypothesis #1: We predict that baseline functional health status and cognitive functioning do not differ significantly between the Bosnia-deployed and comparison, non-deployed groups of ARNG soldiers.

Hypothesis #2: We predict that there will be differences in functional health status and cognitive functioning over time within Bosnia-deployed group, but no significant differences over time within comparison group.

Although there are some significant differences between the deployed and comparison groups at baseline (i.e., age and officer status) as discussed above, no other significant differences between these groups at baseline (***Hypothesis #1***) were noted in terms of functional health status (V/SF12), fatigue symptomatology, and NES3 test performances.

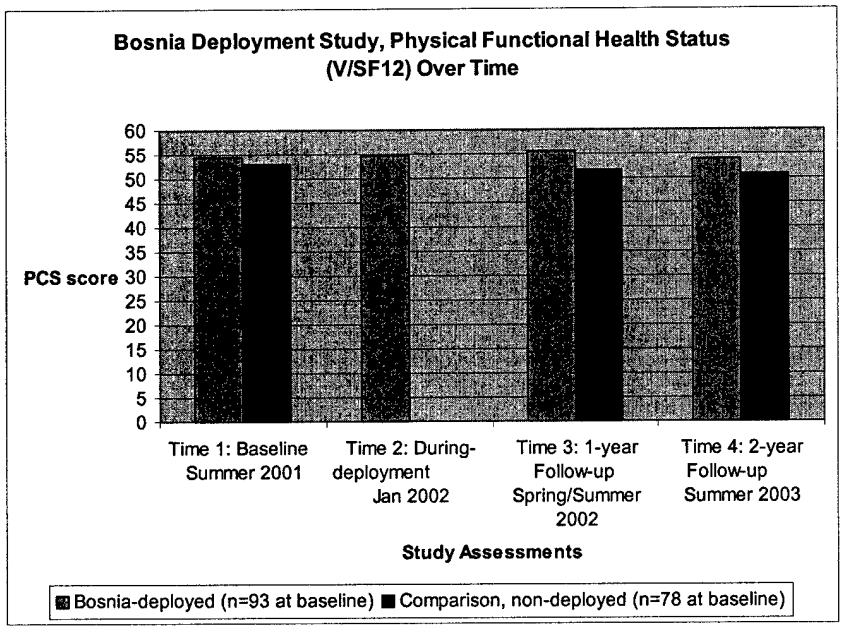
To address ***Hypothesis #2***, a series of analyses are in progress. Over the 2-year study period, we note that there are changes in both the Physical Component and Mental Component Summary scores (from the V/SF12, Kazis 1999) in both the deployed and non-deployed group, with both groups reporting poor functional status over time (**Figure 5**).

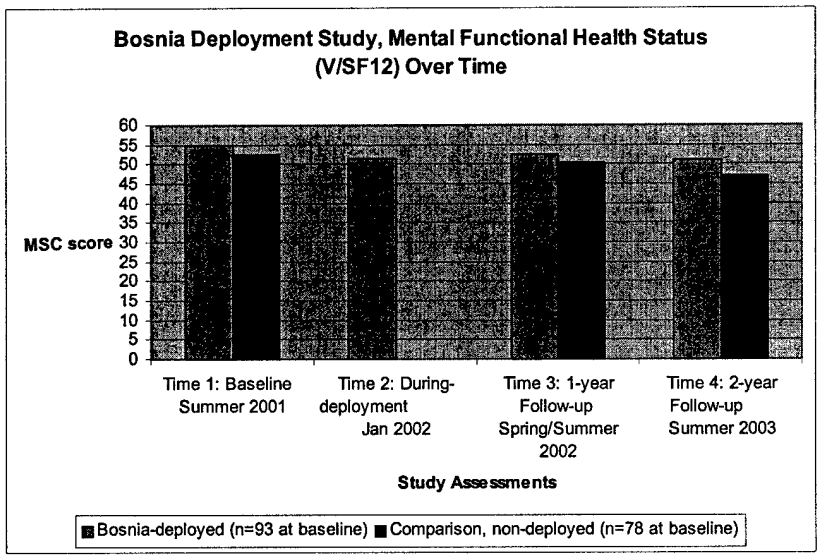
Figure 5.



