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Stress Perceptions of Soldiers Participating in
Training at the Chemical Defense Training
Facility: The Mediating Effects of Motivation,
Experience, and Confidence Level

Linda T. Fatkin
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13 ABSTRACT (Maximum 200 words) An investigation was conducted by the U.S. Army Research Laboratory (ARL) and funded by the Physiological and Psychological Effects of the Nuclear, Biological, and Chemical (NBC) Environment and Sustained Operations on Systems in Combat (P2NBC2) program to assess the psychological reactions of soldiers in mission-oriented protective posture (MOPP) IV participating in training in a simulated chemical agent environment and in a toxic agent environment. A total of 155 soldiers who participated in the basic course (junior enlisted) and the advanced courses (officer and noncommissioned officer [NCO] groups) as part of their military occupational specialty (MOS) training volunteered for the study. The junior enlisted group reported significant increases in anxiety during four sessions as they approached the toxic agent portion of the training. The more experienced groups showed a small, but significant increase in anxiety during sessions. Their level of hostility, a component of stress that usually relates to levels of personal frustration, decreased significantly from the time of their initial testing to just before the training began. Since the initial session occurred 1 to 2 weeks before the U.S. Army Chemical Defense Training Facility (CDTF) training, the elevated frustration level may be a reflection of their overall experiences within the intensive chemical defense training program. A significant drop in reported fatigue between the pre- and post-training sessions may indicate a certain level of vigilance gained by participating in the training. The above results were also consistent with those published in a 1989 Walter Reed Army Institute of Research report of soldiers participating in CDTF training.					
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To assess the relative level and intensity of the subjects' stress experience, the authors compared CDTF data with data obtained in previous studies conducted by the ARL Stress and Performance Team. Three separate anxiety measures indicated that while the junior enlisted group experienced a moderate level of stress, the experienced group did not report a level of anxiety that was significantly different from an independent control group.

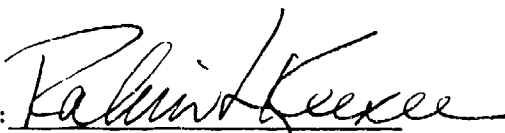
A discussion of the mediating effects of the specific characteristics and resources of the individuals in that situation (i.e., preparedness, coping resources, experience, attitude or motivation toward the training) is presented. The fact that the training was not rated highly stressful by soldiers with more experience than the junior enlisted group may indicate that the more experienced soldiers were more confident in their ability to successfully complete the training than were those with less experience. The chemical defense training in a toxic agent environment seemed to create an appropriate level of arousal to create the vigilance necessary to learn and to reinforce prior classroom training but not so stressful as to interfere with this process.

STRESS PERCEPTIONS OF SOLDIERS PARTICIPATING IN TRAINING AT THE
CHEMICAL DEFENSE TRAINING FACILITY: THE MEDIATING EFFECTS
OF MOTIVATION, EXPERIENCE, AND CONFIDENCE LEVEL

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January 1994

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U.S. ARMY RESEARCH LABORATORY
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EXECUTIVE SUMMARY

The U.S. Army Chemical Defense Training Facility (CDTF), located at Fort McClellan, Alabama, was the site of an investigation conducted by the U.S. Army Research Laboratory (ARL) and funded by the Physiological and Psychological Effects of the Nuclear, Biological, and Chemical (NBC) Environment and Sustained Operations on Systems in Combat (P²NBC²) program to assess the psychological reactions of soldiers in mission-oriented protective posture (MOPP) IV participating in training in a simulated chemical agent environment and in a toxic agent environment.

A total of 155 soldiers (153 male, 2 female) who participated in the basic or advanced courses as part of their military occupational specialty (MOS) training volunteered for the study. The objectives of the CDTF evaluation were to (a) determine the extent of stress experienced throughout the CDTF training program using a battery of psychological measures designed to assess personality traits, coping resources, and perceptions of stress at specified times in the program; and (b) identify factors that might contribute to their experience of stress or their successful completion of the training.

To assess whether the soldiers exhibited typical stress responses, analyses of the data from the junior enlisted group (2-day training) were performed separately from the noncommissioned officer (NCO) and officer groups (1-day training). The junior enlisted group reported significant increases in anxiety during four sessions as they approached the "hot area" training, with a slight drop in their anxiety level once involved in the training. This pattern indicated that their anxiety levels increased as they anticipated participating in the toxic agent portion of the training.

Data were combined for the other four standard training groups (basic noncommissioned officer course [BNOC], advanced noncommissioned officer course [ANOC], officer basic course [COBC], and officer advanced course [COAC]) and analyzed across sessions. There was a small but significant increase in anxiety throughout sessions (initial, pre, and post). Their level of hostility, a component of stress that usually relates to levels of personal frustration, decreased significantly from the time of their initial testing to just before the training began. Responses on the Anger subscale of the Mood Questionnaire also indicated that the soldiers were experiencing significantly more frustration or anger during their initial measurement session than they were just before or just after the training. Since the initial session occurred 1 to 2 weeks before the CDTF training, the elevated frustration level may be a reflection of their overall experiences within the intensive chemical defense training program.

Fatigue, as reported on an overall Sleepiness scale and on the Fatigue subscale of the Mood Questionnaire, decreased significantly from the time of the initial measurement to just after the training. The significant drop in reported fatigue between the pre- and post-training sessions may indicate a certain level of vigilance gained by participating in the training. These results were consistent with those published in a 1989 Walter Reed Army Institute of Research (WRAIR) report, indicating that soldiers participating in CDTF training reported a steady decrease in mean scores for the Fatigue subscale.

To assess the relative level and intensity of the subjects' stress experience, the authors compared CDTF data with data obtained in previous studies conducted by the ARL Stress and Performance Team. Two separate

anxiety measures indicated that while the junior enlisted group experienced a moderate level of stress, the experienced group did not report a level of anxiety that was significantly different from an independent control group.

On the Specific Rating of Events scale (a more global measure of stress), both CDTF comparison groups rated the stress of CDTF training significantly lower than the stress associated with most of the referent protocols and significantly higher than the independent control group rated it. These moderate stress results seem to indicate that the CDTF training was stressful enough to get their attention but not high enough so that it exceeded their available resources.

When defining an experience as stressful, it is important to look beyond the defined situation (CDTF training) and recognize the mediating effects of specific characteristics and resources of the people in that situation (i.e., preparedness, coping resources, experience, attitude or motivation toward the training). The adage, "one person's stress is another one's challenge," seems to convey the differences in response patterns of individuals in this investigation who were either less motivated to complete the CDTF training or were less experienced. The fact that the training was not rated highly stressful by soldiers with more experience than the junior enlisted group may indicate that the more experienced soldiers were more confident in their ability to successfully complete the training than were those with less experience. The relatively low stress rating by the more experienced groups is therefore a positive finding. It would not be advantageous for soldiers to be concentrating more on their anxiety than on the training. An important conclusion might be that CDTF training seemed to create an appropriate level of arousal to create the vigilance necessary to learn and to reinforce prior classroom training but not so stressful as to interfere with this process.

A primary objective of the chemical defense training is to increase the level of confidence in the equipment and in the soldiers' performance of chemical defense procedures. Previous stress research has indicated that to increase the confidence expectancy that would enhance actual performance, individuals must be provided with successful training experiences (Bandura, 1977, 1982, 1986; Lazarus & Folkman, 1984; Solomon, Benbenishty, & Mikulincer, 1991). Nearly half of the CDTF subjects stated that their personal motivation for successful completion of the training included the realism provided by the experience within a toxic agent environment and the opportunity to gain confidence in the equipment that had been previously used only with simulants. Those soldiers who had recently returned from Saudi Arabia were among those who ranked these two issues as most important. The unique training in the toxic agent environment provides soldiers the opportunity to maintain or increase their level of confidence in chemical defense procedures and equipment in a situation that is stimulating enough to augment their participation yet not so stressful as to interfere with training.

STRESS PERCEPTIONS OF SOLDIERS PARTICIPATING IN TRAINING AT THE CHEMICAL
DEFENSE TRAINING FACILITY: THE MEDIATING EFFECTS OF
MOTIVATION, EXPERIENCE, AND CONFIDENCE LEVEL

INTRODUCTION

The nation's sole facility for providing chemical defense training in both simulated and toxic agent environments is located at Fort McClellan, Alabama, within the U.S. Army Chemical School. The U.S. Army Chemical Defense Training Facility (CDTF) was the site of an investigation conducted by the U.S. Army Research Laboratory (ARL) and funded by the Physiological and Psychological Effects of the Nuclear, Biological, and Chemical (NBC) Environment and Sustained Operations on Systems in Combat (P²NBC²) program to assess the psychological reactions of soldiers in mission-oriented protective posture (MOPP) IV participating in training in a simulated chemical agent environment and in a toxic agent environment.

This report describes the final portion of the two-phase research effort in support of the P²NBC² program. The initial phase was a stress evaluation of soldiers participating in a Special Forces Assessment and Evaluation Course at Fort Bragg, North Carolina (Hudgens & Fatkin, 1992), using a battery of psychological measures designed to assess personality traits, coping resources, and perceptions of stress at specified times in the course. The operational definition of stress used in research studies conducted by the ARL Stress and Performance Team is "the relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984, p. 19). Using a methodology that facilitates the measurement of individual appraisals of situations, the present research effort provided an assessment of (a) the extent of stress experienced throughout the CDTF training program using a battery of psychological measures designed to assess personality traits, coping resources, and perceptions of stress at specified times in the program; and (b) other factors that might contribute to the subjects' experience of stress or their successful completion of the training. The assessment of the level and intensity of the subjects' stress experience was accomplished by comparing CDTF data with data from the battery of psychological measures used within the ARL Stress and Performance research program, a combination of in-house and contract efforts studying the links between psychological and physiological stress responses and performance in a variety of settings.

METHOD

Subjects

Volunteers were recruited in accordance with AR 70-25 from the standard CDTF training courses already scheduled for June, July, and August 1991. A total of 155 subjects (153 male, 2 female) included 47 soldiers from the junior enlisted course (B10), 34 from the basic noncommissioned officer course (BNOC), 25 from the advanced noncommissioned officer course (ANOC), 36 from the officer basic course (COBC), and 13 from the officer advanced course (COAC). As indicated in Table 1, data were also collected for eight non-chemical military occupational specialty (MOS) officers participating in the COBC course and were treated separately for the purposes of data analysis.

Apparatus

A battery of questionnaires used in previous ARL research investigations was administered to the CDTF subjects. This battery has proved its sensitivity to the degree of stress experienced in a variety of situations and includes several standardized measures that have demonstrated construct validity within the stress research literature. The battery includes the following:

General Information Questionnaire (GIQ)

This questionnaire includes general demographic information (age, education, rank, etc.) and questions regarding the subjects' previous experience with chemical training, the total number of hours spent in MOPP IV, their subjective rating (0 to 100) of the importance of successfully completing the training, and the reasons for their motivation to complete the training. Table 1 shows the demographic breakdown of all study subjects according to CDTF course, number, age, education, length of service, and experience in MOPP IV gear.

Measures of Amount of Current Life Stress

The Life Events Form-I and II are used to assess the amount and type of naturally occurring stressors that the subjects may be experiencing at the time of the study, along with their available resources. The Life Events Form-I is usually administered on the same day as the personality (trait) measures, which are usually administered at least a day before the stress period being evaluated, and asks subjects to rate the amount and type of stress they have "recently" experienced. The Life Events Form-II is administered on the same day as the state measures and asks subjects to rate the amount and type of stress they have experienced since they last completed the questionnaires.

Table 1

Demographic Information for All Subjects
in the CDTF Stress Evaluation

Course	n	Age (mean years)	Education (mean years)	LOS ^a (mean years)	MOPP hours (range)
Junior enlisted	47	20.7	13	1.5	1 to 10
Basic NCO	34	27.4	12.5	6.7	11 to 50
Advanced NCO	25	32.5	13.5	12.4	11 to 50
Basic OFF	36	24.4	16.5	2.7	0 to 10
Advanced OFF	13	27	16	4.9	11 to 50
Non-chemical MOS (COBC)	8	45.5	19.2	15.8	0 to 10

^aLOS = length of service

Trait measures. The following trait measures were used:

1. The State-Trait Anxiety Inventory (STAI) Form Y-2 (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) consists of 20 statements that assess how the respondents "generally" feel. The essential qualities evaluated by the STAI are feelings of apprehension, tension, nervousness, and worry.
2. The Multiple Affect Adjective Check List - Revised (MAACL-R), general or trait form (Zuckerman & Lubin, 1985) consists of five primary subscales (Anxiety, Depression, Hostility, Positive Affect, and Sensation Seeking) derived from a one-page list of 132 adjectives. An overall distress score, dysphoria or negative affect, is calculated by adding the anxiety, depression, and hostility scores. The respondents are instructed to check all the words that describe how they "generally" feel.
3. Rotter's Internal-External Scale (Rotter, 1966) is used as a measure of locus of control. Respondents are asked to complete 29 forced choice items (including six "filler" statements) relating to their locus of control beliefs. If individuals perceive that an event was the result of luck, chance, fate, or as under the control of powerful others, it constitutes a belief in "external" control. If they perceive that the event was contingent upon their own behavior or their own relatively permanent characteristics, it is considered a belief in "internal" control.
4. The Eysenck Personality Questionnaire (EPQ) scales recognize three distinct dimensions of personality: Extraversion-Introversion (E), Neuroticism (N), and Psychoticism (P) (Eysenck & Eysenck, 1975). When the EPQ-P and EPQ-N scales are used to measure personality traits in normal persons, Eysenck and Eysenck (1975) describe them as measures of "emotionality," "toughmindedness," or "stability-instability."
5. The Revised Ways of Coping Checklist (RWCCCL) (Vitaliano, Russo, Carr, Maiuro, & Becker, 1985) identifies five individual coping efforts: problem-focused thoughts or behaviors, seeking social support, wishful thinking, blaming self, and avoidance. Raw scores are converted to relative scores to eliminate bias resulting from differences in the number of items on each scale (Vitaliano, Maiuro, Russo, & Becker, 1987).

