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RUNNING HEAD: OPTEMPO and Performance

It Cuts Both Ways: Differential Relations between
OPTEMPO and Performance

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Abstract

Recently, military researchers have recognized the need to focus on a unique organizational stressor currently affecting the military, operations tempo (OPTEMPO). In the present study OPTEMPO survey data and unit performance data were collected from 10 companies from the United States Army, Europe operating in garrison, training, and deployed settings. We posited that the impact of OPTEMPO on performance would not be universally detrimental, and that there would be differences in OPTEMPO, performance, and the relationship between OPTEMPO and performance across settings. Hypotheses were generally supported. OPTEMPO was most frequently found to be positively associated with performance whereas the perception of work overload was negatively related. The training environment had higher levels of OPTEMPO and performance than garrison or deployment. Implications and directions for future research are discussed.

Introduction

Occupational stress and the models that have been developed and built upon the study of occupational stress have been a dominant area of discussion and research for the past 25 years. In general, the occupational stress literature suggests that stressors in the environment or organization will lead to negative psychological and physical health, and poor performance (e.g., Beehr, 1995; Spector, Dwyer, & Jex, 1988). However, certain aspects of occupational stress (e.g., high work hours, hours of training) may not be universally detrimental in terms of affecting performance (e.g., Thomas, 2000; Kaminski, 2001). In the present study, we study occupational stress derived from high operational tempo in the US Army and its relationship with performance. We assert that high operational tempo may not only be negatively related to performance in the Army, but may be positively related to performance as well.

From the early 1990s to the present day, the US Army has reduced its forces by one-third across the entire Army. The decade-long draw down is a reflection of a shift in military threat away from the Cold-War model that preceded the fall of the Berlin Wall. Consequently, forces that comprise the US Army, Europe (USAREUR), have been particularly affected with a two-thirds reduction in forces during the corresponding period. However, a dramatic increase in operations tempo (OPTEMPO) has also accompanied the reduction in forces. In fact, military missions have increased a staggering 300 percent during this same time.

The convergence of the reduction in forces and the increase in OPTEMPO has become a particularly salient issue to military leaders, policy-makers, and planners as they have seen their personnel, budget, and resources placed under a greater strain as a

result. Just what are effects of being asked to do more with less? What are the effects in terms of soldier performance?

Research focusing on the effects of OPTEMPO on military performance outcomes has never been conducted. Although there is a large and diverse literature on the effects of stress on soldier health, the effect of stress associated with the increase in operations tempo (OPTEMPO stressors) has only recently received attention (e.g., Castro & Adler, 1999). Moreover, the important links between stress, climate, and performance in the military have just begun to be examined by researchers (e.g., Thomas, Bliese, & Bullis, 2000; Thomas, 2000).

Therefore, the present investigation makes a contribution to the literature by beginning the systematic study of OPTEMPO and its effects on performance. Furthermore, this study extends both the stressor and performance literature by focusing on each in an applied military context using a multi-trait, multi-method (MTMM) framework. Before turning to specific study hypotheses we will present a brief review of: 1) OPTEMPO, 2) performance, 3) their conceptual relationship, and 4) the importance of military environment in understanding this relationship.

What is OPTEMPO?

Conventionally, OPTEMPO refers to the pace of military operations and typically is conceptualized as occurring in a deployed mission environment. Castro and Adler argue, however, that the definition needs to be expanded to distinguish between different environmental settings. In addition to deployed soldiers, OPTEMPO likely affects soldiers when in garrison and when in training too. Limiting the focus of OPTEMPO to a single environment narrows the scope of soldiers' duties to a small proportion of their

actual duties. Indeed, soldiers spend a much greater proportion of their time in garrison or training, compared to in deployed settings. Although the demands of operating under increased OPTEMPO and with fewer resources exists in all three environments, the impact likely manifests itself in different ways. Broadening the definition of OPTEMPO to include all environments allows for the systematic study of key OPTEMPO markers in each environment. It isn't hard for one to imagine that stressors in a fast-paced garrison environment may differ from stressors in a deployed environment.

Performance

In contrast to the paucity of research studying the effects of OPTEMPO stress, much more literature exists on performance. However, a detailed review of the performance literature is beyond the scope of the present paper. We refer the reader to Borman's (1990) excellent review of performance measurement and conceptualization. For the purposes of this paper, our focus is on viewing performance through an appropriate organizational psychology framework that is applicable to the military.

Before delving into how performance is conceptualized and measured in organizations it is necessary to agree upon a working definition of job performance. Campbell (1990) views job performance as behaviors employees engage in while at work that contribute to organizational goals. Though this definition seems quite broad, it is sufficient in that it emphasizes that performance is made up of more than mere task competency and includes an array of job behaviors (e.g., Organ, 1994). Furthermore, job behaviors must contribute to organizational goals. Jex (1998) points out that some non-task specific behaviors can facilitate performance (e.g., developing and fostering relationships with coworkers) while some non-task specific behaviors can inhibit

performance (e.g., talking on the telephone). By expanding the concept of job performance to incorporate work-related behavior other than job-specific task competency, many researchers have concluded that performance is best conceptualized as multidimensional. We endorse this view and now describe two widely cited models of performance that build an appropriate foundation for the dimensions of performance assessed in the present study.

Project A Model of Performance

A great deal of conceptual and psychometric work has gone into the measurement and modeling of performance (e.g., Campbell, 1990; Murphy, 1990). One such model that is particularly relevant for the sample used in the present study is the Project A Model of Performance (Campbell, McHenry, & Wise, 1990).