As described in last year's AR, the deployed group reported significantly higher physical functioning (better) immediately after deployment; however, it appears that over the second year of the study, both physical and mental functional health has declined (**Figures 6A & B**).

Figures 6A&B





Aspects of testing ***Hypothesis #2*** (that is, whether deployment-related job characteristics are related to changes in functional health status or reported cognitive functioning) have been carried out and an abstract describing this work was presented at the Fifth Interdisciplinary Conference on Occupational

Stress and Health Conference in March 2003 (Dutille et al., 2003). In summary, soldiers' physical functioning improved between the pre- and post-deployment assessments (pre-deployment=54.4 (4.6), post-deployment=55.6 (3.4); paired t-test= -2.1, p=0.04) for the 77 deployed soldiers who completed both pre- and post-deployment assessments. Soldiers' cognitive functioning (CF) was worse over this time period (pre-deployment=87.3 (11.1), post-deployment=83.6 (16.7); paired t-test=1.9, p=0.06). Through hierarchical regression analyses that controlled for age, education level, rank, and pre-deployment functioning, deployment-related job strain changes were not found to be significantly associated with post-deployment physical health functioning. However, increased job strain over deployment was significantly associated with worse post-deployment CF (regression coefficient=-18.1 (SE=5.5), p=0.002). No significant group level differences in job strain or unit cohesion between three deployed units were noted. Within the deployed group over deployment, soldiers took significantly longer to respond to stimuli on the NES3 Continuous Performance Test (measure of sustained attention) with fewer errors, suggesting a strategic performance change.

Additional examination of deployment-related changes.
When examining health status and performance changes over time, we note some deployment-related changes. Analyses have been performed in SAS using generalized estimation equations (GEE) models to examine the repeated measures effects in the two groups over time. We have graphed these results for selected outcomes. (See **Figures 7A-D**.) The models examined whether there was a significant difference in outcome over time that was related to deployment (Deployment*visit (time) model) adjusting for age, education level, rank, and unit cohesion. In these models, we examined the differences between Time 1: Baseline and Time 3: 1-year Follow-up. In Figures 7A-D, we have graphed the results using 'typical' soldier in this study-- that is, not a college graduate nor an officer, who was 27.53 years of age at baseline, and who had mean unit cohesion values. Figure 7A depicts the change over time in the PCS score from the V/SF36. Figure 7B depicts the change over time in the CIS Fatigue scale (Beurskens et al., 2000). Figure 7C depicts the change over time in the NES3 Continuous Performance Test performance (mean response latency, msec). Figure 7D depicts the change over time in the POMS Depression scale score. (For all outcomes except the PCS score, a higher score indicates worse or slower functioning.)

Additional analyses to examine the role that change in ARNG job demands over deployment and over homeland security activities may play in health status and performance changes are in progress. Also, analyses of health status and computer-assisted NES3 cognitive test performances over the whole study period (2 years) in relationship to deployment-/homeland security-related factors and baseline risk characteristics within both the deployed and non-deployed groups are in progress.

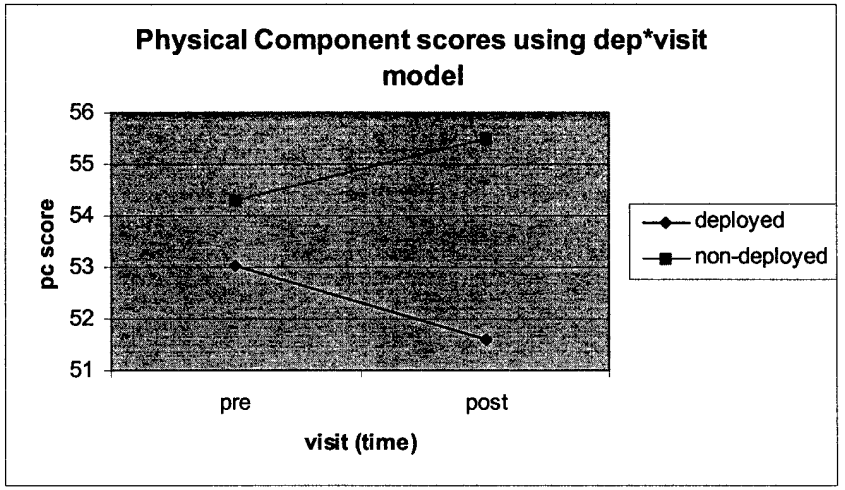


Figure 7A above.

