

Occupational stress and the outcome of basic military training

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Background	Military training has a high dropout rate but the role of occupational stress is not known.
Aims	To examine the relationship between occupational stress and outcome of training.
Methods	A study of occupational stress in 476 army recruits (as measured in Week 4 of 23 weeks of basic military training) using previously identified risk factors for lack of success in training and outcome of training.
Results	Using stepwise logistic regression, occupational stress levels as measured at Week 4 were significant predictors of outcome in training. Psychological scale scores predicted 85% of those who were asked to leave. Other factors previously thought to be predictive of outcome of training were not predictive in this cohort of recruits.
Conclusions	Levels of occupational stress measured 4 weeks into training predicted outcome of training.
Key words	Military training; occupational stress; performance; psychological health.

Introduction

Military training presents a range of stressors for recruits with limited prospect of mitigation. Success in training is influenced by a number of factors.

Injury accounts for a significant proportion of failures in training [1,2]. Research into predictors of success in military training has concentrated mainly on prediction of injury in training using demographic, cognitive and physiological variables. Intrinsic risk factors for injury are thought to be age [3,4], body mass index (BMI) [5,6], gender [5,7], previous injury [8,9], cardiovascular fitness [1,2], muscular strength [1,10], general trainability index (GTI) score, sum of cognitive tests administered by the British Army [1,11] and smoking [1,12].

However, a large number of recruits are also lost to training because they choose to leave or are asked to leave as they are unable to meet the standards required. This is in spite of a thorough selection process involving cognitive, physical and medical tests, designed to identify individuals who have a low probability of successfully completing training.

Psychological factors have also been shown to predict success in military training. Hartmann *et al.* [13] studied

the predictive validity of seven ability tests, including the 'Big Five', which measures five domains of personality, including openness, consciousness, extroversion, agreeableness and neuroticism. They also used the Rorschach method [14], where the subject's perception of ink blots are recorded and analysed using psychological interpretation. The findings showed small correlations between the ability tests, the Big Five scales and the success criterion. Rorschach variables measuring stress tolerance, reality testing, cognition and social adjustment correlated significantly with pass/fail results in training.

There is a growing body of evidence to suggest that psychosocial factors are also significant predictors of musculoskeletal injury. There has been much research into the effect of psychosocial factors on work-related upper limb disorder [15,16]. Some studies show that stress and job strain have a positive correlation with musculoskeletal injury [17–20].

Occupational stress has been shown to have a negative correlation with job performance. Motowidlo *et al.* [21] conducted two studies, the first of which studied 200 nurses, 45 stressful events for nurses were identified. In the second study, 171 nurses completed another

questionnaire and were rated by supervisor and/or co-worker. Findings showed the ratings of interpersonal aspects of job performance (sensitivity, warmth, consideration and tolerance) and cognitive/motivational aspects (concentration, composure, perseverance and adaptability) correlated significantly with self-reported perceptions of stressful events, subjective stress, depression and hostility. Thus, the ability to cope with the cognitive and emotional demands of work is related to the interpersonal aspects of job performance, suggesting that the early experience of adverse psychological reactions to military training will predict subsequent performance. Those who can cope with initial training demands will be more likely to be successful in the future.

The few studies that have been undertaken in military populations have shown a high rate of stress and strain [22–25]. No studies have yet assessed the levels of occupational stress and its impact on British Army trainees. Therefore, the aim of this study was to determine the relationship between occupational stress levels and outcomes of training in a cohort of British Army Recruits.

Methods

Ethical approval was received from the Ministry of Defence research ethics committee. The study followed a voluntary cohort of male junior entry recruits (aged 16–17 years 2 months) through basic training (23 weeks) at the Army Training Regiment in Winchester (ATR(W)). The recruits were informed about the study via a poster in their accommodation and an oral brief after which, if they volunteered, informed, written consent was obtained.

The Occupational Stress Index—Revised (OSI-R) was chosen as the tool for the measurement of occupational stress; it consists of three psychological scales: the Occupational Roles Questionnaire (ORQ) consisting of six scales of 10 questions measuring stress-inducing work roles, Personal Strain Questionnaire (PSQ) consisting of four scales of 10 questions reflecting subjective responses of various types and Personal Resources Questionnaire (PRQ) also consisting of four scales of 10 questions to measure coping resources. The OSI-R was filled out by the subject with a researcher reading out the questions from a PowerPoint presentation (with a break after each section as the OSI-R has 140 items). This took an average of one and a half hours, with two 15 min breaks. Some of the wording was altered to make it relevant to recruits in training. This did not change the underlying intent of the question. The questions were read out as it was recognized that the reading age for recruits on entry can be as low as 7 years. The recruits were able to ask questions if they did not understand. The answers only paraphrased the question to clarify its meaning (a valid method according to the OSI-R professional manual [26]). Subjects completed the questionnaire in a

lecture theatre in groups of 100–120 dependent on the Training Regiment's timetable.