The Project A Model was developed using LISREL confirmatory factor analysis with a large-scale sample of enlisted personnel in the US Army. Specifically, the model predicted criterion dimensions of performance appropriate for enlisted soldiers that were generalizable across nine jobs within the Army. The model specifies that overall performance is made up of five latent constructs: 1) *core technical proficiency*, 2) *general soldiering proficiency*, 3) *effort and peer leadership*, 4) *personal discipline*, and 5) *physical fitness and military bearing*. Operational measures tapping these latent dimensions of performance were peer and supervisory ratings, work sample and job knowledge tests, administrative awards, promotions, discipline problems, and physical fitness measures.

Campbell Model of Job Performance

Campbell (1990, 1993) provides an even broader framework from which to understand the multidimensionality of performance. In his model, Campbell specifies eight dimensions of performance (as cited in Campbell, 1999) that tap overall performance. These include: 1) *job-specific task proficiency*, 2) *non-job specific task proficiency*, 3) *written and oral communication proficiency*, 4) *demonstration of effort*, 5) *maintenance of personal discipline*, 6) *facilitation of peer and team performance*, 7) *supervision/leadership*, and 8) *management/administration*. The dimensions of performance listed in the Campbell model were intended to be as distinct from each other as possible in order to delineate specific work behaviors that contribute to overall performance. However, Campbell wisely points out that this does not preclude the effects of “g” (or general intelligence) and personality factors as determinants of all dimensions of performance. Although dimensions are inter-correlated, it does not lead one to conclude that each dimension will have the same relationship with a predictor. That is, differential relations are possible under this model.

When one examines both the Campbell Model and the Project A Model, there is considerable overlap present. Notice that three dimensions in particular are virtually identical: 1) *personal discipline*, 2) *demonstration of effort*, and 3) *core technical (job specific) task skills*. In fact, Campbell, McHenry, and Wise (1990) argue that these three factors should be generalizable across occupations and settings. In terms of relevance for the present study we used operational measures that tap these three common dimensions. We also added the dimension of physical fitness/military bearing derived from the Project A Model because of the sample of soldiers used in the present study. Lastly, based on

the work of researchers who have studied the “softer” side of performance (e.g., Judge, Thorensen, Bono, & Patton, 2001) we also include job satisfaction as an antecedent of performance.

OPTEMPO & Performance

The way in which the two main concepts of this paper, OPTEMPO and performance, are related to one another needs to be conceptualized within a systematic framework. One interpretation of the relationship between stress and performance is the inverted-U model. Borrowing from the pioneering work of Yerkes and Dodson (1908) who found the inverted-U relationship between arousal and performance in a stimulus-response learning experiment, many stress researchers have adopted this model to explain the link between stress and performance. However, its applicability outside of the laboratory has been difficult to demonstrate (Westman & Eden, 1996). Nonetheless, the inverted-U model remains a useful heuristic for characterizing an optimal range of performance that corresponds to a sufficient but not excessive level of stress.

Another model of the stress-performance linkage is one that focuses only on the negative slope of the inverted-U function reviewed above. The inverse relationship model between stress and performance simply posits that as stress increases, performance decreases and]. In general, this model has found more support than the inverted-U hypothesis. Several reasons have been offered to explain the inverse relationship. For example, Janis and Mann (1981) have noted that when one makes decisions under stressful conditions (e.g., social context) that stress causes an emotional strain resulting in poorer performance for unrehearsed, novel situations. This interpretation is similar to findings from the social facilitation/social inhibition research; performance on well-

learned tasks may not suffer when occurring in a social context, however, novel or unfamiliar tasks may suffer as a result of the social context.

Similarly, Cohen, Evans, Stokolos, and Krantz (1986) have suggested that there is a negative relationship between stress and performance because one may perform more poorly and lack concentration when stress causes a narrowing or limiting of one's attention. When this reduction in concentration happens, decision-making suffers. Lastly, the research of Caplan, Cobb, French, Van Harrison, and Pinneau (1975) has demonstrated a strong link between stress and anxiety. Given this linkage and the widely established finding in educational psychology of the negative relationship between student anxiety and academic performance (e.g., Seipp, 1991), we believe that this model of the stress-performance relationship has a good deal of face validity.

The third model, or the positive relationship between stress and performance, focuses on the part of the inverted-U model which slopes upward toward the optimal level of performance. Although this model has not been fully articulated in the literature, it is useful to isolate as a separate focus because it may be relevant to non—laboratory occupational stress research. That is, if most occupational stress research concerns itself with levels of stress that are not excessive or in the traumatic range, then studies are likely to find only a positive link between stress and performance.

In terms of the present study, all three models have merit. In the case of the military, soldiers are asked and trained to perform under adverse conditions, thus we would expect soldiers to be relatively resilient in the face of stressful demands. However, we do not expect OPTEMPO stress, a new and perhaps uniquely military stressor, to serve as a facilitator in all cases. Nor we do expect OPTEMPO stress to serve as an

inhibitor in all cases. From a conceptual perspective this appears to be sitting on the fence. What are the effects of OPTEMPO? We believe it can act as both a facilitator and inhibitor of performance. Thus, we have chosen to adopt the inverted-U model as a heuristic to study OPTEMPO stress. Though it lacks precision and has not been supported by research occurring outside the laboratory, it is a useful tool with which to tackle the question of OPTEMPO effects particularly because we expect with positive and negative effects. The present study will help military researchers further delineate the adverse and positive outcomes of OPTEMPO.

We have briefly reviewed and defined OPTEMPO, its cross-environment importance, the conceptualization of performance, and the proposed relationship between OPTEMPO and performance. Below we propose four study hypotheses based on our primary research question and the literature reviewed above.

Study Hypotheses

H1: OPTEMPO stressors will have differential effects on performance.

H2: OPTEMPO stressors will vary in intensity across garrison, training, and deployed environments.

H3: Performance outcomes will differ across garrison, training, and deployed environments.