State Measures

A 15-minute battery of stress perception measures is usually administered at strategic time points before, during, and after the stress period being evaluated (see Tables 2 and 3 for specific times). The battery includes

1. Form Y-1 (state form) of the STAI (Spielberger et al., 1983). This is identical to the trait form, except that subjects are instructed to answer according to how they feel "right now" or how they felt during a specified time period or event.
2. The Today form of the MAACL-R (Zuckerman & Lubin, 1985). Because of the improved discriminant validity and the control of the checking response set, the MAACL-R has been particularly suitable for investigations that postulate changes in specific affects in response to stressful situations. This is identical to the trait form, except that subjects are instructed to answer according to how they feel "right now" or how they felt during a specified time period or event.

Table 2
Schedule for the Administration of Psychological
Questionnaires for the Junior Enlisted Course

Day	Events	Questionnaires
Day 1 (administrative)	CDTF classroom instruction	(T)
	Medical screening	(S1)
	Safety briefing	
Day 2 (simulant training)	Training day	
	Administrative classroom instruction	(S2)
	Safety briefing	
	Preparation of detector kits	
	Simulant pad training	
Day 3 (toxic agent training)	Student critique at Administrative Bldg	(S3)
	Training day	
	Administrative classroom instruction	(S4)
	Safety briefing	
	Preparation of detector kits	
	Toxic agent environment	
	Student critique at Administrative Bldg	(S5)

(T) = trait measures

(S) = state measures

Table 3

Schedule for the Administration of Psychological Questionnaires for the Basic NCO Course (BNOC), the Advanced NCO Course (ANOC), the Basic Officers' Course (COBC), and the Advanced Officers' Course (COAC)

Day	Events	Questionnaires
Day 1 (administrative)	CDTF classroom instruction	(T)
	Medical screening	(S1)
	Safety briefing	
Day 2 (training)	Training day	
	Administrative classroom instruction	(S2)
	Safety briefing	
	Preparation of detector kits	
	Simulant pad training	
	Toxic agent environment	
	Student critique at Administrative Bldg	(S5)

(T)

= trait measures

(S)

= state measures

3. The Subjective Stress scale was developed by Kerle and Bialek (1958) to detect significant affective changes in stressful conditions. Subjects are instructed to select one word from a list of 15 adjectives that best describes how they feel "right now" or how they felt during a specified time period or event.

4. The Specific Rating of Events (SRE) scale (Fatkin, King, & Hudgens, 1990) is a measure designed for the ARL stress research program, wherein the subjects rate (on a scale of 0 to 100) how stressful an event or time period was to them or how stressed they feel "right now" or how they felt during a specified time period or event.

5. A Coping Efficacy scale asks respondents to rate their level of confidence in their ability to do well from 1 ("not at all confident") to 10 ("extremely confident"). This scale is adapted from a self-efficacy scale developed by Bandura (1977) for investigating the predictive power of efficacy expectations on behavior or performance. Bandura (personal communication, December 31, 1985) suggested that self-efficacy scales be tailored to the testing situation through simple modifications of the instructions.

6. The Mood Questionnaire was described by Ryman, Biersner, & LaRocco (1974) and modified by Tyner, Manning, & Oleshansky (1989). It includes scales to measure fear, anger, depression, fatigue, activity, and happiness. Although this questionnaire has not been a part of the original

battery of questionnaires previously used by ARL, it has been included for both phases of the P²NBC² research as an additional instrument previously proved sensitive in military exercises involving chemical protective suits. Subjects were asked to respond according to how they feel "right now" or how they felt during the training.

7. The Stanford Sleepiness scale (Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973) asks respondents to rate on a scale from 1 to 7, in defined steps, how sleepy they are at the time or how sleepy they felt during the training. This scale has been added to the basic ARL stress evaluation battery for the P²NBC² research to allow an index of fatigue to be obtained, particularly for comparison with responses from the special forces (SF) troops in Phase I of the research.

8. The revised Environmental Symptoms Questionnaire (Sampson & Kobrick, 1980) is used to obtain information about the incidence and severity of symptoms associated with physical stresses frequently encountered by military personnel. Using a 0 to 5 response scale, valuable information about the subjective symptom state of individuals is provided by the individual item scores or by the mean scores of separate symptom categories. The separate categories used for the chemical decontamination training environment include (a) primary CDTF-specific symptoms, which include "feel warm," "sweating," and "have a headache"; (b) secondary CDTF-specific symptoms; (c) fatigue; and (d) wellness. A complete list of items that are included in each symptom category is given in Appendix A. This questionnaire was included to assess the subjective symptoms that might be related to the physical strain of wearing chemical protective suits. Subjects were asked to respond according to how they feel "right now" or how they felt during the training.

9. The final survey in the evaluation, the Debriefing Questionnaire, was used to obtain a subjective evaluation from subjects about their training experience. They were asked to rate the extent of their training preparation, how well they believed they performed during the training, what factors may have contributed to any drop in their performance, any risk or danger associated with the training, and what aspects of the training they found to be most stressful.

Procedure and Methodology

Individuals participate in CDTF training either as part of their regular MOS training (e.g., Chemical School students) or as volunteers. Data collection was accomplished by means of questionnaires administered before and immediately after the chemical defense courses, with no interference with the standard training schedule. Subjects were repeatedly informed that their consent to participate in the study was not associated with their willingness to receive CDTF training and that they were only consenting to complete questionnaires.

The CDTF operation regulations and guidelines approved by the Surgeon General are as follow:

a. TRADOC Reg 385-1, dated 15 June 1989, "Safety Regulation for Toxic Chemical Agents, GB and VX."

b. AR Reg 50-6, dated 12 November 1986, Chemical Surety Program.

c. Site Safety Plan, dated 17 June 88, "Updated Final Safety Submission and Site Plan for the Chemical Decontamination Training Facility at Ft. McClellan, Alabama."

Subject Scenario

The soldiers participate in the CDTF training in basic or advanced courses that last as long as 2 days. Specific tasks and procedures included in the training are listed in Appendix B. Before the training, soldiers receive an introduction to the CDTF, a medical screening, and a safety briefing. The training day includes administrative classroom instruction, training in a simulated chemical agent environment (simulant pad training), and training in a toxic agent environment. The next morning, randomly selected subjects return to the CDTF Lab for cholinesterase testing only. (Note. Cholinesterase is an enzyme in blood plasma that would indicate an exposure to toxic agents. Random testing after completion of the training is a CDTF safety requirement.)

The schedules for the administration of the psychological questionnaires (see Tables 2 and 3) were established with the assistance of CDTF personnel. Training for the junior enlisted course is 2 days long; simulant pad training is conducted on the first day, and toxic agent training is conducted on the second. Training for the NCO basic and advanced courses and the officer basic and advanced courses is conducted within 1 day. Trait measures (T) were completed during administrative sessions 1 to 2 weeks before training, along with the first package of state measures (S1). Subsequent state measures were administered four times (S2, S3, S4, S5) during the 2-day training course and two times (S2, S5) during the 1-day training. The S5 packet of questionnaires was used as the final post measurement for all groups because it included a debriefing questionnaire and coping checklist.

Experimental Design

Information obtained from the Life Events Form I and from the trait measures was used to screen any subjects with extreme personality characteristics or who might be experiencing a high level of stress unrelated to the CDTF training. The demographic information from the GIQ, the responses obtained from the state measures, and the information obtained on the Debriefing Questionnaire provided dependent variable data. The design for data obtained from the various groups within the CDTF training program is a Groups x Measures x Sessions design. Because the CDTF is a training facility, the performance data that were obtained were limited to whether soldiers successfully completed their tasks during the simulant pad training (see Appendix B), which allowed progression into the toxic agent training days.

Data obtained from the CDTF evaluation were also compared with data obtained in previous studies ("referent protocols") conducted by ARL. Previous stress evaluations (Fatkin, King, & Hudgens, 1990; Hudgens, Malto, Geddie, & Fatkin, 1991) have demonstrated the utility of referent protocol comparisons for estimating the relative stress experienced in a given situation. Each protocol is briefly described in the results section about "Comparisons with Other Protocols." The design is essentially Protocols x Measures.

RESULTS

To evaluate the stress experienced by the subjects in the CDTF training, the CDTF Groups x Measures x Sessions data and the Protocols x Measures data were analyzed by a multivariate analysis of variance (MANOVA). The results of some analyses may show degrees of freedom that do not always correspond to the original number of subjects from whom data were obtained. The multivariate statistical program eliminates any case with a missing value on a variable included in the analysis (Wilkinson, 1990).

Mean responses obtained from the Mood Questionnaire were also compared with similar data collected by WRAIR personnel at the CDTF in 1987 (Tyner, Manning, & Oleshansky, 1989) when the Chemical School first began to incorporate CDTF training at the end of the chemical instruction block of each course.

Trait Measures

The trait questionnaires were used in conjunction with the Life Events Form I to provide information that could be used to screen for subjects whose recent experiences indicated that they were undergoing very high stress unrelated to the CDTF training or those whose personality characteristics were so extreme that they might be classified as displaying clinical abnormalities. No soldiers were excluded by these criteria. Data from the trait measures are summarized in Appendix C.

Motivation Level

To obtain a measure of the soldier's motivation to complete the CDTF training, each subject was asked to rate the importance of successfully completing the training (0 to 100) and then state the reason for his or her rating. An analysis of variance (ANOVA) including all five groups indicated a significant difference between the groups ($F(4,144) = 6.46, p < .001$). Post hoc comparisons were conducted using Dunn's multiple comparison procedure (also known as Bonferroni *t* statistics; Kirk, 1968) with an α level of .01 for each of the comparisons. Both officer groups (basic and advanced) reported training importance ratings significantly lower than those of the junior enlisted, basic NCO, and advanced NCO groups (see Figure 1). The significant results of these post hoc comparisons are indicated in the shaded box on Figure 1.

The reasons for the ratings of training importance fell into six categories, listed below in rank order (most common to least common response): (a) realism, (b) career development, (c) increase confidence in the equipment, (d) personal accomplishment, (e) graduation requirement, and (f) training others. Figure 2 shows a breakdown of the proportion of soldiers that responded within the six categories.

To evaluate the effect of the soldiers' motivation to successfully complete the training on their responses to the training experience, MANOVAs were performed using the six categories of training importance reasons (TReason) listed above as the independent variables and the demographic data (as described in the Methods section under "General Information Questionnaire") and scores from the psychological state measures as the dependent variables. Since there were no significant group differences in TReason, all groups were combined for subsequent analyses using a TReason x Measures x Sessions design.