The OSI-R had not yet been used with a military population nor with a population of 16- to 17-year-olds. Therefore, test–retest reliability was assessed by completing the modified questionnaire twice in 3 days using a pilot group of 37 recruits at ATR (W) who were in Week 14 of training.

Analysis of the Pearson's correlation between the total scores for each of the scales within the OSI-R showed generally good reliability; the Pearson Product Moment Correlation Coefficient was 0.81** (ORQ), 0.91** (PSQ), 0.57** (PRQ) [correlation significant at the 0.01 level (2 tailed)]. Recruits completed the OSI-R questionnaire at the end of Week 4 of training. Additional information was obtained in a cover sheet on the OSI-R (previous injury and smoking status) and from their selection records [1.5 mile run time, GTI score, age, BMI, static lift strength (a measurement of back and lower limb muscular strength)].

Recruits already injured prior to this point were excluded retrospectively. Recruits were also excluded if they chose to withdraw from the study. Week 4 was chosen as the organization could only accommodate one 2 h session in the training timetable, thereby only allowing one measurement of the OSI-R. By Week 4, recruits have had a chance to experience most aspects of military training and any associated stress. The incidence of musculoskeletal injuries initially peaks at Week 3. In Week 5, recruits are given the option to leave training if they have changed their mind about an Army career, this is known as Discharge As Of Right (DAOR). At any time in training, recruits may not be able to meet the required standard in training and will be discharged as Not suitable For Army Service (NFAS). If a recruit completes training, they are said to have 'Passed out'. Recruits are not assigned a grade at the end of training; therefore, completing training is the only marker of success.

The recruits then completed their phase one training (23 weeks). At the end of their training, their service record was accessed to determine the outcome of training. Service records were then accessed on a weekly basis, until the outcome of training for all recruits had been identified.

Data were analysed using SPSS. Scale reliability was assessed using Cronbach's alpha. Bonferroni *post-hoc* tests were used to analyse the relationship between the OSI-R score and outcome of training. This method was used to avoid the fallacies of multiple testing especially when not related to the prior hypothesis. There were no known associations between severity of injury, outcome of training and the variables in the equation [OSI-R scores, previous injury, smoking status, GTI, age, BMI and static lift strength (SLS)].

Forward stepwise logistic regression was used to assess which of the variables in combination had the

greatest influence on the severity of injury and outcome of training.

Results

Of the 481 recruits eligible to take part in the study, only five declined (99% participation rate). Thirty-four (7%) recruits were injured prior to Week 4 of training and were therefore excluded. Of the remainder, 72 (15%) chose to leave (DAOR), 20 (4%) were deemed NFAS and 1 recruit was medically discharged.

All the recruits were male and aged between 16 and 17 years 2 months. Forty per cent admitted to smoking, with a mean of four cigarettes a day. Thirty-six per cent admitted to some form of previous musculoskeletal injury. The mean BMI was 21.6 [range 17–27.8; standard deviation (SD) 2.4]. The mean time for the 1.5 mile run was 10.5 (range 8–13.6; SD 1 min).

Known risk factors for injury (smoking, BMI, GTI, previous injury, SLS and 1.5 mile run time) were included in the regression analyses.

There were very few missing data. Three participants had erroneous run times recorded and seven participants declared a previous injury but did not state where. A summary of the OSI-R scores and outcome can be found in Table 1.

Internal consistency was tested looking at Cronbach's α scores within the three psychological scales. ORQ had a Cronbach's α of 0.8, PSQ of 0.9 and PRQ of 0.7.

The inter-scale correlation was significant in this population and showed a positive correlation between ORQ and PSQ and a negative correlation with PRQ, as expected [26] (Table 2).