H4: The relationship between OPTEMPO stressors and Performance outcomes will differ in magnitude across garrison, training, and deployed environments.

Method

Participants

US Army, Europe (USAREUR) soldiers volunteered for participation in the study. The data reported here were part of a larger, longitudinal research effort on the effects of OPTEMPO across time and various outcome domains. Soldiers participating in the OPTEMPO study were from 10 companies representing units in garrison (Germany and Italy, $n = 425$), units in training rotations (Grafenwoehr, Germany, $n = 147$), and making up a deployed task force (Kosovo, Saudi Arabia, and Kuwait, $n = 123$). Fifty-four percent of the soldiers were junior-enlisted (military grades E1 through E4), 37% were non-commissioned officers, and 9% were officers. In terms of gender and ethnicity, the sample was made up of 84% men and 16% women, and 56% were Caucasian, 21% African-American or Black, 13% Hispanic, 2% Asian and 8% were other. More than half the sample was married (51%), 40% were single, and 9% were separated or divorced. The mean age of the sample was 25.8 ($SD = 5.7$).

Procedure

Data collected in support of the study consisted of survey, interview, and unit archival records. However, interview data were omitted from analyses for the purposes of the present study. From January 2000 to March 2000, 2-3 person OPTEMPO research teams traveled to each of the ten units involved in the study regardless of where they were during this time period. Thus, there were 6 garrison data collections, 2 training data collections, and 2 deployed data collections.

After signing consent forms agreeing to participate in the study, soldiers were administered the surveys. Surveys consisted of base module, which asked general

questions about the impact of OPTEMPO, and an environmental module that asked more specific questions about OPTEMPO in the particular environment (e.g., deployed). In order to collect accurate archival performance data, it was necessary to wait until the subsequent survey mission to each of these units. OPTEMPO data were collected quarterly and in order to get accurate and complete archival performance records the research teams gathered the archival performance records for the previous quarter. This procedure controlled for the lag time associated with records keeping in each of the units. For the present study, survey data from quarter three (collected January-March 2000) were paired with archival performance records from quarter three (collected April-June 2000). Once all data for the study were collected, soldiers' survey data and archival performance data were matched and merged into a single database.

Measures

OPTEMPO: Self-report survey questionnaires assessed OPTEMPO using the following nine measures: 1) average number of hours worked per day in the past week, 2) leave days (vacation days) taken, 3) leave days (vacation days) lost or cancelled because they were not taken in a certain period of time, 4) days spent on training exercises in the past six months, 5) days worked per week, 6) hours worked on days off, 7) days on temporary duty (TDY) away from garrison 8) number of military deployments that lasted more than 30 days, and 9) perceptions of work overload. Refer to Table 1 for summary statistics on all OPTEMPO measures.

Note that all but work overload are measures assessing frequency of occurrence of the OPTEMPO stressor. Work overload is a role stressor (Katz & Kahn, 1978) which occurs when a member of an organization perceives that the organization is demanding

more of them than can be accomplished in a given time, or that the work demands are simply excessive (Jones, Flynn, & Kelloway, 1995). Work overload was assessed using a 3-item measure developed by Camman, Fichman, Jenkins, and Klesh (1983). A representative item from the scale was, "my job leaves me with little time to get things done." Soldiers responded to these items along a 5-point Likert scale where 1 = strongly disagree to 5 = strongly agree. Cronbach's alpha reliability for the work overload scale was .84

Performance. There were two primary means of gathering performance data: accessing unit archival records and using survey questionnaires. Refer to Table 2 for summary statistics on all 11 performance measures used in the present study. Eight of the performance measures were taken from unit archives and included: 1) weapons qualification scores, 2) physical fitness scores, 3) uniformed code of military justice (UCMJ) incidents, 4) Provost Marshall incidents, 5) soldier indebtedness, 6) number of days on sick call, 7) number of days on medical "profile" or limitations placed on duty because of health status, and 8) awards and certificates. Three measures of performance were taken from surveys and included measures of combat readiness and operational readiness (Marlowe et al., 1985; Vaitkus, 1994). The four combat readiness items measure a soldier's confidence in his or her units' mission capabilities and the three operational readiness items measure a soldier's confidence in his or her unit's equipment and support. A representative item from the combat readiness scale was, "if we went to war tomorrow, I would feel good about going with my unit"; a representative item from the operational readiness scale was, "I am confident in my units' mission essential equipment." Cronbach's alpha was .91 for the combat readiness scale, and .81 for the

operational readiness scale. The job satisfaction scale, adapted from Hackman and Oldham's (1975) Job Diagnostic Survey General Satisfaction Scale, consisted of three items. A representative item was "I like my job in the Army". Cronbach's alpha was .92. All three survey scales were rated on a 5-point Likert format where 1 = strongly disagree and 5 = strongly agree.

Analysis Strategy: For hypotheses one, two and three, the analyses were correlational and made use of Pearson's r to test for linear relationships and one-way ANOVAs when appropriate. Hypothesis four required the use of hierarchical moderated regression. This is an approach suggested by Cohen and Cohen (1983), who claim that a hierarchical moderated regression procedure must be utilized in order to interpret interactions among variables. Using this approach, the "interactive" effects of X_iZ (e.g., workload x environment) on Y (e.g., fitness scores) are assessed only after the "additive" effects of X_i and Z have been partialled out. Thus, to assess if the moderating effects of environment were significant, the unstandardized (B) and standardized (β) regression coefficients of the final equation, were examined.

Besides the analyses to test the four hypotheses, we also ran bivariate correlations (e.g., validity coefficients) for the OPTEMPO measures and the Performance measures. This additional analysis was necessary in order to examine how well each measures tapped into the construct it purported to measure.