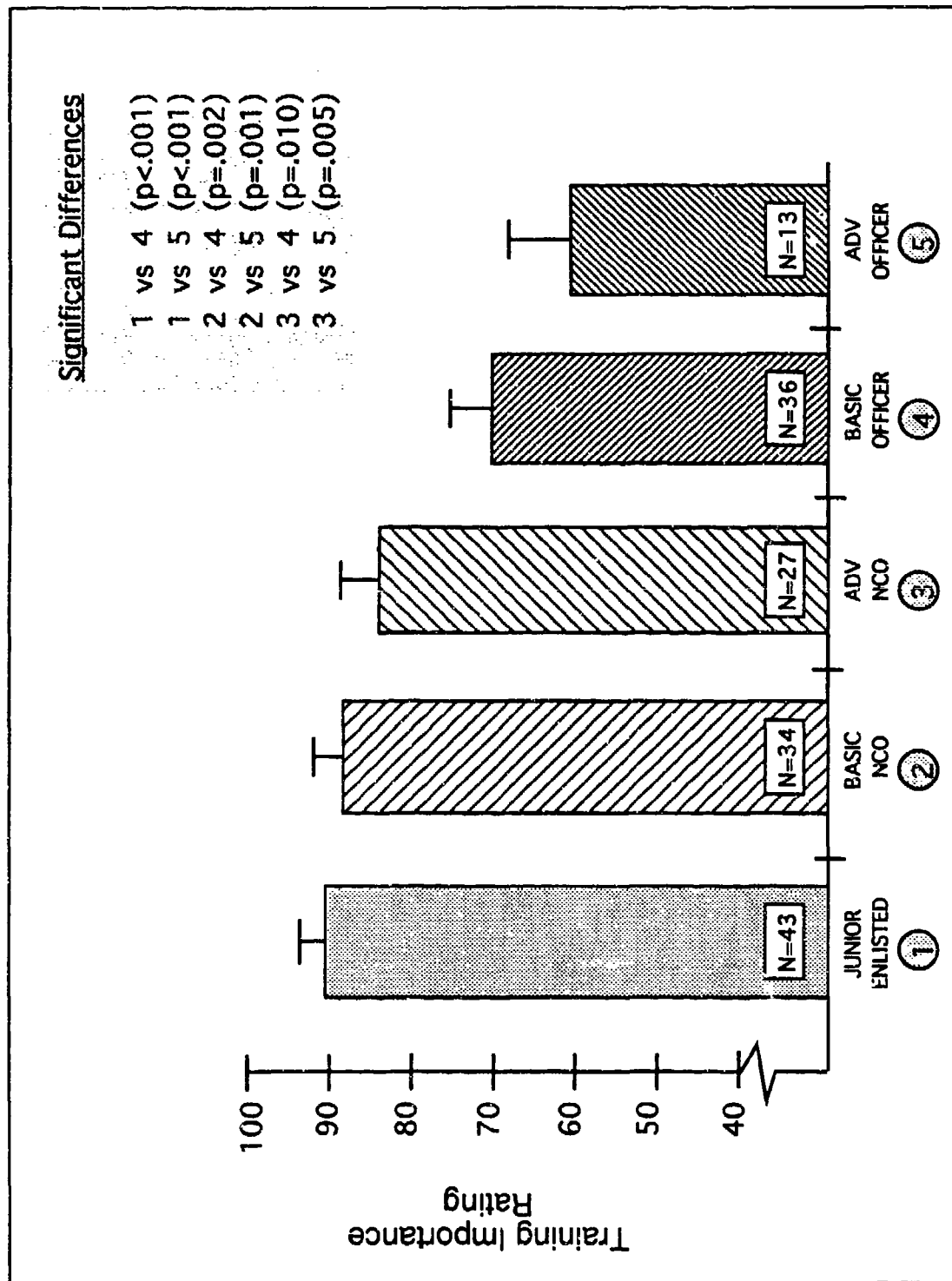


Figure 1. Mean training importance ratings (+ one standard error of the mean, SEM) according to the chemical defense training groups.

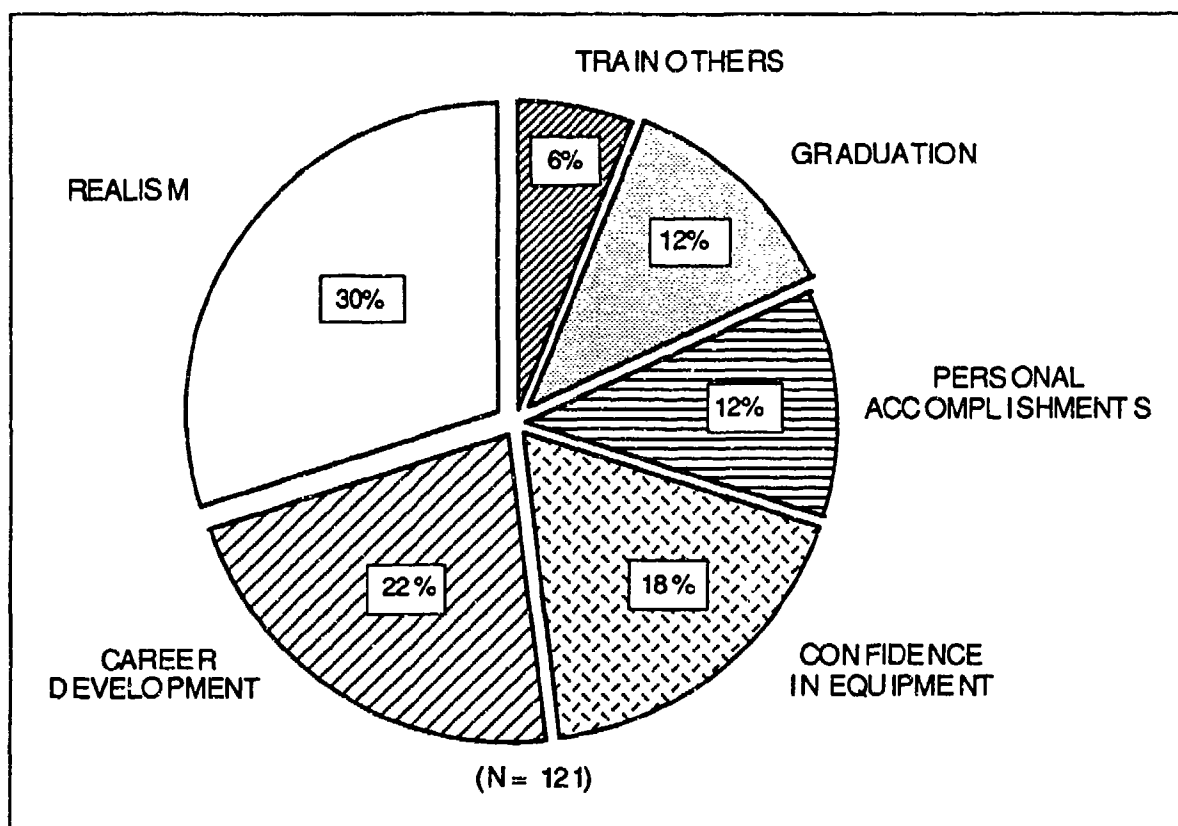


Figure 2. Proportion of soldiers who provided reasons for the importance of successful completion of their chemical defense training.

A three-way interaction effect was significant (Wilks' $\lambda = .693$; $F(25,391) = 1.63$, $p = .03$) for the MAACL-R Hostility subscale only. Post hoc comparisons were conducted using Dunn's multiple comparison procedure with an α level of .01 for each of the comparisons. The soldiers whose sole motive for successful completion of the training was to meet the graduation requirement reported significantly higher levels of pre-training hostility than did soldiers who stated any other reason (realism, $p = .001$; career development, $p = .001$; increase confidence in the equipment, $p = .001$; personal accomplishment, $p = .001$; and training others, $p = .003$) (see Figure 3).

Psychological State Measures

Because of the differences in training structure, analyses of the data from the junior enlisted group (2-day training) were performed separately from the NCO and officer groups (1-day training), classified as the "experienced group" in the figures. MANOVAs indicated that there were significant differences across sessions for the variables discussed below for both the junior enlisted group (Wilks' $\lambda = .395$; $F(68,653) = 2.57$; $p < .001$) and the experienced group (Wilks' $\lambda = .647$; $F(34,552) = 3.95$; $p < .001$). The results of the post hoc comparisons for these measures are indicated in the shaded boxes on each of the figures.

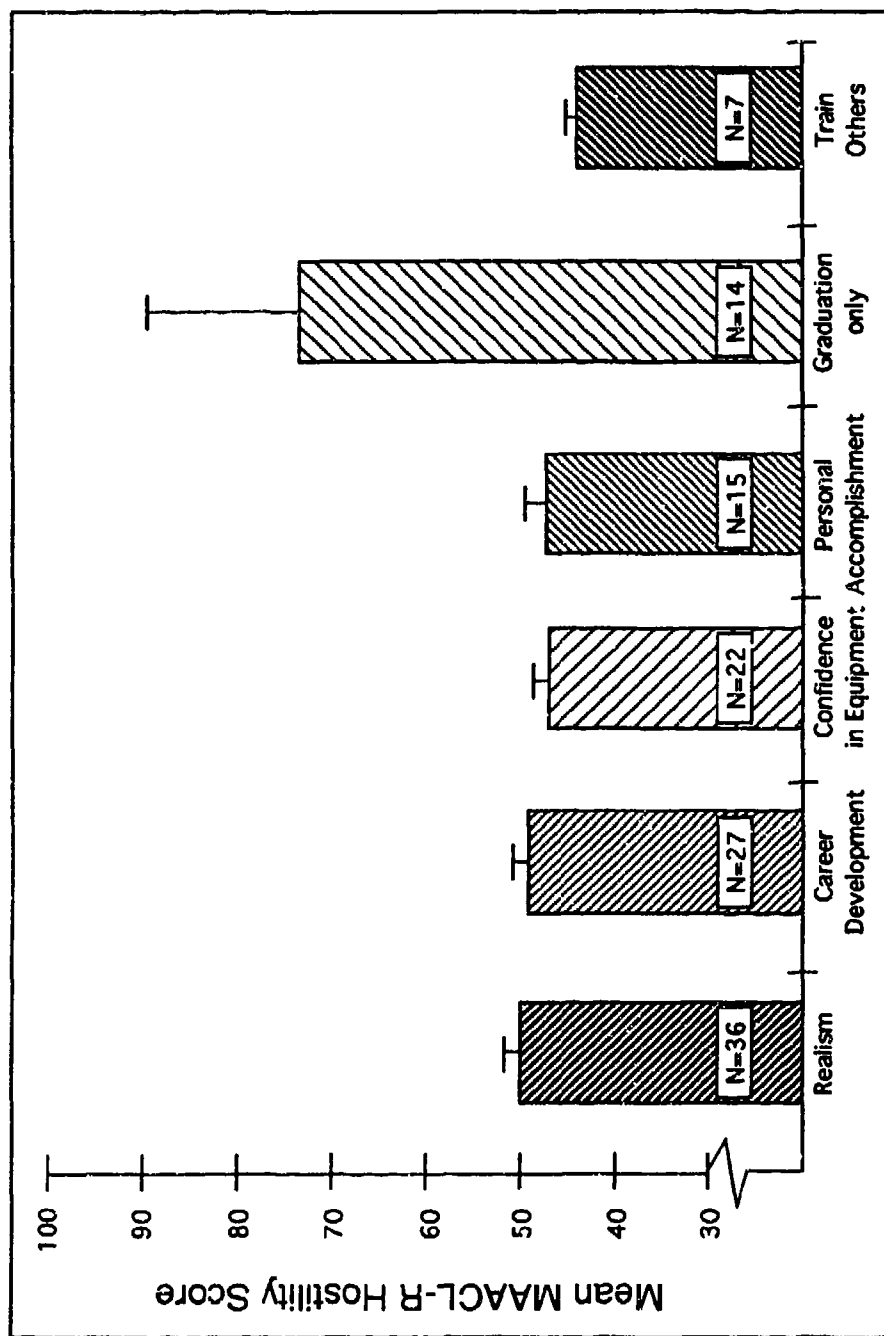


Figure 3. Mean pre-training MAACL-R Hostility scores (+ SEM) according to reasons given by the 121 participants who specified reasons for the importance of training at the CDTF. Note. The remaining 34 subjects who did not provide a specific reason for training importance reported low levels of pre-training hostility (mean = 50.4; SEM = 2.4).

MAACL-R Anxiety (see Figure 4)

The junior enlisted group's anxiety varied significantly across sessions on the MAACL-R Anxiety subscale (univariate $F(4,182) = 4.08$, $p = .003$). The magnitude of their responses steadily increased from Session 1 to Session 4, just before the "hot area" training, and then dropped slightly after the training.

The soldiers from the experienced group showed a significant increase in anxiety (univariate $F(2,292) = 6.32$, $p = .002$) from their initial session to their final session.

MAACL-R Depression

There were no significant differences in depression across sessions for the junior enlisted group (univariate $F(4,182) = 1.04$, $p = .390$) or for the experienced group (univariate $F(2,292) = .99$, $p = .373$).

MAACL-R Hostility (see Figure 5)

Only the experienced group indicated significant changes in hostility levels across sessions (univariate $F(2,292) = 3.44$, $p = .033$). There was a significant decrease in hostility from the time of their initial testing (ranging from 1 to 2 weeks before the CDTF training) to the pre-training data collection.

STAI Anxiety

Although there were no significant differences in STAI anxiety scores across sessions for the junior enlisted group (univariate $F(4,182) = .41$, $p = .801$) or for the experienced group (univariate $F(2,292) = 2.77$, $p = .065$), the pattern of response was similar to that illustrated by MAACL-R anxiety in Figure 4.

Subjective Stress scale

There were no significant differences in levels of stress as reported on the Subjective Stress scale across sessions for the junior enlisted group (univariate $F(4,182) = 1.59$, $p = .178$) or for the experienced group (univariate $F(2,292) = .82$, $p = .442$).

Specific Rating of Events scale (see Figure 6)

Only the experienced group indicated a significant change in overall stress levels across sessions (univariate $F(2,292) = 4.13$, $p = .017$). The stress ratings were significantly higher at the post-training session than they were at the initial testing session and just before the training.

Mood Questionnaire, Happiness subscale (see Figure 7)

The experienced group reported a significant change on the Happiness subscale of the Mood Questionnaire across sessions (univariate $F(2,292) = 3.20$, $p = .042$). There was a slight but statistically significant decrease in mean score from the initial testing to the post-training data collection. Data from the WRAIR report (Tyner et al., 1989) indicated a drop in "positive mood" during the 3 test days.