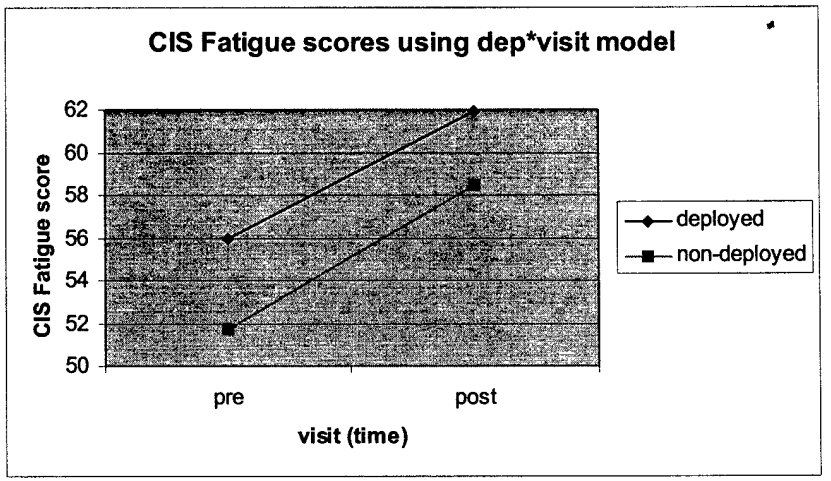


Figure 7B above.

Figure 7C below.

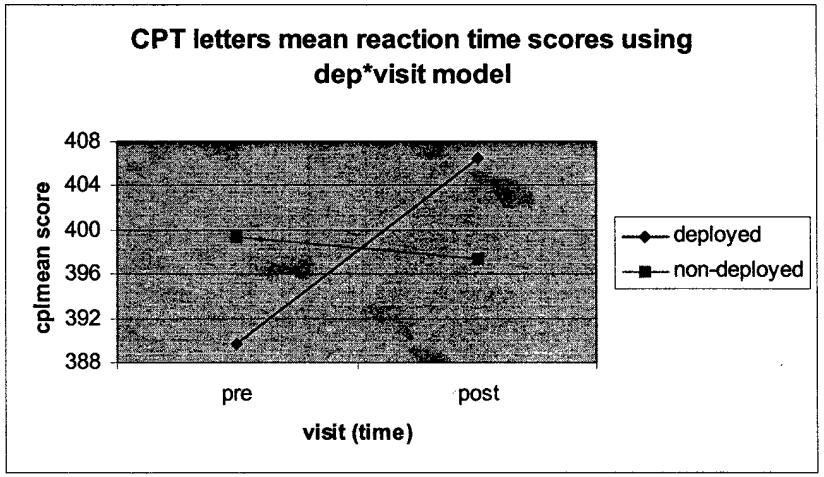
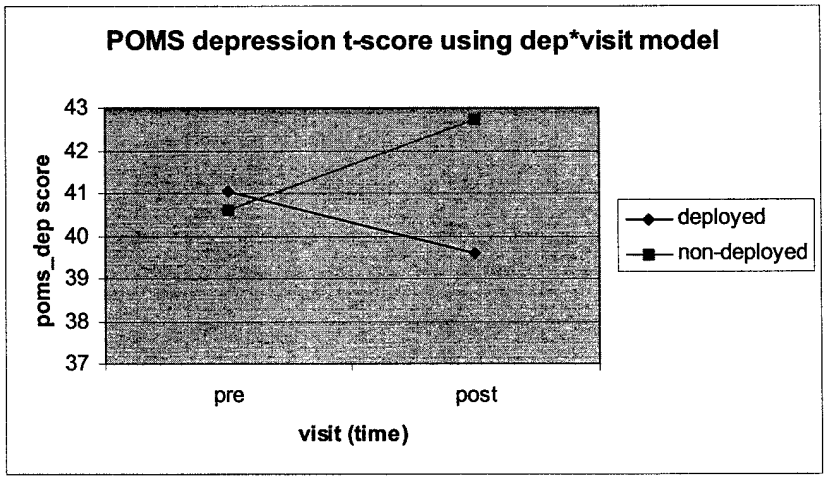


Figure 7D below.