Results

Descriptive statistics for all OPTEMPO and performance variables are summarized in Table 1 and Table 2, respectively. These include means, standard deviations, and intercorrelations. Although not central to any of the study hypotheses, we

examined the inter-relationships among measures tapping into the OPTEMPO and performance constructs.

OPTEMPO measures

OPTEMPO is an amorphous construct and a new one for researchers. Overall, the intercorrelations between OPTEMPO measures were quite low with significant inter-relationships ranging from .08 to .36. It should be noted that the measures used to assess OPTEMPO are self-report behaviors of the pace of operations (e.g., average hours worked per day, days spent training in last 6 months) in addition to a single measure assessing role stress (perceptions of work overload). Given the multi-method assessment of OPTEMPO, we did not expect intercorrelations to be large in magnitude.

Not surprisingly, self-report measures assessing the frequency or pace of operations were positively related to one another. For example, average number of days worked per week was positively correlated with average work hours per day ($r = .36, p < .001$), number of days off spent working ($r = .35, p < .001$), and days spent training in last 6 months ($r = .16, p < .001$). Furthermore, data analysis revealed that hours spent working on off days was significantly related to other frequency measures such as days spent training in last 6 months ($r = .13, p < .01$), average number of days worked in the last week ($r = .26, p < .001$), and days of leave taken ($r = .10, p < .01$).

The only subjective measure of OPTEMPO, work overload, was related to average work hours per day ($r = .10, p < .01$), days of leave taken ($r = -.08, p < .05$), and the number of deployments a soldier had taken part in ($r = .09, p < .05$). This finding is interesting in that work overload is a different type of OPTEMPO stress than mere pace of operations as measured by hours or days spent on task. Work overload assesses the

degree to which individuals feel capable of or have the time necessary to perform their duty. This is an interesting distinction from the frequency-based measure noted above. We shall return to a discussion of work overload in the discussion below.

Performance Measures

Key trends to point out among the performance inter-relationships generally involved the subjective measure of combat readiness and the objective measure of fitness scores. We found that combat readiness was positively related to operational readiness ($r = .85, p < .001$), and fitness scores ($r = .20, p < .001$), while negatively related to soldier indebtedness ($r = -.15, p < .01$), and M16 weapon scores ($r = -.15, p < .01$). We also found that fitness scores were positively related to operational readiness ($r = .22, p < .001$) and awards ($r = .10, p < .01$), while negatively related to soldier indebtedness ($r = -.10, p < .01$), and days spent on medical profile ($r = -.08, p < .01$). Job satisfaction (our “soft measure”) was related to both subjective measures of combat and operational readiness ($r = .39, p < .001$; $r = .39, p < .001$, respectively), and the two objective measures of UCMJ incidents ($r = -.10, p < .05$), and fitness scores ($r = .13, p < .01$).

Furthermore, the number of days soldiers were on medical profile was positively related to soldier indebtedness ($r = .14, p < .01$) and days on sick call ($r = .37, p < .001$). Lastly, we found that the number of Uniformed Code of Military Justice (UCMJ) violations was positively related to the number of Provost Marshall (law enforcement) incidents ($r = .07, p < .01$) and number of days on sick call ($r = .10, p < .01$). It is important to note that a few of the performance measures were low frequency events, such as UCMJ violations, Provost Marshall incidents, and soldier indebtedness, therefore, caution must be taken in interpreting their significance (and non-significance). The one

finding indicating an inverse relationship among the performance measures was that M16 weapons qualifying scores were negatively related to both combat and operational readiness ($r = -.15, p < .001$; $r = -.21, p < .001$, respectively).

Hypothesis 1

The first hypothesis addressed the issue of whether OPTEMPO stress would have differential effects on performance (i.e., both positive and negative effects). Because there were nine OPTEMPO measures and eleven performance measures assessed, for brevity's sake, we have displayed only the significant relationships observed. These can be seen in Figures 1 and 2.

Figure 1 summarizes the positive relationships between OPTEMPO and performance, whereas Figure 2 summarizes the negative relationships between OPTEMPO and performance. An examination of both Figure 1 and 2 reveals that there were many more positive relations between OPTEMPO and performance. In fact, only soldier perception of work overload was related to adverse performance outcomes with a negative relationship to soldier fitness scores ($r = -.08, p < .05$) and a positive relationship to soldier indebtedness ($r = .17, p < .001$).

In contrast, there were many positive relationships observed among the OPTEMPO measures characterized as frequency or pace of operations behavior and performance outcomes. For example, average number of work hours per day was positively related to job satisfaction ($r = .10, p < .05$) and fitness scores ($r = .12, p < .01$), and was negatively related to UCMJ violations ($r = -.10, p < .05$). The average number of days working during the week was negatively related to soldier indebtedness ($r = -.25, p < .001$) and UCMJ violations ($r = -.11, p < .01$). Note that in the case of indebtedness

and UCMJ violations, the relationships were negative, however, this direction indicates a positive effect of OPTEMPO for as work days increased, problematic outcomes such as military discipline and financial trouble decreased.

Furthermore, we found that the number of days that soldiers spent training in the last six months and days on temporary duty (TDY) were positively related to both combat and operational readiness ($r = .11, p < .05$; $r = .13, p < .01$, respectively). Similarly, days spent training and days on temporary duty were positively related to fitness scores ($r = .10, p < .05$; $r = .16, p < .01$, respectively). Overall, increases in OPTEMPO as assessed by frequency of behavior were related to enhanced performance.