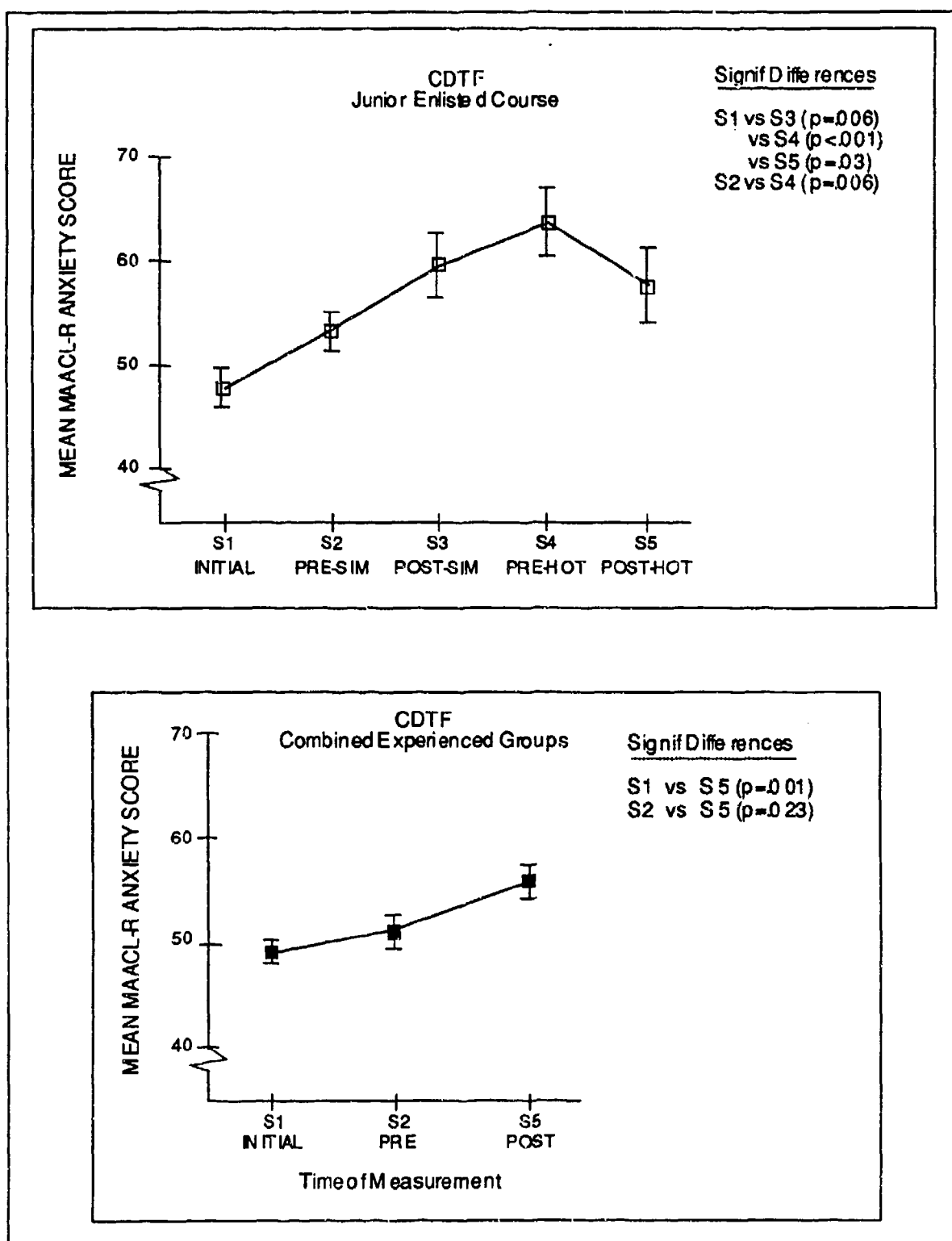


Figure 4. Mean MAACL-R anxiety scores for the junior enlisted course and the combined experienced groups across sessions.

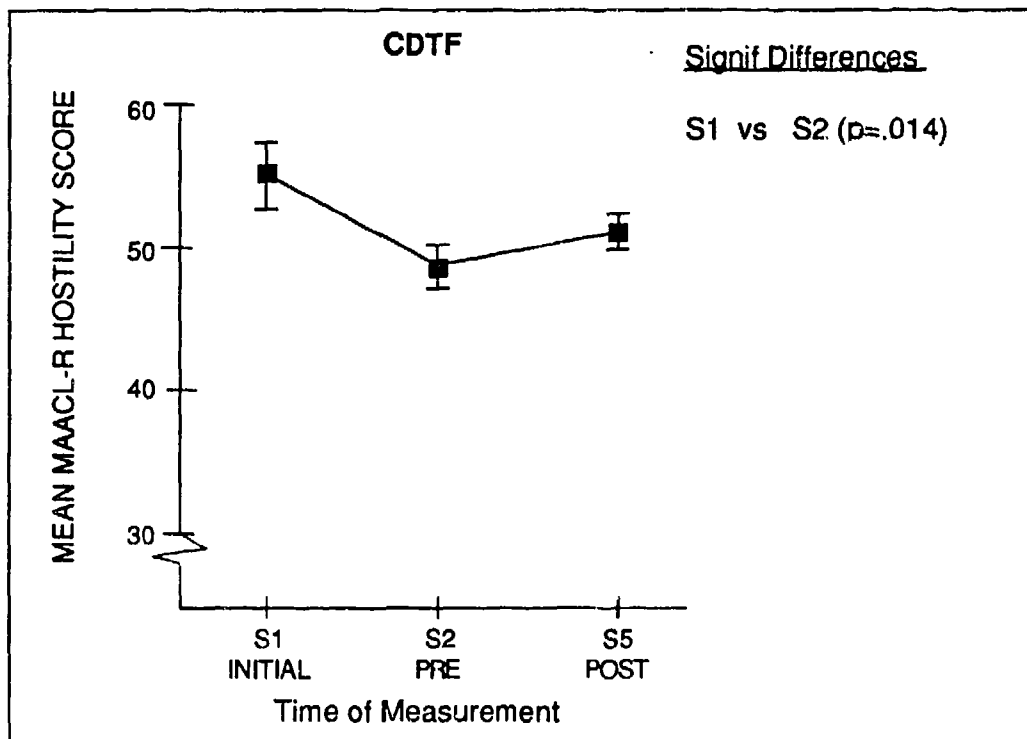


Figure 5. Mean MAACL-R hostility scores across sessions for the combined experienced groups.

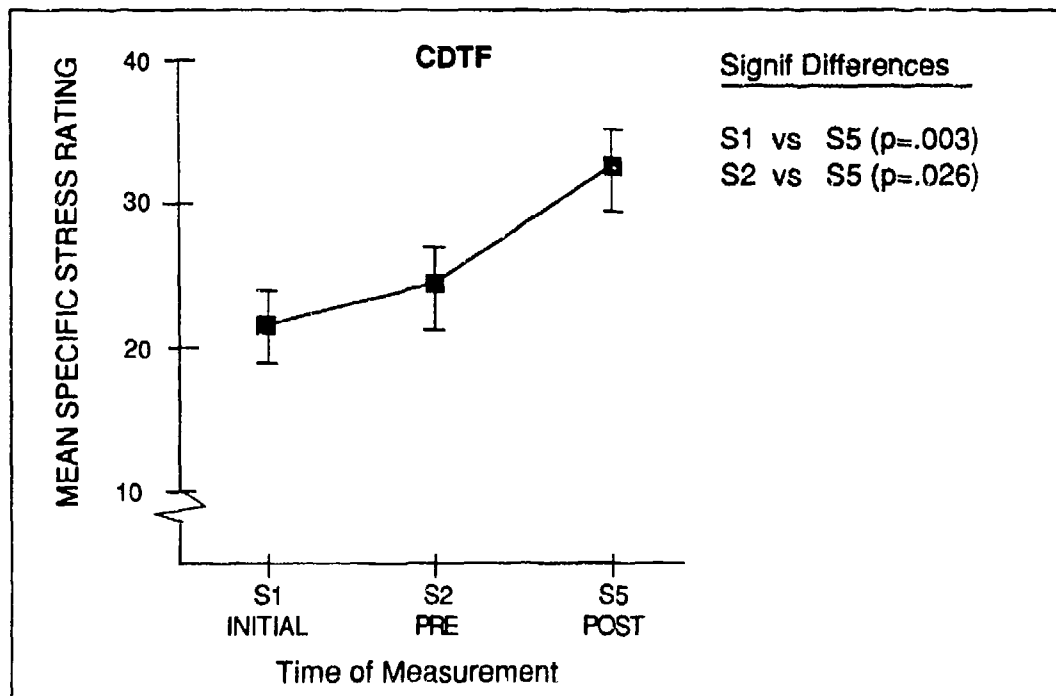


Figure 6. Mean specific stress rating across sessions for the combined experienced groups.

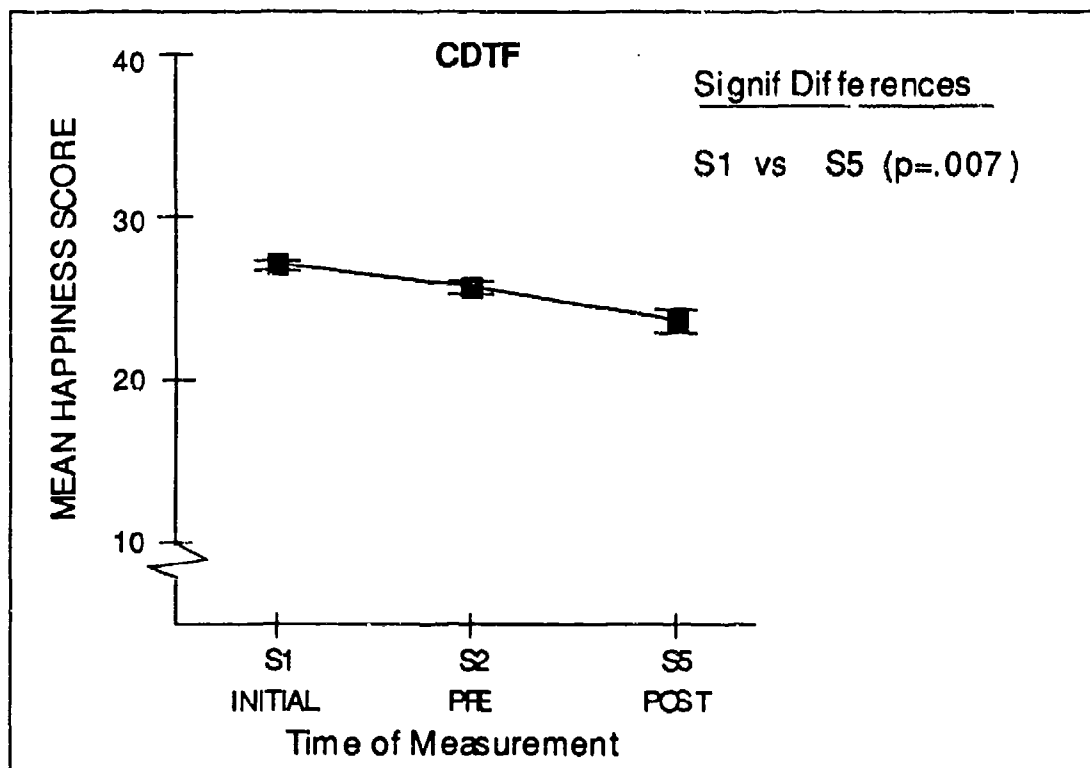


Figure 7. Mean score across sessions from the Happiness subscale of the Mood Questionnaire for the combined experienced groups.

Mood Questionnaire, Anger subscale (see Figure 8)

The junior enlisted group reported scores on the Anger subscale that were significantly higher during their initial session, 1 to 2 weeks before training, than they were just before or during training (univariate $F(4,182) = 3.18$, $p = .015$). Although the mean Anger score raised slightly from pre- to post-simulant training, it decreased significantly just before "hot area" training.

The experienced group showed a significant decrease in scores on the Anger subscale (univariate $F(2,292) = 11.45$, $p < .001$) from the initial session to the pre- and post-training sessions.

Anger subscale data from the 1989 WRAIR report were not available for comparison with CDTF data.

Mood Questionnaire, Fatigue subscale (see Figure 9)

There was a significant drop in the mean Fatigue subscale scores for the experienced group (univariate $F(2,292) = 7.98$, $p = .001$) from the initial session to the pre- and post-training sessions.

Data from the 1989 WRAIR report indicated that mean Fatigue subscale scores declined during the 3 test days.