PLANNED DATA ANALYSES & TIMETABLE

-For the purposes of manuscript preparation analyses, our first focus is testing ***Hypotheses #1 & 2*** focusing on deployment-related changes between Time 1 and Time 3 in terms of health status and cognitive performance (NES3). We anticipate completing the review of results and drafting a manuscript for submission by Summer 2004. The working title for this paper is 'Changes in Neurocognition in Army National Guard Soldiers over a Peacekeeping Deployment Mission'.

-Analyses of ***construct validity between NES3, ANAM, and ARES tests*** will be the second analytic focus. We anticipate completing the review of results and drafting a manuscript for submission by Fall/Winter 2004.

-Analyses of relationship between self-reported cognitive functioning and objective cognitive test performances (cross-sectionally) will be reviewed in Fall 2004.

-Analyses of ***Hypotheses #2*** focusing on post deployment/current mobilization status changes between Time 3 and Time 4 in terms of health status and cognitive performance (NES3) will be reviewed in early 2005.

Summary of Year 3 Work Tasks for Project #2

At the mid-point of this third year of the funding award, we have made progress on all the tasks set forth this year. The remainder of the project period will be completing the analyses addressing the hypotheses and longitudinal nature of the study design. We anticipate completion of all the SOW tasks at the conclusion of the approved grant period.

For those issues that we have identified along the way as needing specific attention, we have taken specific actions (see below).

Specific actions taken:

- Efforts to maintain communication with study participants for continued tracking efforts.
  1) Due to the importance of continued participant tracking efforts in a prospective study design, we initiated newsletter mailings to update participants on study progress and to maintain current addresses. In the past year, we worked closely with the MA ARNG Surgeon's office in order to ensure completeness in tracking the status of all study participants.
  2) The number of recent ARNG call-ups for deployment and homeland security missions (i.e., > 33% of MA ARNG soldiers have been activated or deployed in the past year) and the classified nature of the identities of deployed/activated soldiers has required continued contact with MA ARNG headquarters and commanders to be kept aware of these changes to the extent possible.

- Efforts to address generalizability of results. Through efforts from another study undertaken under IRB-exempt status, we are able to provide understanding for the comparability between those soldiers who have participated in this study and the group who did not and thus provide estimates of the generalizability of the study results. By design, the study results will be generalizable to ARNG soldiers on peacekeeping deployments, but not necessarily to combat missions. Due to the prospective nature of the study design and to increased activation for homeland security missions, we will also be able to examine

whether there are health status and cognitive performance changes related to this type of activation.

KEY RESEARCH ACCOMPLISHMENTS

During this funding period (Jan. 24, 2003- Jan. 23, 2004), we have completed most of the tasks set out in the Approved Statements of Work for both projects. It is anticipated that all tasks will be completed by the conclusion of the funding award period.

Project # 1-specific (the survey study) Research Accomplishments:

- Developed a comprehensive survey instrument, with good estimates of survey scale characteristics and internal consistency reliabilities, to systematically query current and former ARNG members about their jobs and aspects of their jobs that might impact their health.
- Established a data management system to enable efficient integration of the collected survey data with the HRA data obtained from MA ARNG databases.
- Conducted efforts to address the generalizability of study results, via a telephone interview with survey non-respondents.
- Initiated a data analysis and manuscript preparation timetable.

Project # 2-specific (the deployment health study) Research Accomplishments:

- Continued extensive tracking efforts to maintained a cohort of Bosnia-deployed MA ARNG subjects and a comparison group of non-deployed MA ARNG members for prospective study.
- Integrated ANAM tests into the study protocol in order to conduct a validation study of selected ANAM tests in comparison to performance on comparable NES3 tests in cross-sectional analyses.
- Tested the administration of ANAM tests on a hand-held computer device (ANAM Readiness Evaluation System, ARES) in the field.
- Successfully established and maintained a field study research team that is trained to conduct the study protocol in prospective field study settings with military personnel.
- Initiated a data analysis plan to address various aspects of longitudinal data analyses methods, as well as a manuscript preparation timetable.