Hypothesis 2

The study's second hypothesis asserted that OPTEMPO effects would vary across military environments (e.g., garrison, training, and deployed). One limitation to addressing OPTEMPO across these environments is that some of the OPTEMPO measures are confounded with the environment (e.g., days spent in training in past 6 months, number of deployments), therefore, we were only able to analyze some of the OPTEMPO effects across environments. OPTEMPO variables assessed across environment included: average number of days worked per week, average number of hours worked per day, average number of hours worked on off days, work overload, leave taken within last 12 months, and leave lost within last 12 months. Of these, significant differences were found across environmental settings in the reporting of average number of hours worked per day ($F(2, 661) = 65.29, p < .001$), work overload, ($F(2, 665) = 1.94, p < .05$), and average number of days worked per week ($F(2, 676) = 82.47, p < .001$). Interestingly, post hoc analyses revealed that soldiers reported more

work hours per day, and days worked per week while in a training environment and the least in a garrison environment. Furthermore, overload was lowest in deployment and differed significantly from both garrison and training environment.

Hypothesis 3

The third hypothesis was similar to the second in that we were interested in testing for differences across environmental settings. For hypothesis three we examined performance across deployment, garrison, and training environments for significant differences. In contrast to the OPTEMPO variable x environment confound noted for hypothesis two, we had no such confound when testing performance across environments. Soldiers and units maintain and record performance indicators regardless of the environment they operate in.

Of the eleven performance measures compared across settings, we found significant differences on three. There were significant differences across environments on soldiers' reports of job satisfaction ($F(2, 667) = 10.04, p < .001$), fitness scores ($F(2, 532) = 22.96, p < .001$), and combat readiness ($F(2, 674) = 28.75, p < .001$). A general trend with the post-hoc analyses emerged. Soldiers reported significantly higher job satisfaction scores and fitness scores when in a training environment compared to either garrison or deployed environments. Moreover, there were no differences in soldier estimates of unit combat readiness between training and deployed settings. Both were rated significantly higher than combat readiness in garrison environment.

Hypothesis 4

The study's fourth hypothesis was exploratory and sought to test for differences in the magnitude of the relationship between OPTEMPO and performance across settings. By conceptualizing the environment a moderator of the OPTEMPO-performance linkage, we tested environmental setting as a moderator of the significant OPTEMPO-performance links observed in the first hypothesis. In this way, we limited our analyses to only the relationships between OPTEMPO and performance established in when the first hypothesis was tested. Of the fourteen significant links found, only the relationship between perceptions of work overload and soldier fitness scores varied significantly across environments. That is, the environment was a significant moderator of this relationship such that when in a deployed environment, workload and fitness scores were positively related while in garrison and training environment workload and fitness were negatively related. Note that we adopted the more liberal p value cutoff of .10 (see Table 3) for the interaction term following researcher guidelines for detecting interaction effects in field studies (McClelland and Judd, 1993). See Figure 3 for the form of the moderating effect of environmental setting.

Discussion

Overall, all study hypotheses were supported or received limited support. We frame our discussion of these results around four themes: 1) OPTEMPO Measurement-construct difficulty and divergent validity, 2) Performance measure inter-relationships, 3) The OPTEMPO and Performance link: mostly positive relations, 4) The role of military environment. This will be followed by some suggestions for future research on OPTEMPO and performance.

OPTEMPO Measurement

As was noted above, OPTEMPO is a nebulous construct and a new one that military researchers have only recently begun to examine. Therefore, its assessment involved multiple measures that purported to tap into the behavioral frequency of soldier work pace. An examination of the measures used to assess OPTEMPO suggested that of the nine OPTEMPO measures, only lost leave and days spent on temporary duty (TDY) were unrelated to any other OPTEMPO measures.

Generally speaking, self-report behavioral frequency measures held together quite well. For example, hours worked per day, days spent training, days worked per week, days of leave taken, and the number of deployments longer than 30 days were modestly related. Interestingly, the OPTEMPO stressor more affective in nature, work overload, also shared a significant relationship with most of the behavioral frequency measures.

Thus, of the OPTEMPO variables that were correlated there seems to be two conceptually distinct components that emerge: an affective OPTEMPO stressor as measured by soldier perceptions of overload, and the mere frequency of the daily and weekly soldier duty. This distinction is an important one because soldiers have been trained and indoctrinated into the military work culture. In this culture, long hours, little sleep, and physical and mentally challenging duty are commonplace. However, it is intriguing to point out that despite viewing long hours and training as simply part of being a soldier epitomized by the phrase used by soldiers "suck it up and move on", there is an affective component that pinpoints soldiers' concerns about having the time and energy to complete all that is being asked of them. For example, a soldier may be aware that performing a duty to standard will require a great deal of effort (e.g., long hours,

physical demands), although that soldier may perceive the task as overwhelming. We will return to this topic below.

Performance Measurement

The OPTEMPO variables inter-relationships were gleaned using a common method: self-report survey questionnaire. In contrast, using both archival performance records and self-report survey questions, we were able to capture a more resolute picture of performance using a multi-trait, multi-method (MTMM) lens. Of the eleven performance measures we assessed in the present study, only Provost Marshall incidents (a measure of the performance dimension indicating lack of personal discipline) did not correlate with any other performance measure. However we recommend caution drawing any inferences regarding Provost Marshall incidents as a military performance indicator. That is, Provost Marshall incidents as well as UCMJ incidents, and soldier indebtedness (all measures of lack of personal discipline) were low base-rate behaviors and in the present sample rarely occurred.

Performance variables that shared the strongest relationship were the readiness measures (combat and operational), fitness scores, soldier indebtedness, and job satisfaction. Sick call rates and days on medical profile (illness or injury measures) were related with fitness scores and UCMJ incidents, respectively. Fitness scores were related to awards.

In terms of the subjective performance measure of job satisfaction we found that it was very strongly related to the two subjective ratings of combat and operational readiness. Given that all three measures were affective ratings, the magnitude of their relationship is not surprising. Job satisfaction was also negatively related to UCMJ

violations and positively related to fitness scores. Thus, in terms of the performance measures that consistently related to other indicators of performance, we found that combat readiness, operational readiness, fitness scores, job satisfaction, and soldier indebtedness shared relationships with three to five other performance indices.