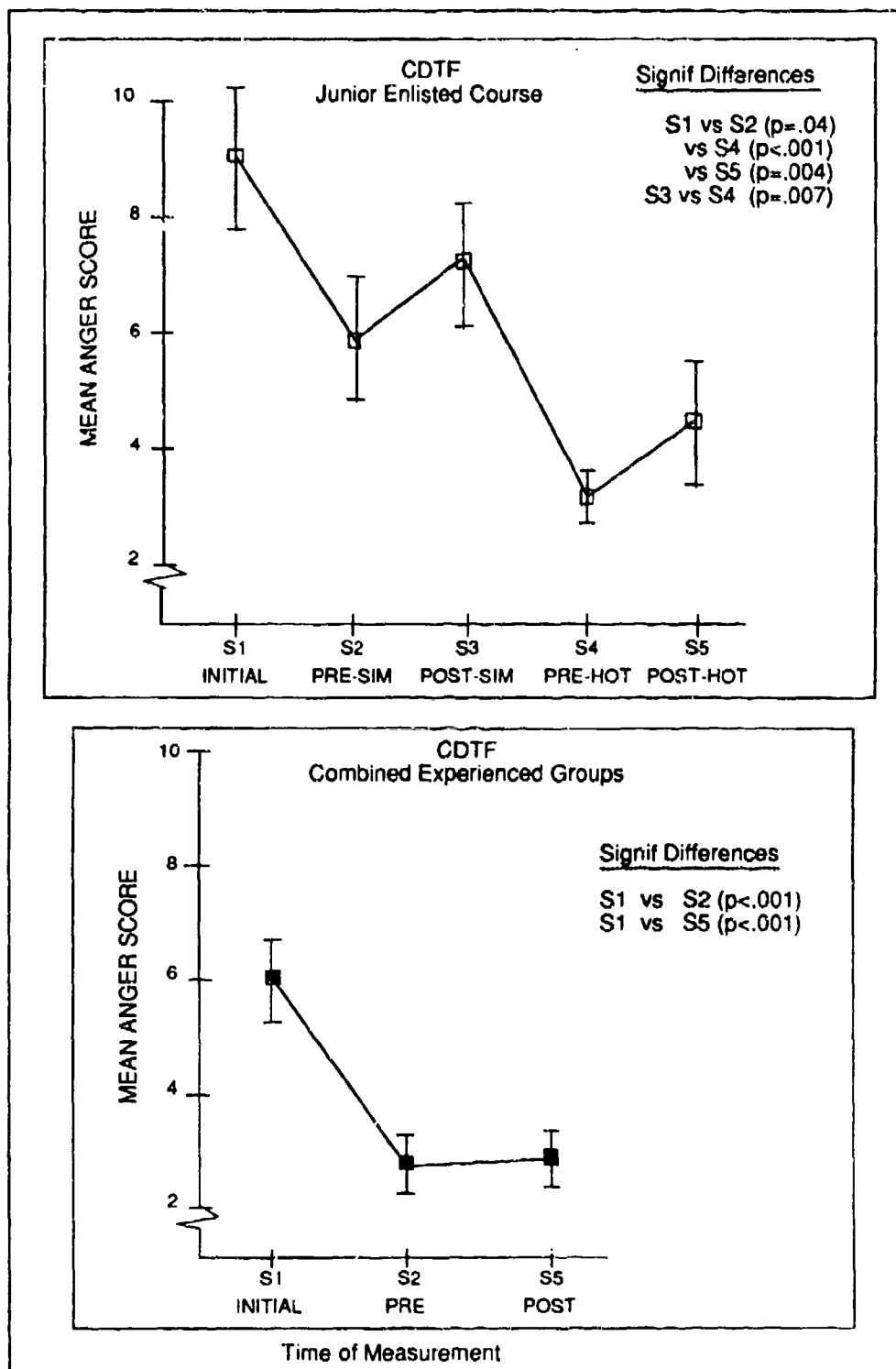


Figure 8. Mean scores from the Anger subscale of the Mood Questionnaire for the junior enlisted group and the combined experienced groups across sessions.

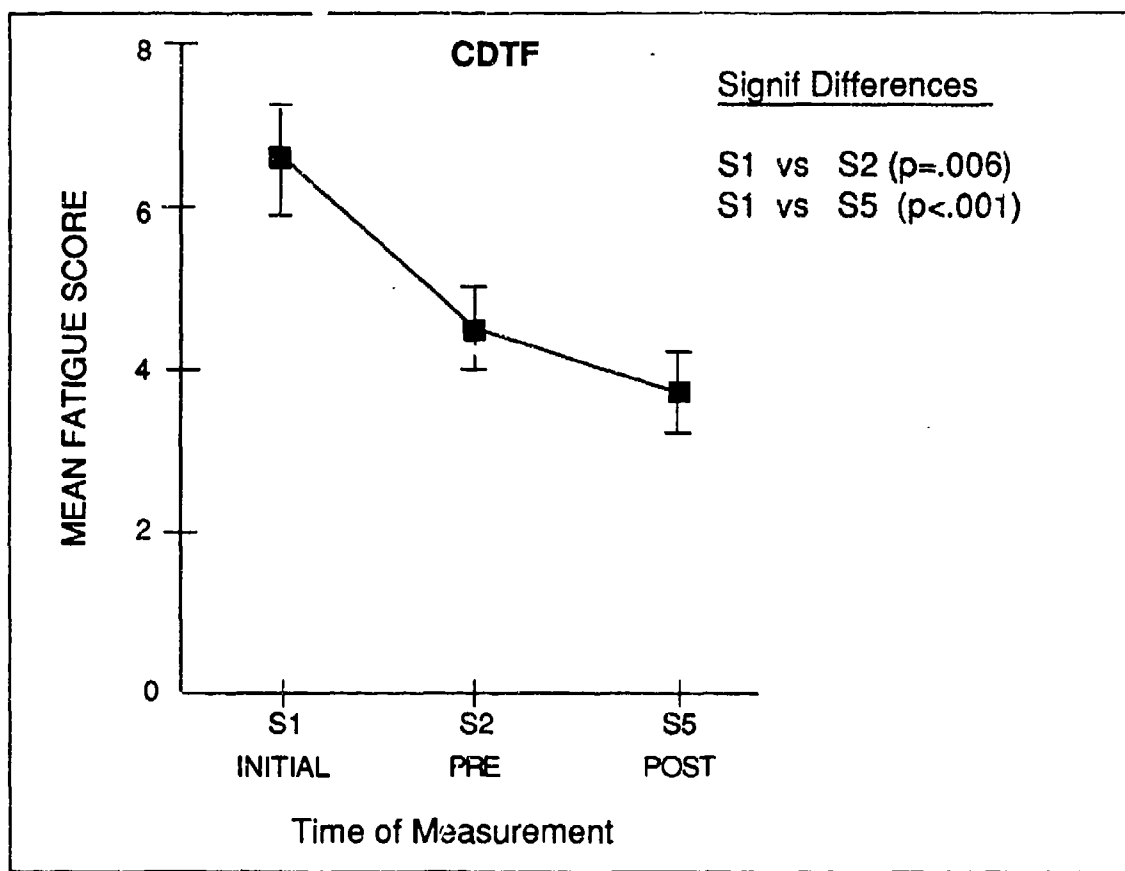


Figure 9. Mean scores from the Fatigue subscale of the Mood Questionnaire for the combined experienced groups.

Stanford Sleepiness scale (see Figure 10)

The experienced group reported a decrease in sleepiness or overall fatigue from the initial session to the post-training session (univariate $F(2,292) = 4.87, p = .008$).

Comparisons With Other Protocols

Psychological data from the junior enlisted group and combined data for the four standard training groups (BNOC, ANOC, COBC, and COAC) were compared in separate analyses with data from five referent protocols (see Figures 11 through 13). The referent protocols for the present evaluation are (a) ONCOL SURG - men visiting a hospital on a day when their wives were facing cancer surgery under general anesthesia; (b) ABDOM SURG - men visiting a hospital on a day when their wives were facing abdominal surgery under general anesthesia; (c) WRITTEN EXAM - third year male medical students taking a written examination required for completion of the clerkship portion of their medical training; (d) SS COMPET - male soldiers representing elite units in marksmanship competition; and (e) INDCNTRL - men investigated during normal work days when they were experiencing no unusual stress. The ONCOL SURG and ABDOM SURG protocols represent a relatively high stress level when compared with the

WRITTEN EXAM and SS COMPET protocols, which represent a relatively moderate level of stress. The INDCNTRL protocol represents a relatively low stress level to a condition of no stress.

MANOVAs were conducted to compare CDTF data with the data obtained in the referent protocols on the stress perception measures including the MAACL-R, the STAI, the Subjective Stress scale and the Specific Rating of Events. Significant differences were found between the junior enlisted group and the referent protocols (Wilks' $\lambda = .165$; $F(80,687) = 3.91$; $p < .001$), and between the experienced group and the referent protocols (Wilks' $\lambda = .194$; $F(80,962) = 4.88$; $p < .001$).

Comparisons between protocols were conducted using Dunn's multiple comparison procedure with an α level of .01 for each of the five *a priori* comparisons with referent groups for an overall α of .05. The results of all significant comparisons are indicated in the shaded boxes on each of the figures.

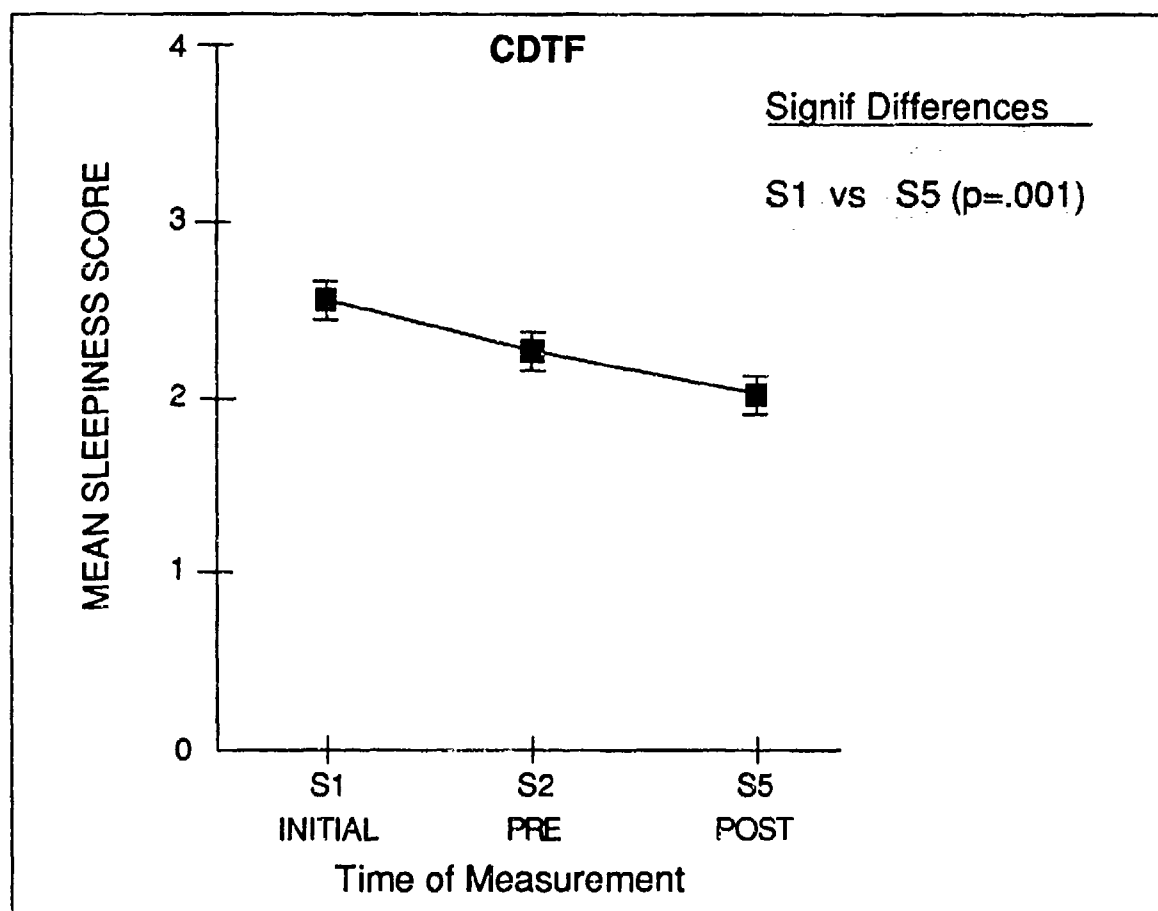


Figure 10. Mean scores from the Stanford Sleepiness scale for the combined experienced groups.

MAACL-R Anxiety, Comparative (see Figure 11)

The junior enlisted group reported pre-stress anxiety scores that were significantly higher than those of the independent control group ($p = .005$) and comparable to the written exam and soldier stress (SS) competition groups' mean scores, indicating a moderate level of stress. The experienced group, however, did not report a level of anxiety that was significantly different from that of the independent control group.

Subjective Stress scale, Comparative (see Figure 12)

Similar results were found when the CDTF data from the Subjective Stress scale were compared to the data from the referent protocols. The junior enlisted group reported experiencing a level of stress just before the training that was significantly higher than the independent control group ($p = .007$) and comparable to the written exam and SS competition groups' mean levels. There were no significant differences between the experienced groups and the independent control groups on this measure.

Specific Rating of Events scale, Comparative (see Figure 13)

Both CDTF comparison groups rated the stress of the CDTF training significantly lower than the stress of most of the referent protocols and significantly higher than the independent control group rated it (junior enlisted group, $p = .004$; experienced group, $p = .009$).

Training Performance

Four individuals, who were participating in courses at the basic level, did not complete the chemical defense training. Two soldiers dropped from the junior enlisted course, one dropped from the basic NCO course, and the fourth from the basic officer course. Although general observations can be made (i.e., there were no dropouts from the advanced training courses; hence, dropouts were younger and had less military experience), the sample size was too small to draw conclusions and there were not enough performance data that could be reliably quantified and correlated with the psychological data obtained. Mean differences ($\pm$ SEM) in demographic, psychological, and subjective performance responses for those who completed the training and those who did not complete the training are presented in Table 4.

Environmental Symptom Questionnaire-Revised (ESQ-R)

A MANOVA was performed using data from all three sessions (S1, S2, S5) for each of the experienced groups (BNOC, ANOC, COBC, and COAC). The scores from the five symptom categories were used as the dependent variables.