Research accomplishments central to both projects:

- Establishment and continued updating of a study website as an efficient communication to and from research subjects and other interested parties.
- Planned study newsletters to participants to update them on the progress of the study (also posted on the study web-site).

REPORTABLE OUTCOMES

1. Abstract, Presentations, & Manuscripts

   - Several presentations have been made by the PI over this past year:

     Proctor SP. Examining the Occupational Health of Massachusetts Army National Guard members. 6th Annual Northeast Regional AMEDD Conference, January 26, 2003, Hanscom AFB, Bedford, Massachusetts.

     Proctor SP. Health Status of Current National Guard Members: Deployment Health Issues. Presented at the AIBS Force Health Protection Review Program, February 25, 2003, San Diego, California.

Proctor SP, Dutille KE, Rosenman ES, Zimelman A, Ness J, Reeves D, Elsmore T. Deployment Health Research Study: Computer-assisted assessment of cognitive performance among Army National Guard Members. Presented (by LTC Hover) at the 6th Annual Force Health Protection Conference, Albuquerque, New Mexico August 12, 2003.

Proctor SP. Examining the Occupational Health of Massachusetts Army National Guard members: Research Status Report. 7th Annual Northeast Regional AMEDD Conference, January 25, 2004, Hanscom AFB, Bedford, Massachusetts.

- Three Abstracts have been presented / See attachments.

  *Dutille KE, Rosenman ES, Pepper L, Proctor SP. Deployment-related job strain and health among Army National Guard members. To be presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 22, 2003.

  *Rosenman ES, Dutille KE, Pepper L, Proctor SP. Civilian Job Strain and Performance in Army National Guard Members. To be presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 21, 2003.

  *Proctor SP, Dutille KE, Rosenman ES, Zimelman A, Ness J, Reeves D, Elsmore T. Deployment Health Research Study: Computer-assisted assessment of cognitive performance among Army National Guard Members. Presented (by LTC Hover) at the 6th Annual Force Health Protection Conference, Albuquerque, New Mexico August 12, 2003.

- Two manuscripts, one for each study, are currently in the analyses stages. (See **PLANNED DATA ANALYSES & TIMETABLE** on pages 14 & 25.

2. Active Collaborations (in addition to MA ARNG collaborations)

- With colleagues CDR Dennis Reeves, and Dr. Timothy Elsmore to work on development and validation aspects of the ANAM & ARES. As part of this collaboration we anticipate being able to provide anonymous ANAM and ARES test performance data to these collaborators for integration into their master database system (following final data analyses and IRB approvals).
- With Dr. Ryan of the Millennium Cohort Study, in order to examine generalizability of results.
- With Tom Mangione, PhD and JSI (for their survey methodology expertise).
- With Dan and Lynda King, Ph.D. to explore additional longitudinal data analyses methods.

3. Research training opportunities

Three Boston University School of Public Health students have worked as Research Assistants on these projects. Two of them graduated with MPH degrees in May 2003 and the other in Jan 2004.

4. Funding applications based on work supported by this award

With Dr. Jennifer Vasterling (clinical neuropsychologist) from the New Orleans Veterans Affairs Medical Center, the PI was awarded joint DoD and VA funding to carry out a prospective assessment of changes in neurocognition pre- and post- deployment in to-be-deployed (2003) Gulf and non-Gulf deployed military personnel (#DAMD17-03-2-0020; Prospective Assessment of Neurocognition in Future Gulf-Deployed and Gulf-Nondeployed Military Personnel: A Pilot Study. PI: Jennifer J. Vasterling, Ph.D.; Co-PI: Susan P. Proctor, D.Sc.). This new project, the Iraq Deployment Study, follows a similar design and methodology to the PI's current study of Bosnia-deployed MA ARNG soldiers and data collection was initiated in April 2003. As of 1 February 2004, a total of ~1,400 Active-duty Army soldiers (including a Iraq-deployed group and a comparison group of non-deployed soldiers) have participated in the pre-deployment assessment phase.