The ORQ/PSQ and PRQ scores were analysed using a general linear model and Bonferonni *post-hoc* tests according to the outcome of training (passed out, DAOR or NFAS). This showed significant differences in the ORQ between those who passed out and those who chose to leave (DAOR) [–11.6, 95% confidence interval (CI), –17.8 to –5.4; $P < 0.01^{**}$] and those who passed out and were asked to leave (NFAS) (–17.6, 95% CI, –28.6 to –6.6; $P < 0.01^{**}$) showing that those who scored lower, i.e. had less occupational overload (strain) were more likely to pass out (Table 3).

Table 1. Mean and standard deviation OSI scores overall and for main outcome groups

	ORQ	PSQ	PRQ
All	156.9 (20.6)	99.8 (22.3)	119.8 (13.1)
Passed out	154.3 (19.5)	96.5 (20.5)	120.8 (13.1)
Not fit for army service	172.4 (21.5)	120.1 (28.5)	115.0 (14.2)
DAOR	164.8 (22.1)	113.3 (23.7)	116.6 (13.2)

Less personal strain (PSQ) was also shown to be significant for those who passed out compared with those who chose to leave (DAOR) (–17.8, 95% CI, –24.4 to –11.3; $P < 0.01^{**}$). There was an even greater difference in the PSQ score, those who passed out having a lower score than those who were asked to leave (NFAS) (–19.8, 95% CI, –31.4 to –8.1; $P < 0.01^{**}$) (Table 3).

In the PRQ, a higher score indicates better coping strategies and therefore a better ability to cope with strain. Those who passed out scored significantly higher than those who chose to leave (5.2, 95% CI, 1.2–9.3; $P < 0.06^*$). Those who were asked to leave scored lower on average, but this was not significant (Table 3).

Forward stepwise logistic regression was used to analyse the significant predictors of those who passed out, chose to leave (DAOR) and were asked to leave (NFAS). All the variables, including those predictive of injury, were included in the regression. When the individual psychological scales which make up the ORQ/PSQ and PRQ were used in forward stepwise logistic regression, high levels of role insufficiency (the extent to which an individual's training, education, skills and experience are appropriate to job requirements—part of the ORQ) was a significant positive predictor of those who were asked to leave (NFAS) odds ratio (OR) 1.23 ($P < 0.05^*$) and

Table 2. Inter-scale correlations

Correlations		ORQ	PSQ	PRQ
ORQ	Pearson correlation	1.00	0.71**	–0.24**
PSQ	Pearson correlation	0.71**	1.00	–0.41**
PRQ	Pearson correlation	–0.24**	–0.41**	1.00

**Correlation is significant at the 0.01 level (two-tailed).

Table 3. Bonferonni *post-hoc* analysis of ORQ/PSQ/PRQ and outcome of training

(A) Outcome	(B) Outcome	Mean difference (A–B)	95% CI	
			Lower bound	Upper bound
ORQ passed out	DAOR	–11.6**	–17.8	–5.4
	NFAS	–17.6***	–28.6	–6.6
PSQ passed out	DAOR	–17.8***	–24.4	–11.3
	NFAS	–19.8***	–31.4	–8.1
PRQ passed out	DAOR	5.2*	1.2	9.3
	NFAS	6.7	–0.5	13.8

Passed out—completed training.

*Significant at the 0.06 level

**Significant at the 0.01 level

***Significant at the 0.001 level

a negative predictor of those who passed out OR 0.907 ($P < 0.05^*$). None of the individual scales predicted those who chose to leave (DAOR). This may be due to the fact that the scales were designed to be used to assess the three main causes of stress, occupational role, personal strain and personal resources [26], and when subdivided into scales of 10, the validity of such small scales is much lower. This was demonstrated by increased variance in Cronbach's α for the smaller scales (from 0.39 responsibility to 0.90 psychological strain).

PSQ and PRQ scores were the strongest predictor of those who passed out. Those who scored lower in the PSQ, i.e. had less personal strain, were more likely to pass out and those who scored higher in the PRQ, i.e. those who had better personal resources were more likely to pass out (Table 4). PSQ and PRQ together predicted 48% of those who passed out (Nagelkerke R square). Fifty-six percent of DAOR (Nagelkerke R Square) (Table 4). A lower score in the PRQ alone predicted those who did not meet the required standard, NFAS (Table 4). PRQ was lower in those who were asked to leave than in those who chose to leave and was a stronger predictor of NFAS than any of the other variables. PRQ predicted 85% of those who were asked to leave (Table 4). ORQ was not shown to be a significant predictor of outcome in forward stepwise logistic regression.

Discussion

This study showed that occupational stress levels, in particular the PRQ as measured at Week 4 of a 23 week course appeared to be a significant predictor of the outcome of training, despite its lower test retest reliability.