A three-way interaction effect, Groups $\times$ Sessions $\times$ Symptom Categories, was significant (Wilks' $\lambda = .417$; $F(24,171) = 2.52$; $p < .001$). As illustrated in Figure 14, the advanced officer group reported experiencing more CDTF-specific symptoms ("headache," "warm," "sweating") during the training than the other three groups did (BNOC, $p < .001$; ANOC, $p = .001$; COBC, $p = .004$).

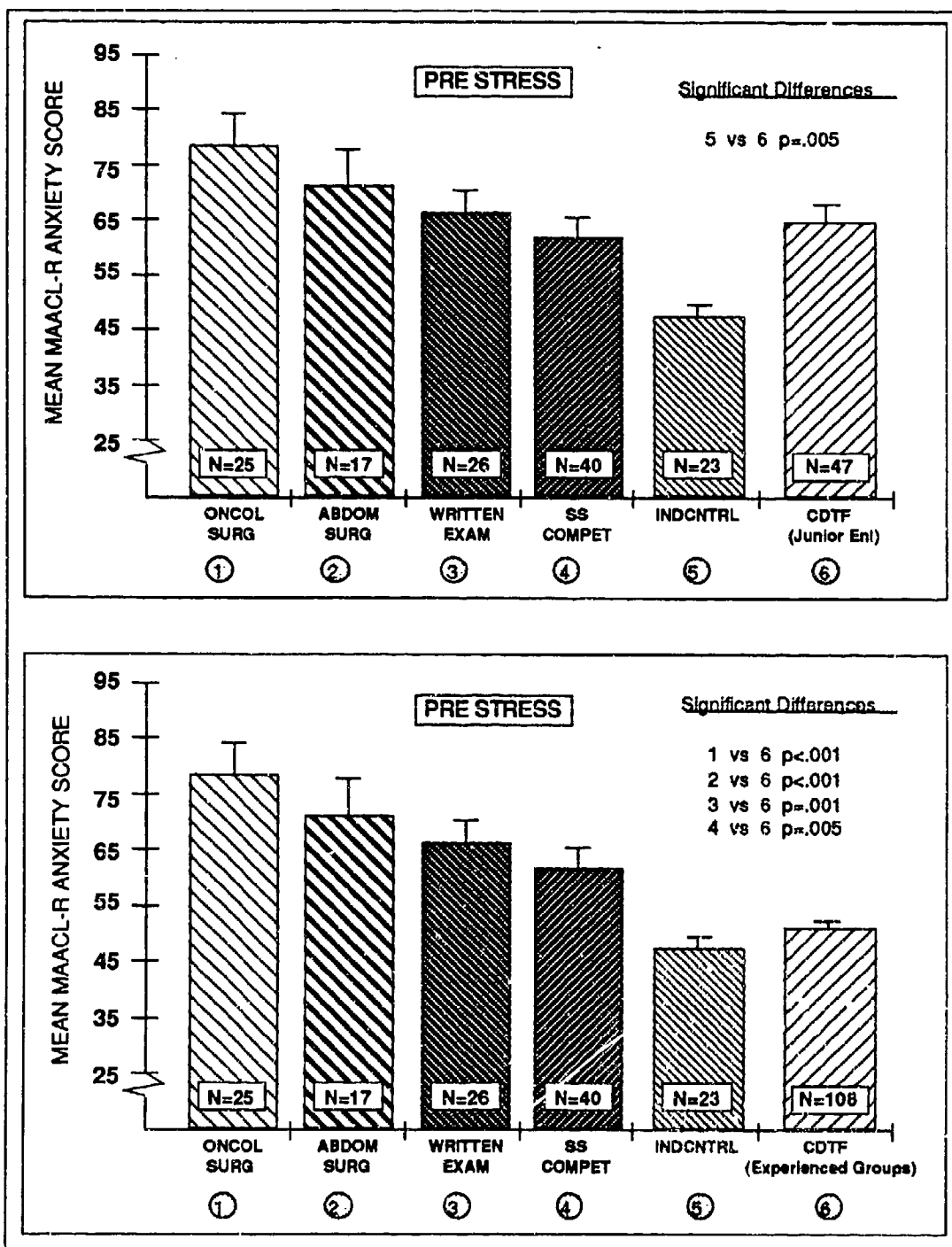


Figure 11. Comparison of mean pre-stress MAACL-R anxiety scores (+SEM) for CDTF junior enlisted and experienced groups with those for subjects in the following conditions: (1) spouse having cancer surgery under general anesthesia; (2) spouse having abdominal surgery under general anesthesia; (3) taking an important medical school written exam; (4) performing in military weapon-firing competition; or (5) the independent non-stress control condition.

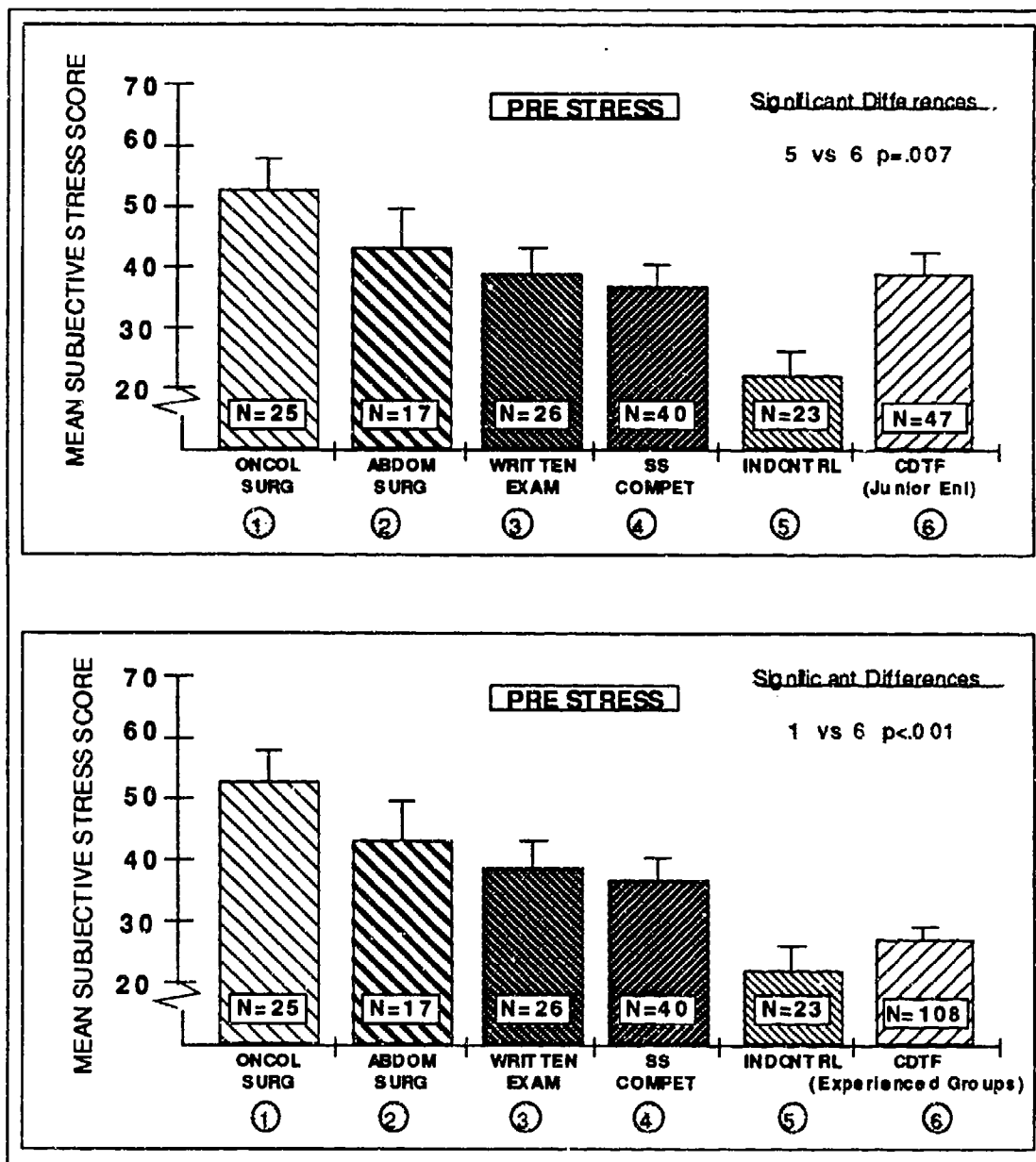


Figure 12. Comparison of mean pre-stress subjective stress scores (+SEM) for CDTF junior enlisted and experienced groups with those for subjects in the following conditions: (1) spouse having cancer surgery under general anesthesia; (2) spouse having abdominal surgery under general anesthesia; (3) taking an important medical school written exam; (4) performing in military weapon-firing competition; or (5) the independent non-stress control condition.

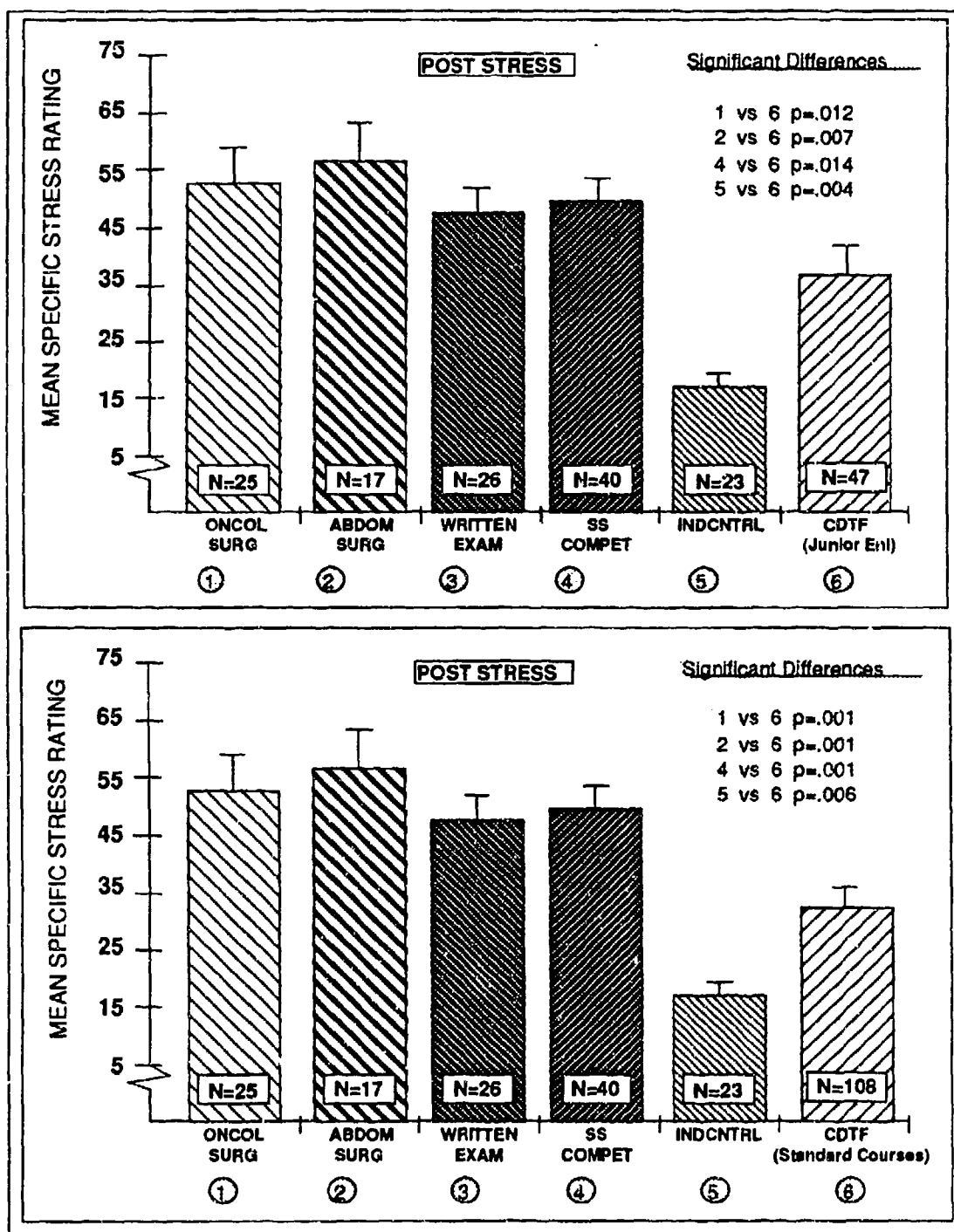


Figure 13. Comparison of mean post-stress specific stress rating (+SEM) for CDTF junior enlisted and experienced groups with those for subjects in the following conditions: (1) spouse having cancer surgery under general anesthesia; (2) spouse having abdominal surgery under general anesthesia; (3) taking an important medical school written exam; (4) performing in military weapon-firing competition; or (5) the independent non-stress control condition.