CONCLUSIONS

The work on these funded projects are on-going. When completed, they will provide important information about the health and well-being of ARNG forces in the current Army climate and will identify occupational factors that relate either negatively or positively to health status and/or job performance (including cognitive readiness) and that can lead to implementation of effective intervention strategies that will protect and improve the health of National Guard members in the current military environment.

Recent efforts in the area of deployment health and Force Health Protection appear largely focused in the Active duty arena. There is also a need to provide some focused effort on National Guard and Reserve forces and this research need has been identified by the Institute of Medicine (1999, 2000) and mentioned at the recent session concerning Force Health Protection at the Conference on Illnesses among Gulf War Veterans (January 2001). The Army National Guard operates under a somewhat different structure than the Active Duty Army: politically, bureaucratically, and socially. Thus, to be most beneficial in designing effective strategies in deployment health protection one needs to understand the nature of who and what make up the ARNG forces in this current climate, as well as the State and National frameworks in which they operate. The two projects being conducted under this funding award are some of the first to focus of the specific occupational health issues surrounding ARNG service and deployment health.

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CIVILIAN JOB STRAIN AND PERFORMANCE
IN ARMY NATIONAL GUARD MEMBERS

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Using data from a cross-sectional survey study of current and former members of the Massachusetts Army National Guard (MA ARNG) conducted in 2001-2002,
we examined the relationship between civilian job strain and civilian job performance and determined whether National Guard-related job strain acts as either a confounder or an effect modifier of that relationship. While 1,971 subjects completed the survey, 860 were included in the following analyses as they were currently in the ARNG and also currently working a civilian job.
Civilian and ARNG job strain scores were calculated using answers from a subset of questions on the Karasek Job Content Questionnaire (JCQ). To assess civilian job performance problems, each respondent was asked how many times in the past year they had missed work, done poor quality work, arrived late or left early, did less work than usual, had an argument with a co-worker, or got injured on the job. A summary score for job performance problems was then calculated by summing the individual scores [mean (SD): 5.44 (5.3 1), range: 0-36].
Increasing civilian job strain was positively and significantly correlated with all job performance problem items as well as the overall job performance problem summary score (r=0.089-0.2l 1). Increasing ARNG job strain showed a positive, significant correlation with increasing civilian job strain, and increasing civilian job performance problems (r=0. 1 86,0. 128 respectively).
In multivariate linear regression analyses, civilian job strain was significantly associated with increased job performance problems [regression coefficient =2.436 (SE=0.65 1), p<O.OO1], after adjusting for age, gender, education, marital status, rank, and civilian job satisfaction. The inclusion of ARNG job strain in the model did not produce significant changes in the results (i.e. does not confound).
ARNG job strain does appear to act as an effect modifier. When civilian job strain is low, moving from a low to high ARNG strain job produces a subtle change in the civilian job performance problem score. However, when civilian job strain is medium or high, moving from a low to high ARNG strain job is associated with an increase in civilian job performance problem scores (0.29 and 1.09, respectively).
This effect modification will be taken into account in future analyses.

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DEPLOYMENT-RELATED JOB STRAIN AND HEALTH
AMONG ARMY NATIONAL GUARD MEMBERS

Kathryn E. Dutille, B.S.*, Erik Rosenman, B.A., Lewis Pepper, M.D., Boston University School of Public Health (BUSPH), Susan P. Proctor, DSc., BUSPH and VA Boston Health Care System