A puzzling finding was that soldiers' perceptions of combat and operational readiness were both negatively related to soldier M16 weapons' scores. This finding appears counterintuitive as M16 proficiency is a fundamental measure of general soldier skill level. One explanation of this finding borrows from the social psychology literature. Perhaps soldiers who are not as skilled as others with their weapon have a stronger and more positive identity with their primary group as a means of compensation for this deficiency. Potential covariates that could provide insight into this relationship may include self-efficacy (belief in one's own future success and collective efficacy (belief in one's reference group's success)). Another explanation could be that the different units considered themselves to be combat and operationally ready for reasons other than weapons skills. If soldiers from non-combat arms units defined their readiness through other kinds of mission-essential skills (e.g., medical proficiency, transportation planning), these soldiers could have low scores on their weapons qualifications while rating their units as highly ready. Obviously, this finding warrants further attention and needs to be replicated in other studies.

In sum, the inter-relationships of the performance variables confirmed the major dimensions of performance as defined by the two performance models presented in the introduction. Task proficiency was represented by soldier readiness perceptions, personal

discipline by UCMJ incidents and indebtedness, demonstration of effort by awards and job satisfaction, and physical fitness and military bearing by fitness scores.

The OPTEMPO-Performance link: more positive than negative

The study's primary hypothesis centered on the assertion that OPTEMPO would be differentially related to performance. Note that this hypothesis was general in nature because the OPTEMPO construct under study is a newly recognized phenomenon facing the military and it has not been previously examined in conjunction with military performance indicators. This hypothesis was put forth with the inverted-U Model in mind. The inverted-U Model offers a range of optimal performance given a certain stress level, but slopes positively under minimal stress and negatively under maximal stress.

Simply put, we found more positive relations between our OPTEMPO measures and our performance indicators than negative relations. Figure 1 highlights the significant and positive relationships between OPTEMPO and performance. In fact, only the role stressor of work overload was negatively related to any performance indicator. This is illustrated in Figure 2.

The OPTEMPO measures that can be characterized as behavioral frequency indicators consisted of the following five measures: hours worked per day, days worked per week, days spent training in the last six months, days on temporary duty in last 12 month, and the number of deployments longer than 30 days. Each of these five OPTEMPO measures was correlated with performance. In total, all of these displayed positive relations to performance. Performance outcomes positively linked to these behavioral frequency measures included job satisfaction, readiness, awards, indebtedness and UCMJ incidents.

These findings are consistent with research conducted by Thomas (2000) who found in an aggregate analysis of 31 groups that work hours were positively related to fitness scores, M16 scores, and organizational citizenship behavior. Furthermore, Kaminski (2001) has noted that not all indicators of heavy workload manifest in negative performance outcomes. For example, in a study conducted with small manufacturing plants across the Midwest, she found that higher work hours per week were associated with fewer work-related injuries and were also positively related to measured productivity.

In contrast to the positive links between OPTEMPO and performance, the role stressor of work overload was negatively related to the performance indicator of fitness scores and positively related to soldier indebtedness. Earlier, we presented our OPTEMPO measures as consisting of two components: the behavioral frequency indicators and the one affective role stressor of overload. It is interesting that these showed differential relations with performance. We suggest that because of the inherent stress associated with military duty (e.g., long hours, physical exhaustion, etc), when measured in terms of frequency and without regard to subjective load is expected by soldiers and considered requisite in order to simulate real-world missions. Therefore, in a sense the soldier has been conditioned to be resilient and hardy.

However, it is when the affective component of this heavy workload results in the perception of being overloaded that the negative effects of OPTEMPO are reflected in performance. It could be that role stressors such as overload take a greater toll on soldier's mental readiness compared to more physical behavioral frequency and repetition of duty. The crux of the difference lies between actual workload and perceived overload.

This distinction is worthy of further study. Individual difference variables such as hardiness and self-efficacy may shed some light on this distinction.

Lastly, we found an interesting pattern with regard to soldiers who had deployment experience either in a combat environment or peacekeeping/humanitarian mission environment. Soldiers who had either combat or peacekeeping experience reported higher job satisfaction. We suggest that this highlights the military relevancy of the duty performed by soldiers in tactical environments. Anecdotally, we have observed this particular result through qualitative interviews with soldiers in Kosovo; there is sense of fulfillment associated with participation in the Kosovo missions.

The role of the military environment on OPTEMPO and performance—

When the relationship between OPTEMPO and performance was assessed in each of the three military environments, garrison, deployment and training, an interesting trend emerged. Soldiers in training reported greater OPTEMPO in terms of work hours and number of days worked per week than in the other two environments. The subjective measure of OPTEMPO again revealed a different pattern in that work overload was highest in garrison and lowest on deployment. Thus, it appears that while soldier work hardest in training in terms of time spent working, this work level is not the most overwhelming to them in terms of role stress. It could be that the multiple roles soldiers experience in garrison from family and work responsibilities combine to exacerbate feelings of work overload. The training environment, while hard in terms of overall amount of work hard, is offset by a reduction in the stress from other competing roles.

The performance measures confirmed the unique nature of the training environment. Soldiers in training had higher fitness scores, and higher subjective ratings

of performance in terms of job satisfaction than in the other two environments of garrison and deployment. Soldiers in training and deployment had high combat readiness scores relative to soldiers in garrison. Taken together, a picture emerges of the special circumstances of training missions. In the environment of a training exercise, which usually occurs in some remote site over a period of several days or weeks, soldiers experience a focused work environment that they typically consider relevant to their mission but, unlike a deployment, the separation from home is not prolonged. In this environment, soldiers may respond positively to the high work expectations and may rise to the level expected of them during this short but intense period.