Table 4

Means ($\pm$ SEMs) of the Demographic and Psychological Data Between Soldiers Who Successfully Completed CDTF Training and Those Who Dropped Out

Measure	Completed (N=151)			Dropped out (N=4)		
	Initial	Pre	Post	Initial	Pre	Post
Demographic (yrs)						
Age	25.7 (0.4)	—	—	21.2 (1.1)	—	—
Length of service	5.2 (0.3)	—	—	1.7 (1.2)	—	—
Psychological						
SSE, Confidence (1-10)	8.8 (0.1)	8.6 (0.2)	—	6.0 (1.5)	8.7 (0.9)	—
MAACL-R Anxiety	48.8 (1.0)	51.9 (1.3)	56.1 (1.5)	48.0 (3.0)	56.5 (4.8)	65.2 (14.6)
MAACL-R Depression	52.0 (1.5)	52.6 (1.8)	50.6 (0.9)	55.0 (8.0)	59.0 (12.0)	71.8 (14.3)
MAACL-R Hostility	56.0 (2.2)	50.9 (1.7)	51.8 (1.2)	52.3 (6.3)	57.0 (6.5)	53.8 (4.7)
Specific Rating of Events	25.5 (2.2)	24.3 (2.2)	33.6 (2.5)	36.0 (23.3)	50.5 (13.0)	50.2 (17.5)
STAI Anxiety	41.7 (0.8)	42.7 (0.7)	43.2 (0.8)	41.0 (4.4)	51.0 (3.9)	52.2 (8.5)
Subjective Stress scale	27.5 (1.9)	28.0 (1.8)	30.1 (2.0)	20.8 (9.3)	43.5 (12.5)	43.5 (20.2)
Mood Ques, Happiness	26.9 (0.8)	25.3 (0.8)	23.4 (0.8)	25.2 (4.1)	24.0 (3.9)	10.2 (3.0)
Mood Ques, Activity	20.8 (0.7)	19.2 (0.7)	18.3 (0.8)	15.0 (3.3)	15.0 (3.3)	9.8 (3.5)
Mood Ques, Depression	4.9 (0.6)	3.9 (0.5)	2.7 (0.4)	1.0 (0.7)	5.8 (5.4)	5.0 (3.1)
Mood Ques, Fear	3.8 (0.5)	3.8 (0.4)	4.6 (0.5)	0.5 (0.5)	5.8 (3.2)	7.5 (3.8)
Mood Ques, Anger	7.0 (0.6)	3.6 (0.5)	3.4 (0.5)	4.2 (2.2)	10.5 (5.5)	2.2 (1.1)
Mood Ques, Fatigue	6.3 (0.6)	5.9 (0.5)	4.0 (0.4)	9.5 (4.9)	7.5 (4.0)	5.8 (3.1)
Sleepiness scale	2.6 (0.1)	2.6 (0.1)	2.3 (0.3)	3.3 (0.9)	2.8 (0.6)	2.8 (0.8)
Other (0 to 10 ratings)	—	—	8.2 (0.2)	—	—	8.7 (0.8)
Prior preparation	—	—	8.7 (0.1)	—	—	4.2 (1.9)
Subjective performance						

Note. Shaded areas highlight interesting differences.

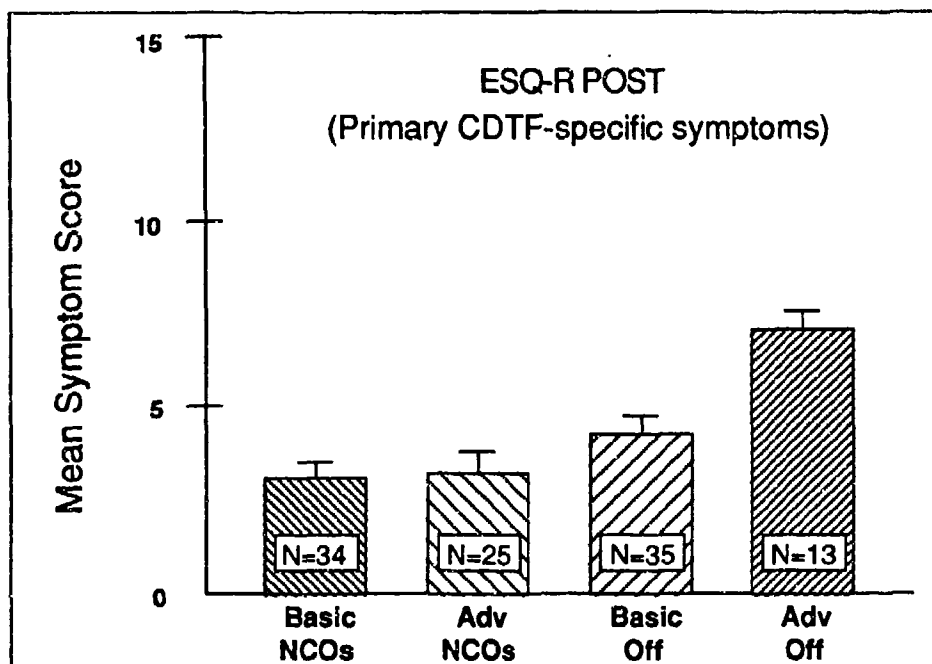


Figure 14. Mean ESQ-R symptom scores (+SEM) for the primary CDTF-specific symptom category (headache, warm, sweating) according to each chemical defense training group.

Results from the Fatigue subscale of the ESQ-R (see Figure 15) indicate that the basic officers reported experiencing significantly more fatigue symptoms than the BNOC ($p = .005$) and the ANOC ($p = .042$) groups did during the training. The means (+SEMs) for the symptom category responses between those who completed the training and those who did not complete the training are presented in Table 5.

Debriefing Questionnaire

At the end of the training day, subjects were asked two open-ended questions regarding (a) what factors may have contributed to drops in performance, if any, and (b) what was the most stressful aspect of the training. The responses to the first question, factors contributing to drops in performance, are listed beginning with the most common responses: BDOs were too thick and too heavy; the concern and worry about wearing the mask (leakage, lack of visibility, straps too tight, etc.); the heat and humidity; the threat of being exposed to toxic agents; the length of time in MOPP IV; and the perception that the subjects could not hear well. The responses to the second question regarding the most stressful aspect of the training are also listed beginning with the most common responses: the threat of exposure; wearing the mask (difficult to breathe, too tight, difficult to see); the length of time in MOPP IV; being in MOPP IV; just entering the "hot area"; the MOPP exchange exercise; the heat; and the behavior of others (complaining, making mistakes, etc.).

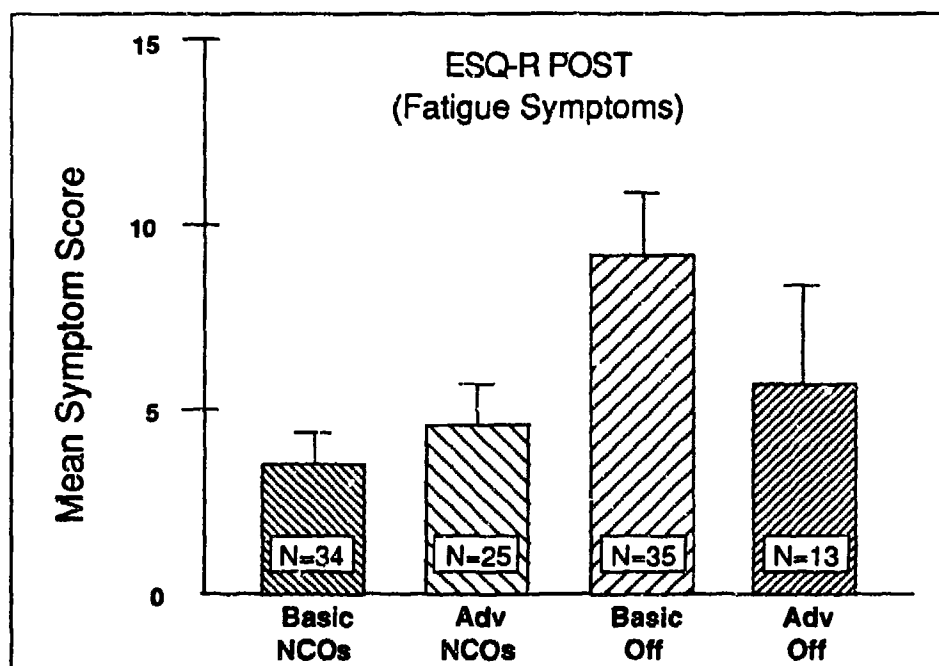


Figure 15. Mean ESQ-R symptom scores (+SEM) for the fatigue symptom category according to each chemical defense training group.

When asked to compare the danger or risk of toxic agent training to the dangers or risks of parachute jumping, the soldiers rated toxic agent training nearly as high as they did parachuting, regardless whether they had actual experience with parachute jumping (see Table 6). Similar results of a risk assessment of CDTF training were reported in the WRAIR report (Tyner et al., 1989).

DISCUSSION AND RECOMMENDATIONS

CDTF Evaluation

An evaluation of the stress experienced throughout the CDTF training program was accomplished using a battery of psychological measures designed to assess personality traits, coping resources, and perceptions of stress at specified times in the program. Because of the differences in training structure, analyses of the data from the junior enlisted group (2-day training) were performed separately from the NCO and officer groups (1-day training), classified as the "experienced group" in the figures.

The junior enlisted group reported increases in anxiety during sessions (S1 through S4) as they approached the "hot area" training. There was a slight drop in their anxiety level when asked how they felt during the training (S5). This pattern indicated that their anxiety levels increased as they anticipated participating in the toxic agent portion of the training.

Table 5

Means ($\pm$ SEMs) of the Environmental Symptom Questionnaire Data Between Soldiers Who Successfully Completed CDTF Training and Those Who Dropped Out

ESQ-R symptom category ^a	Completed		Dropped out	
	Initial	Pre Post	Initial	Pre Post
I. Primary CDTF-specific	2.4 (0.2)	1.0 (0.1) 4.0 (0.3)	2.5 (2.2)	0.2 (0.2) 6.0 (3.6)
II. Secondary CDTF-specific	5.9 (0.4)	4.9 (0.3) 6.7 (0.4)	5.0 (1.0)	5.5 (1.5) 10.8 (4.2)
III. Non-CDTF	1.1 (0.3)	0.4 (0.2) 0.5 (0.2)	0.0 (0.0)	0.0 (0.0) 0.0 (0.0)
IV. Wellness	10.6 (0.3)	10.0 (0.3) 8.2 (0.4)	8.5 (3.1)	8.3 (3.5) 6.8 (1.8)
V. Fatigue	8.8 (0.8)	5.9 (0.6) 6.3 (0.7)	2.0 (1.0)	10.0 (2.1) 16.0 (8.2)

^aSee Appendix A for a listing of specific symptoms within each category.

Note. Shaded areas highlight interesting differences.

Table 6

Comparison of the Mean (+SEM) Risk Rating for Parachute Jumping
with the Risk Rating for CDTF Training

Group	n	Risk of parachute jumping	Risk of CDTF training
WRAIR subjects (1989 report)		6.0	4.5
Current study			
All subjects	155	6.0 (0.2)	4.4 (0.2)
With parachute-jumping experience	112	6.4 (0.2)	5.0 (0.3)
Without parachute- jumping experience	43	5.2 (0.5)	3.4 (0.4)

Data were combined for the other four standard training groups (BNOC, ANOC, COBC, and COAC) and analyzed across sessions. There was a small but significant increase in anxiety during sessions (initial, pre, and post). Their level of hostility, a component of stress that usually relates to levels of personal frustration (Fatkin, Hudgens, Torre, King, & Chatterton, 1991; Zuckerman & Lubin, 1985), decreased significantly during sessions. Fatigue, as reported on an overall Sleepiness scale, also decreased significantly across all sessions. The significant drop in reported fatigue between the pre- and post-training sessions may indicate a certain level of vigilance gained by participating in the training.

Mean scores from both the Happiness subscale and the Fatigue subscale of the Mood Questionnaire declined from the time of the initial measurement to just after the training. These results were consistent with those reported by Tyner et al. (1989), indicating that soldiers participating in CDTF training reported a steady decrease in mean scores for these same subscales.

Responses on the Anger subscale of the Mood Questionnaire indicated that the soldiers were experiencing significantly more frustration or anger during their initial measurement session than they were just before or just after the training. This may be a reflection of their experiences within the overall chemical defense training program. The CDTF training is the final portion of an intensive training regimen that lasts as long as 5 months.

The intensity of responses on the Mood Questionnaire reported by Hudgens and Fatkin (1992) is also relatively consistent with those results reported in this study. The only outstanding difference is in the response on the Activity subscale. Soldiers participating in the Special Forces Assessment and Selection Course at Fort Bragg, North Carolina, reported a more intense level of activity than did those involved in the CDTF training.

Comparisons With Other Protocols

Data obtained from the CDTF evaluation were also compared with data obtained in previous studies ("referent protocols") conducted by ARL. These comparisons provide a method for estimating the relative stress experienced in a given situation. The two surgical protocols represent a relatively high stress level; the written exam and the soldier competition protocols represent a relatively moderate level of stress; and the independent control protocol represents a condition ranging from no stress to low stress.

Two stress perception measures completed just before the training, MAACL-R Anxiety and the Subjective Stress scale, indicated that the junior enlisted group experienced a moderate level of stress, significantly higher than the INDCNTRL group, and significantly lower than the ONCOL SURG group. The experienced group, however, did not report a level of anxiety that was significantly different from the INDCNTRL group.