This study was a prospective study; the OSI-R was completed by all participants at the same stage of training. The study also gathered information on other known risk factors from participants' selection data, held on a central database and from the participant themselves. Participation rates were good.

The ORQ and PRQ scores should increase as stress levels increase. The PRQ should decrease as stress levels increase [26]. This fits with the Lazarus model of occu-

pational stress [27] in that if coping abilities are poor (low score on PRQ), perceived personal and occupational stress will be greater. This inverse relationship was demonstrated in this data (Table 2).

There is no standard measurement of occupational stress. Most studies of occupational stress have either used an approximation, e.g. outcome measures such as the General Health Questionnaire or have designed a bespoke questionnaire looking at the unique stressors of that industry. The OSI-R is a commercially available detailed measurement of occupational stress which is published in America and has normative data from several studies for comparison [26]. Not all questions were ideal for a military training population. It is acknowledged that a bespoke tool would have been more appropriate. The measurement of occupational stress was taken in Week 4 in order to allow recruits to adjust to the military environment, exclude pre-existing injuries and to include those who wished to leave before they were able to do so. It would have been useful to be able to repeat the OSI-R weekly in training; however, this would have been unacceptable to the organization due to the pressure on training time. It is likely that the external stressors will vary throughout the course, however, to mitigate this; the total scores for the individual psychological scales among the group were compared internally and not with normative data. This was done in order to identify those individuals who experience higher levels of stress despite many of the external stressors being the same for the group. The pilot study demonstrated that although the training programme was more demanding at the time of the second questionnaire, individuals still showed good correlation between the total scores for the psychological scales in the first and second questionnaire.

The low ORs may indicate that although the scales are predictive, the outcome depends on many other variables that were not measured, possibly external factors such as homesickness or other problems outside of work that could not be measured. Bridger *et al.* [28] showed that a significant proportion of psychological strain in naval personnel is due to stressful life events outside work.

The significant predictors for those who were asked to leave (NFAS) were much greater than for DAOR or those who passed out. It is anticipated that this is due to the fact that for those who are NFAS, there is a much worse job/person fit and therefore, this group is very different from those who pass out or those who could pass out but choose not to.

There is significant inter-scale correlation within the OSI-R and this would make it difficult to make true assumptions about any one psychological scale's importance in predicting outcomes. However, in a military training population where so many of the external stressors are the same, it would seem logical that those who are more likely to pass basic military training would have greater psychological resilience and therefore greater personal resources.

Table 4. Significant predictors of outcome using forward stepwise logistic regression

Outcome	Predictor	OR	95%CI	Nagelkerke R square
Passed out	PSQ	0.98***	0.97–0.98	0.48
	PRQ	1.03***	1.001–1.01	
DAOR	PSQ	1.02***	1.01–1.02	0.56
	PRQ	0.97***	0.98–0.99	
NFAS	PRQ	0.97***	0.97–0.98	0.85

Passed out—completed Training.

***Significant at the 0.001 level.

Chen *et al.* [17] found significant associations between psychosocial factors and musculoskeletal injury in a cohort of offshore oil installation workers. It may be that personal resources are important in workers who have similar extrinsic stressors such as in the oil industry.

Quick *et al.* [29] conducted two studies. Study 1 was a cross-sectional comparative analysis of three groups of basic military trainees ($N = 158$). Study 2 was a predictive validity study of 30 groups of basic military trainees ($N = 1339$). Both studies showed that self-reliant trainees fared better in training than their less self-reliant counterparts. They were healthier, had higher self-esteem, lower burn-out and higher completion rates.

This study shows that the ability of an individual to succeed and their interpretation of work-related stress is related to their intrinsic personal resources. The OSI-R was best at identifying people who did not fit rather than those who gave up. It may be that by measuring occupational stress or more specifically, personal resources, the military may obtain a better person-job fit at selection. For industry, it may be that more consideration needs to be given to measuring occupational stress and coping skills, in order to give support to those individuals who have poorer personal resources to allow them to achieve better occupational outcomes.

Key points

- Occupational stress levels of recruits in training were assessed using the Occupational Stress Index-Revised which assesses occupational roles, personal strain and personal resources.
- Those recruits who experienced greater occupational overload, greater personal strain and poorer personal resources were less likely to succeed in training.
- Poorer personal resources were the strongest predictor of those who wished to stay in training but did not succeed.

Conflicts of interest

None declared.

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