The deployed environment also presents unique challenges to understanding the impact of OPTEMPO on performance. While for soldiers in training and in garrison high levels of work overload were linked with lower fitness scores, this relationship was not found for soldiers in a deployed environment. The absence of this relationship suggests that military environment may function as a moderator of the impact of OPTEMPO on performance. Most of the regression equations did not confirm this pattern, however, which suggests that the unique nature of the three military environments need to be more carefully examined.

OPTEMPO is a stressor for soldiers throughout their career but there may be periods during a soldier's military service marked by greater or lesser OPTEMPO and periods marked by higher or lower performance. The degree to which the deployment cycle, the training cycle and time spent in garrison affect OPTEMPO, performance and their relationship can be best studied by analyzing longitudinal data from the same units as they progress through each of the cycles.

Future Research

In recent years, the concern about the long-term impact of OPTEMPO on soldier readiness had held that high, unrelenting rates of OPTEMPO would eventually degrade soldier readiness (see Castro & Adler for a review, 1999). That we find a positive link between OPTEMPO and performance is certainly intriguing. Future research needs to identify at what level OPTEMPO begins to degrade soldier performance and what variables would hasten such a link in terms of mission, leadership, and personality type. Furthermore, confirmatory factor analysis with the OPTEMPO measures can begin to identify what types of OPTEMPO measures are critical in determining the relationship of OPTEMPO to readiness outcomes. By analyzing and refining the measures of OPTEMPO, a model of best fit can be developed. Moreover, future work should identify subsets of OPTEMPO variables that can serve as predictors in the three different military environments.

Another issue that needs to be addressed in future research is the role of subjective measures of OPTEMPO as opposed to objective, frequency-based measures. From our results, it is clear that the role of perceptions of work overload is critical in revealing unique relationships with performance that are not found with frequency-based measures. Future research should identify other types of subjective ratings of OPTEMPO such as role conflict or role ambiguity in order to pinpoint what aspects of OPTEMPO are in fact associated with reductions in soldier performance.

Future research on performance should continue to draw from the overlapping constructs in the Campbell and Project A models. Results support the importance of the specific components of the models, as does the addition of the "softer" measure of job

satisfaction. Future studies should include additional “soft” measures of job performance such as organizational commitment and organizational citizenship behavior. Future research should also continue to include archive-based indicators of performance despite the difficulty in obtaining such information (e.g., Hodges, 1994). Such archival data can be augmented by the inclusion of performance knowledge test scores that soldiers take as part of the process of receiving regular duty assignments. For discipline data which have rates too low to make regression appropriate, a separate set of in-depth analyses are planned.

With the current high pace of military operations, the role of OPTEMPO in predicting performance will continue to be an issue for planners, leaders, and soldiers. That we have found a positive relationship needs to be replicated, confirmed by qualitative data, and understood in the context of what is subjectively meaningful to the planners, leaders, and the soldiers themselves. Hard work, long hours, and high demands are endemic to many different kinds of occupations. The degree to which and the mechanism with which these work variables characterize stressors that lead to alterations in performance is worth pursuing in both the civilian and military work environments.

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Table 1.

Intercorrelations Among all OPTEMPO Variables

OPTEMPO Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Work Hours	12.08	3.73	1.00								
2. Work Overload	2.99	0.90	.11	1.00							
3. Days Training in past 6 mos.	30.77	31.91	.16	.00	1.00						
4. Days worked per week	5.83	1.28	.36	.07	.13	1.00					
5. Days on TDY in past 12 mos.	10.47	24.19	.01	.05	.03	.05	1.00				
6. Deployments over 30 days	1.06	2.17	.10	.09	.05	.09	.02	1.00			
7. Hours worked on days off	4.14	5.53	.35	.10	.18	.26	.01	.08	1.00		
8. Days leave in past 12 mos.	19.48	12.79	-.03	-.07	.07	-.03	.07	.00	-.10	1.00	
9. Lost leave in past 12 mos.	1.15	4.08	.01	.06	.06	.07	.00	.06	.07	.04	1.00

Note. Pair-wise deletion resulted in N values ranging from 669 to 684. All correlations greater than or less than $r = .08$ are significant ($p < .05$).

Table 2.

Intercorrelations Among all Performance Variables

Performance Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Combat Readiness	3.01	.98	1.00										
2. Operational Readiness	2.95	.95	.85	1.00									
3. Indebtedness**	.01	.01	-.14*	-.09*	1.00								
4. Number of Awards	.08	.30	-.02	.02	-.03	1.00							
5. Fitness Scores	255.70	32.67	.20*	.22*	-.10*	.10*	1.00						
6. UCMJ Incidents**	.02	.16	-.04	-.04	-.02	-.04	-.06	1.00					
7. Provost Marshall**	.03	.18	-.02	-.05	-.02	-.02	.03	.07	1.00				
8. M16 Scores	34.02	5.84	-.15*	-.21*	.01	.00	.01	-.01	.00	1.00			
9. Sick Call Days	.38	.79	.09*	.08	.12*	.04	-.06	.10*	.02	-.13*	1.00		
10. Days on Profile	2.42	10.55	.09*	.08	.14*	-.02	-.08*	.02	-.02	-.06	.37*	1.00	
11. Job Satisfaction	3.09	1.07	.39*	.39*	-.05	.09	.13*	-.10*	-.03	-.02	-.04	-.03	1.00

Note. Pair-wise deletion resulted in N values ranging from 289 to 890.

*Flagged correlations are significant at $p < .05$. ** These variables were of low base-rate frequency. Few soldiers had reported cases of indebtedness, UCMJ and Provost Marshall Incidents.