A group of Massachusetts Army National Guard (ARNG) soldiers has been studied prospectively over the course of their scheduled peacekeeping mission to Bosnia in 2001-2002, along with a comparison group of non-deployed ARNG members. One specific aim of this study is to evaluate the role of deployment-related experiences (e.g., job strain) on changes in physical health and fatigue-related cognitive functioning (e.g. attention and concentration) over a deployment mission.
A total of77/93 deployed subjects (83%) completed the questionnaire portion Of the protocol at both the pre- and post-deployment time point. The questionnaire included the SF12V and the MOS Cognitive Functioning Scale at each time point. ARNG job strain was assessed through the core 14-item Karasek Job Content scale. For this presentation, we focus on questionnaire responses from the deployed group concerning two outcomes of interest (physical health and cognitive functioning).
The mean age of this deployed ARNG group of77 soldiers is 28.2 years (range: 19-5 1). Approximately 88% are White, 55% are enlisted soldiers, 20% are married, 83% have some schooling beyond high school, and they are all males.
Soldiers' physical functioning improved between the pre- and post-deployment assessments (pre-deployment=54.4 (4.6), post-deployment=55.5 (3.4); paired t-test= -2.1, p=O.O4). Soldiers' cognitive functioning (CF) was worse over this time period (pre-deployment=87.3 (1 1 . 1), post-deployment=83.6 (1 6.7); paired t-test=I .9, p=O.O6).
Through hierarchical regression analyses that controlled for age, education level, rank, and pre-deployment functioning, deployment-related job strain changes were not found to be significantly associated with post-deployment physical health functioning.
Increased job strain over deployment was significantly associated with worse post-deployment CF (regression coefficient=-18.1 (SE=5.5), p=O.OO2). No significant group level differences in job strain or unit cohesion between three deployed units were noted.
Reported improvements in physical functioning over a deployment period are not associated with deployment-related job strain in this cohort of ARNG soldiers. However, results suggest that the cognitive functioning changes over a deployment period are related to changes in job strain factors. Modeling of computer-assisted cognitive test performance over time in relationship to changes in job strain among both the deployed and non-deployed groups is planned, along with further assessment of unit-level factors (such as unit cohesion and peacekeeping experiences).

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DEPLOYMENT HEALTH RESEARCH STUDY: COMPUTER-ASSISTED ASSESSMENT OF COGNITIVE PERFORMANCE AMONG ARMY NATIONAL GUARD MEMBERS

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There have been few research studies that focus on prospective assessment of military personnel to examine health status changes over deployment and that include pre-deployment baseline measurements. This research study has two objectives: 1) to characterize and evaluate the functional health and cognitive abilities (such as attention and concentration) of the deployed group over time and in comparison to a group of non-deployed Army National Guard members, and 2) to conduct a feasibility and field validation study involving computer-assisted test batteries.

We will report on the progress in our on-going prospective field study involving a group of US Army National Guard members who deployed to Bosnia in 2001-2002 as part of SFOR 10 (n=93) and a comparison group of non-Bosnia-deployed ARNG soldiers (n=78). Pre-, during-, and post-deployment assessments have been completed within the deployed group and the initial baseline and follow-up assessments have been carried out with the non-deployed group (coinciding with the pre- and post-deployment time frame). The 1-year post-deployment follow-up assessment phase for both groups is planned for the spring of 2003. The study protocol includes a questionnaire and interview to assess functional health status, unit cohesion, fatigue and cognitive functioning symptomatology, ARNG job characteristics, and deployment preparedness. Cognitive performances have been measured at each timepoint using selected tests from the computer-assisted Neurobehavioral Evaluation System (NES3) battery, a validated neurobehavioral test battery developed for the epidemiological field study of the effects of environmental and occupational exposures. Additionally, subjects performed selected tests from the computer-assisted Automated Neuropsychological Assessment Metric (ANAM) battery and from the newly adapted version of several ANAM tests to a hand-held computer (PDA) platform called the ANAM Readiness Evaluation System (ARES).

The mean age of the study participants is 28 years, with 72% reporting some post-high school education, and 11% being officers. Results suggest that over the deployment period the physical health functioning levels of those who deployed to Bosnia significantly improved while there were no significant changes in physical functioning in the group of soldiers who did not deploy. Reports of fatigue and cognitive functioning difficulties increased between the pre- and post-deployment assessments in both groups, however, the differences were not significant over time within the non-deployed group. Within the deployed group over deployment, soldiers took significantly longer to respond to stimuli on the NES3 Continuous Performance Test (measure of sustained attention) with fewer errors, suggesting a strategic performance change.

In our presentation, we will summarize our findings relating to changes in functional health and cognitive functioning over deployment and discuss our experiences with the cognitive test batteries in these field settings.