On the Specific Rating of Events scale (a more global measure of stress), both CDTF comparison groups rated the stress of CDTF training significantly lower than the stress of most of the referent protocols and significantly higher than the INDCNTRL group rated it. These moderate stress results seem to indicate that the CDTF training was stressful enough to get their attention but not high enough to exceed their available resources.

Mediating Factors Influencing Stress Perception

When defining an experience as stressful, it is important to look beyond the defined situation (CDTF training) and recognize the mediating effects of specific characteristics and resources of the individuals in that situation (i.e., preparedness, coping resources, experience, attitude or motivation toward the training). The intensity and extent of the stress state and associated behaviors are usually not readily predicted from a knowledge of the situational factors alone but require an analysis of underlying motivational patterns and of the context in which the stressor is applied (Appley & Trumbull, 1977; McGrath, 1977). The adage, "one person's stress is another one's challenge," seems to convey the differences in response patterns of individuals in this investigation who were either less motivated to complete the CDTF training or were less experienced.

For example, soldiers whose sole motive for successful completion of the training was to meet the graduation requirements reported significantly higher levels of pre-training hostility than did soldiers who stated any other reason, such as realism, career development, increased confidence in equipment, personal accomplishment, or training others. Those who initially rated the overall importance of CDTF training as relatively low, later complained of more physical symptoms.

In addition to the soldiers' motivation to complete the training, their level of experience seemed to be a mediating factor influencing their stress perception. The fact that the training was not rated as moderately or highly stressful by soldiers with more experience than the junior enlisted group may indicate that the more experienced soldiers were more confident in their ability to successfully complete the training than were those with less experience. The relatively low stress rating by the more experienced groups is therefore a positive finding. It would not be advantageous for soldiers to be concentrating more on their anxiety than on the training. An important

conclusion might be that CDTF training seemed to create an appropriate level of arousal to create the vigilance necessary to learn and to reinforce prior classroom training but not so stressful as to interfere with this process.

A primary objective of the CDTF training is to increase the level of confidence in the equipment and in the soldiers' performance of chemical defense procedures. Debriefing questionnaire responses indicate that although some of the critical aspects of the training identified by the soldiers included factors that could be learned while training with simulants, the most crucial concerns of the soldiers included the threat of exposure to toxic agents and doubts about how the equipment would actually function in a contaminated environment. The opportunity provided by CDTF to receive chemical defense training in a toxic agent environment is an ideal way to address these concerns.

The stress literature has indicated that in order to increase confidence expectancy for actual performance, individuals must be provided with successful training experiences. Bandura (1977, 1982, 1986) contends that individuals are constantly assessing their range of capabilities and that these assessments significantly guide and influence behavior. When individuals perceive an action or task as exceeding their ability, they tend to minimize their efforts, perform less effectively, or avoid these situations altogether. On the other hand, when individuals believe the tasks to be within their range of capabilities, they invest more effort and tend to persevere even in the face of obstacles or adverse circumstances.

Training, as in the deliberate practice in performing correct responses, appears to aid in alleviating stress effects and has been highly recommended as a remedy for potential stresses in space missions, civil defense, and other real-life situations. Successful training becomes part of the soldiers' performance history, which consequently serves to build confidence in their ability to perform other related tasks well. In a longitudinal study of combat stress reaction, Solomon, Benbenishty, and Mikulincer (1991) reported that the stability of self-efficacy over time suggests that confidence in one's ability may be a determinant of long-term adjustment outcomes.

Nearly half of the CDTF subjects (48%) stated that their personal motivation for successfully completing the training included the realism provided by the experience within a toxic agent environment and the opportunity to gain confidence in the equipment that had been previously used only with simulants. Those soldiers who had recently returned from Saudi Arabia were among those who ranked these two issues as most important. To deny individuals the unique training within the toxic agent environment would also deny them the opportunity to maintain or increase their level of confidence in chemical defense procedures and equipment.

Effective training not only enhances the soldiers' resistance to potential performance degradation, it also improves their ability to cope with stress while performing their task. Training provides soldiers with the opportunity to demonstrate proficient performance capabilities. This experience reinforces their belief that they can and will successfully accomplish their mission. Such attitudes and perceptions about what they can or cannot accomplish or manage will influence their actual behavior. We know that attitudes develop over time as a result of experiences. Toxic agent chemical defense training is an example of how desirable attitudes develop when soldiers encounter successful experiences.

REFERENCES

- Appley, M.H., & Trumbull, R. (1977). On the concept of psychological stress. In A. Monat & R.S. Lazarus (Eds.). Stress and coping: An anthology. New York: Columbia University Press.
- Assistant Commandant (1988, June). Updated final safety submission and site plan for the chemical decontamination training facility at Ft. McClellan, Alabama (Site Safety Plan). Ft. McClellan, AL: U.S. Army Chemical School.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.
- Bandura, A. (1982). Self-efficacy mechanisms in human agency. American Psychologist, 27, 122-147.
- Bandura, A. (1986). Social foundation of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.
- Eysenck, H. J., & Eysenck, S. B. C. (1975). Manual for the Eysenck Personality Questionnaire. San Diego, CA: Educational and Industrial Testing Service.
- Fatkin, L.T., Hudgens, G.A., Torre, J.P., Jr., King, J.M., & Chatterton, R.T., Jr., (1991). Psychological responses to competitive marksmanship. In J.P. Torre, Jr., S. Wansack, G.A. Hudgens, J.M. King, L.T. Fatkin, J. Mazurczak, & J. Breitenbach (Eds.), Effects of competition and mode of fire on physiological responses, psychological stress reactions, and shooting performance (Technical Memorandum 11-91). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory.
- Fatkin, L.T., King, J.M., & Hudgens, G.A. (1990, August). Evaluation of stress experienced by Yellowstone Army fire fighters (Technical Memorandum 9-90). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, Behavioral Research Division.
- Headquarters, Department of the Army (1984, February). Use of volunteers as subjects of research (Army Regulation 70-25). Washington, DC: Author.
- Headquarters, Department of the Army (1986, November). Chemical surety program (Army Regulation 50-6). Washington, DC: Author.
- Headquarters, Department of the Army (1989, June). Safety regulation for toxic chemical agents, GB and VX (TRADOC Regulation 385-1). Washington, DC: Author.
- Hoddes, E., Zarcone, V., Smythe, H., Phillips, R., & Dement, W. C. (1973). Psychophysiology, 10, 431-436.
- Hudgens, G.A., & Fatkin, L.T. (1992, August). Stress evaluation of a Special Forces Assessment and Evaluation Course (Technical Memorandum 6-92). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, Behavioral Research Division.

- Hudgens, G.A., Malto, B.O., Geddie, J.C., & Fatkin, L.T. (1991, November). Stress evaluation for the TOW Accuracy Study (Technical Note 5-91). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, Behavioral Research Division.
- Kerle, R. H., & Bialek, H. M. (1958). The construction, validation, and application of a Subjective Stress Scale. Staff Memorandum Fighter IV, Study 23. Presidio of Monterey, CA: US Army Leadership, Human Research Unit.
- Kirk, R.E. (1968). Experimental design: Procedures for the behavioral sciences. Belmont, CA: Brooks/Cole.
- Lazarus, R.S., & Folkman, S. (1984). Stress, appraisal, and coping. NY: Springer.
- McGrath, J.E. (1977). Settings, measures, and themes: An integrative review of some research on social-psychological factors in stress. In A. Monat & R.S. Lazarus (Eds.). Stress and coping: An anthology. New York: Columbia University Press.
- Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80, Whole No. 609.
- Ryman, D.~H., Biersner, R. J., & LaRocco, J. M. (1974). Reliabilities and validities of the mood questionnaire. Psychological Reports, 35, 479-484.
- Sampson, J.B., & Kobrick, J.L. (1980). The Environmental Symptoms Questionnaire: Revisions and new field data. Aviation, Space and Environmental Medicine, 1980, 51, 872-877.
- Solomon, Z., Benbenishty, R., & Mikulincer, M. (1991). The contribution of wartime, pre-war, and post-war factors to selfefficacy: A longitudinal study of combat stress reaction. Journal of Traumatic Stress, 4, 345-361.
- Spielberger, C.D., Gorsuch, R.L., Lushene, R., Vagg, P.R., & Jacobs, C.A. (1983). Manual for the State-Trait Anxiety Inventory (Form Y). Palo Alto, CA: Consulting Psychologists Press.
- Tyner, C. F., Manning, F. J., & Oleshansky, M. A. (1989). Stress, confidence, performance, and credibility produced by toxic agent training at the Chemical Decontamination Training Facility (Final report). Washington, DC: Walter Reed Army Institute of Research.
- Vitaliano, P.P., Maiuro, R.D., Russo, J., & Becker, J. (1987). Raw versus relative scores in the assessment of coping strategies. Journal of Behavioral Medicine, 10, 1-18.
- Vitaliano, P. P., Russo, J., Carr, J. E., Maiuro, R. D., & Becker, J. (1985). The Ways of Coping Checklist: Revision and psychometric properties. Multivariate Behavioral Research, 20, 3-26.
- Wilkinson, L. (1990). SYSTAT: The system for statistics. Evanston, IL: SYSTAT.
- Zuckerman, M., & Lubin, B. (1985). Manual for the Multiple Affect Adjective Check List--Revised. San Diego, CA: Educational and Industrial Testing Service.

APPENDIX A
ESQ-R SYMPTOM CATEGORIES

ESQ-R SYMPTOM CATEGORIES

I. Primary CDTF-specific:

headache
warm
sweating

IV. Wellness:

happy
well
thinking clear

II. Secondary CDTF-specific:

difficulty breathing
upset stomach
heartbeat fast
muscles tense
hands sweaty
cannot hear
mouth dry
trouble understanding

V. Fatigue:

back pain
weak
bored
clumsy
sleepy
eyes watery
muscles ache
irritated
off balance
tired
eyes irritated
trouble sleeping
trouble concentrating

III. Non-CDTF:

ears ringing
diarrhea
constipated
ears ache
chest pain
chilly
shivering
nose bleed
heartbeat irregular

APPENDIX B
STANDARD SCHEDULE FOR CDTF TRAINING

STANDARD SCHEDULE FOR CDTF TRAINING

Blood Draw - Cholinesterase testing (before CDTF training)

Day 1 Introduction to CDTF
 Medical Screening
 Safety Briefing

Day 2 - Training Day [0630-1300]

Phase I: Introduction and Administrative Data Classroom Instruction

Includes safety training, mask sizing in classroom, preparation of detector kits, and description of what to expect.

Put on MOPP IV equipment for outside training (simulant pad).

Simulant Pad Training: (Skill Level 1 tasks)

In a simulated chemical agent environment, soldiers will perform portions of the following tasks:

1. Put on and wear MOPP gear
2. Put on, wear, and remove the M17 series protective mask with hood
3. Put on, wear, and remove the M40 protective mask with hood
4. Decontaminate the skin and personal equipment
5. Use M8 detector paper to identify chemical agent
6. Use M9 detector paper to detect chemical agent
7. Decontaminate equipment using ABC M11 decontaminating apparatus
8. Decontaminate equipment using M13 decontaminating apparatus, portable
9. Use M256 or M256A1 chemical detector kit
10. Use and maintain M8A1 alarm system
11. Put the chemical agent monitor into operation

Simulant Doff Area - Students are given a step-by-step "talk through" instruction of the doff procedure.

Then proceed to Safety Control Office and process into the training building;

Go through mask check with stannic chloride.

Phase II: Same tasks as with simulants, but in an actual agent environment

Chemical Agent Training:

Subjects will perform the same tasks listed above in an actual chemical agent environment ("hot area").

Training Bays: No.1 = Rifle contamination

No.2-No.6 = Jeep contamination (only one bay is used)

No.7 = Tank contamination

Toxic Doff Area - Includes two showers

Group meets in lobby of Safety Control Office for exit from the training building;

To the Administration Building to complete student critique.

APPENDIX C

SCORES ON PSYCHOLOGICAL TRAIT MEASURES FOR CDTF TRAINING SUBJECTS

SCORES ON PSYCHOLOGICAL TRAIT MEASURES FOR CDTF TRAINING SUBJECTS

Table C-1

Mean Scores ($\pm$ standard error) on Psychological Trait
Measures Obtained from CDTF Training Subjects

Measure	Mean score ($\pm$ SEM)	NORMS
MAACL-R^a		
Anxiety	51.05 (0.9)	51.0
Depression	52.42 (1.1)	50.0
Hostility	52.85 (1.04)	50.0
Sensation Seeking	54.95 (0.82)	50.0
Positive Affect	48.76 (0.90)	50.0
Dysphoria	52.61 (1.02)	50.0
STAI^b		
Anxiety	47.02 (0.74)	35.6
EPQ^c		
Psychoticism	3.50 (0.23)	3.78
Neuroticism	8.58 (0.41)	9.83
Extroversion	15.02 (0.36)	13.19
LOCUS OF CONTROL^d		
External	8.88 (0.30)	7.99

Note. More specific information about the norms for the various measures is given in the appropriate manual: ^aZuckerman & Lubin, 1985; ^bSpielberger et al., 1983; ^cEysenck & Eysenck, 1975; ^dRotter, 1966.