Table 3

Moderating Effects of Environmental Setting on Soldier Perceptions of Work Overload and Fitness Scores: Hierarchical Moderated Regression

Variable	B	SE B	β	p
Work Overload	-8.58	.87	-.24	.02
Environment (1,2,3)	-4.55	.87	-.11	.46
Work Overload x Environment	-.21	.85	.30	.07

Note. Beta-weights are for the final model.

Figure 1.

Summary of positive effects of OPTEMPO on Performance.

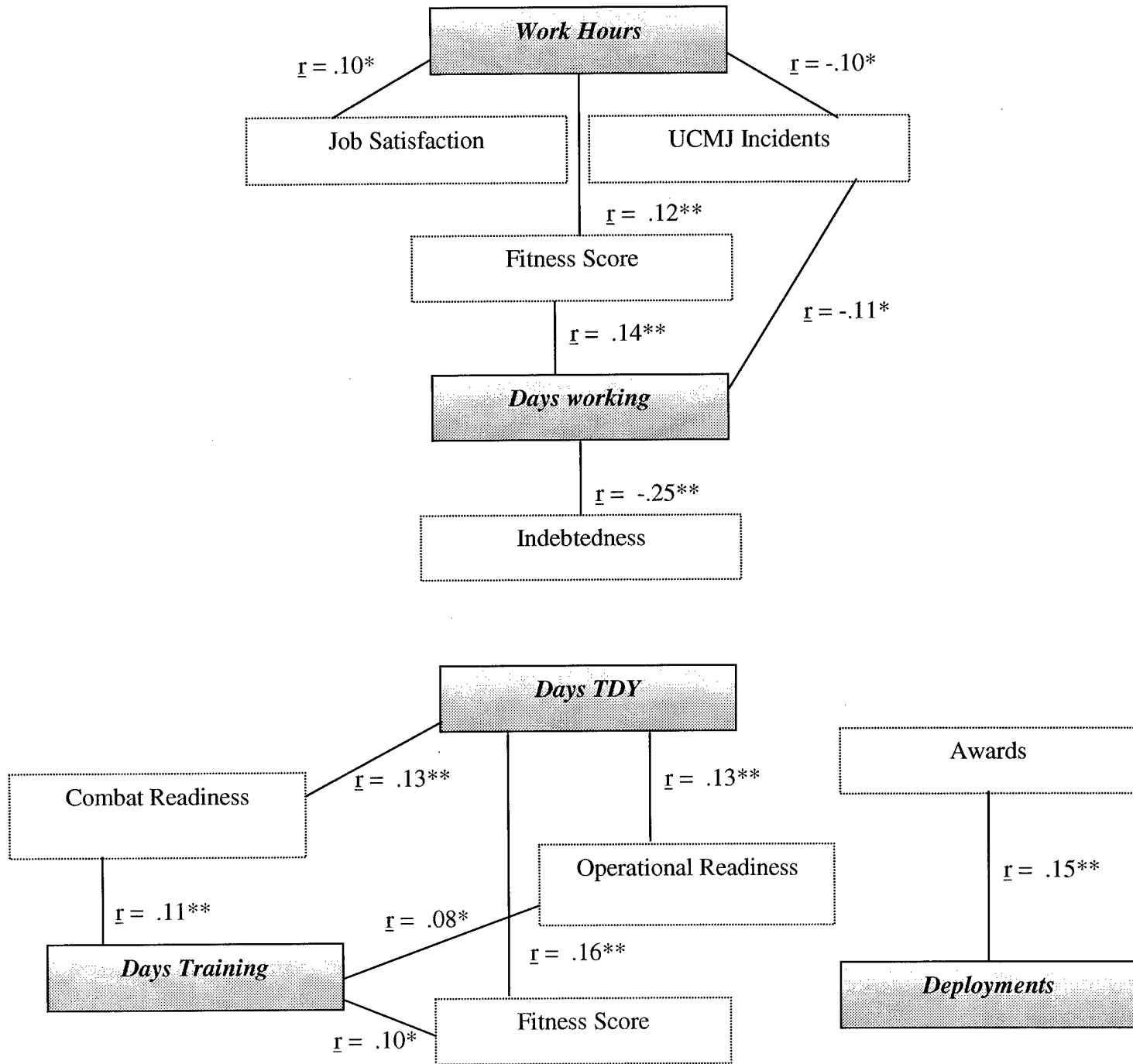


Figure 2.

Summary of negative effects of OPTEMPO on performance

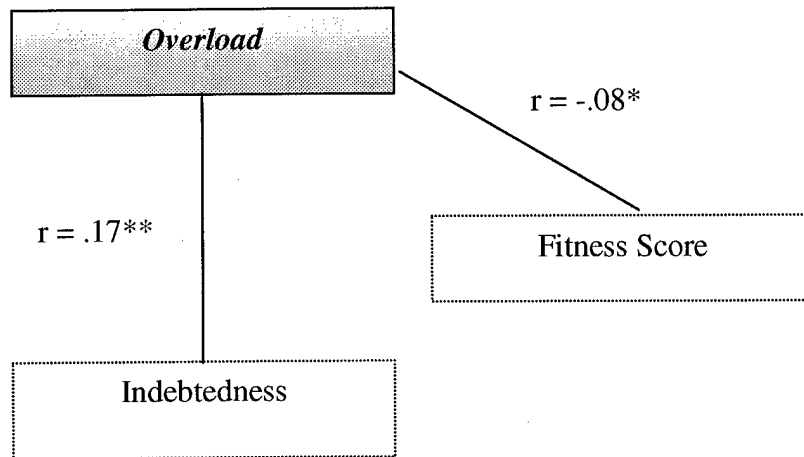


Figure 3. Graphical Depiction of the Moderating Effect of Environmental Setting on the Relationship between Work Overload and Soldier Fitness Scores.

