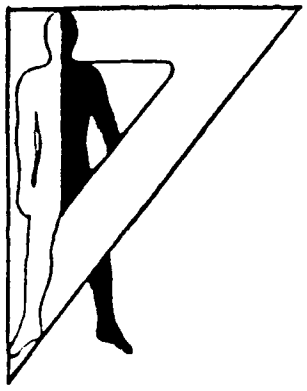

Technical Memorandum 6-92

STRESS EVALUATION OF A SPECIAL FORCES ASSESSMENT AND EVALUATION COURSE

Gerald A. Hudgens
Frank J. Malkin
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August 1992
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U.S. ARMY HUMAN ENGINEERING LABORATORY
Aberdeen Proving Ground, Maryland

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An evaluation of the psychological stress experienced by Special Forces (SF) candidates during the 3-week Special Forces Selection and Evaluation Course was conducted in January 1991 by the U.S. Army Human Engineering Laboratory (HEL). The HEL stress battery was used to assess the psychological stress responses of the candidates seven times representing anticipated times of high and relatively low stress. Periods of higher and lower stress were tracked using the measures in the stress battery. Candidates showed higher stress levels at the start of the course and at times of high physical and mental demand and showed lower levels at times of lower demand. The highest stress levels, however, were associated with the final day when their outcome in the course was revealed. Over all seven times during the course, those who were ultimately selected for SF training displayed lower stress responses than those who were not selected. When the stress responses were compared with those previously collected for men in other stress situations, the candidates' stress levels were found to be in the low to moderate ranges. The selected candidates displayed levels more in the low range and those who were not selected displayed levels more in the moderate range. The highest stress displayed by both groups (moderate to high range) occurred when they were waiting to hear their course outcomes. The findings contributed to the validation of HEL stress assessment methodologies.

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EXECUTIVE SUMMARY

In support of the John F. Kennedy Special Warfare Center and School, the Department of Defense Physiological and Psychological Effects of Nuclear, Biological, and Chemical Environments and Sustained Operations on Systems in Combat (P^2NBC^2) program, and the U.S. Army Human Engineering Laboratory (HEL) Stress and Performance Program, a stress evaluation involving soldiers in a Special Forces Assessment and Evaluation (SFAS) course was conducted during January 1991.

The HEL stress battery of psychological state measures was used seven times representing anticipated times of relatively high and low stress to assess the stress perceived by the candidates throughout the SFAS course. Of 260 candidates who began the course, 41 were dropped during the first 2 days because they did not pass physical testing, 61 voluntarily withdrew during the course, 12 were dropped for medical reasons, 14 were dropped midway through the course by review board No. 1, and 3 were involuntarily withdrawn at other times. Of the remaining 129 who completed the course, 103 were selected by board No. 2 for Special Forces (SF) training (SELECT) and 26 were not (DROPBD2). Because the candidates in the latter two subgroups reacted differently to events during the entire course, data descriptions focused on those subgroups.

The HEL stress battery was sensitive to course events and tracked parallel response patterns for the SELECT and DROPBD2 subgroups throughout most of the course. All candidates showed higher stress responses at the start of the course and at times of high physical and mental demand and showed lower stress responses during times of lower demand. The highest stress levels regardless of subgroup, however, were on the final day while the candidates were waiting to learn their individual outcomes in the course. After learning outcomes, those in the SELECT subgroup dropped to low response levels, while those in the DROPBD2 subgroup remained at high levels. Before the final day, the stress responses for the SELECT subgroup were consistently lower than those for the DROPBD2 subgroup, suggesting a difference from the beginning in how the subgroup members perceived the course events.

When the stress responses of the SFAS candidates were compared with responses previously obtained in other investigations using the HEL stress battery, overall they were determined to be in the low to moderate ranges of stress responsiveness for men in other stress situations. The SELECT candidates' responses before the final day were in the low range, and the DROPBD2 candidates' responses were in the moderate range. In spite of the very demanding nature of the SFAS course, those candidates who completed the course appear to have perceived the demands of the course events as being within their abilities and control (i.e., not overly stressful) for the most part. Waiting to learn the course outcome and learning of a negative outcome proved to be the only events capable of eliciting psychological stress responses in the moderate to high ranges.

The results of this investigation supported the sensitivity and discriminate validity of the HEL stress battery in a situation involving stress that varied in kind and intensity and involving many repeated measurements throughout the course. Several measures were obtained that yielded data suggesting they might be predictive of success or failure in the SFAS course. However, since course events occurred (before obtaining those measures) that could have influenced the data, formal assessment of predictability could not be accomplished.

STRESS EVALUATION OF A SPECIAL FORCES ASSESSMENT AND EVALUATION COURSE

INTRODUCTION

Since its initiation in 1986, the U.S. Army Human Engineering Laboratory (HEL) Stress and Performance Program has been concerned with investigating methods for the valid and reliable measurement of stress (Hudgens, Torre, Chatterton, Wansack, Fatkin, & DeLeon-Jones, 1986a, 1986b). The program has incorporated a postulated interactive model of stress wherein different kinds and levels of stress interact with person variables (e.g., personality, experience, knowledge) to yield unique response profiles as evidenced by psychological, physiological, and performance measures (Hudgens, Chatterton, Torre, Fatkin, & King, 1990). To test and validate the model and determine the general validity of various professed stress measures, the program has thus far generated data from several stress situations involving civilian subjects experiencing a variety of kinds and levels of stress and from situations involving military subjects experiencing low to moderate levels of stress. Because the program is ultimately concerned with investigating performance in military stress situations (most importantly in combat stress situations), which are likely to involve very high levels of stress, it is important that the measurement validation process include data obtained from a large number of military subjects and obtained from situations that include the highest levels of stress allowable in accordance with current human use or training guidelines. A search for such stressful military situations to study was initiated in 1990.

In the fall of 1990, contact was made with the John F. Kennedy Special Warfare Center and School (JFKSWCS) at Fort Bragg, North Carolina, through the HEL Field Office at that agency. Subsequent discussions between representatives of HEL and JFKSWCS explored opportunities for investigations that might prove to be of mutual benefit. It was decided that use of the state and trait measures included in the battery of HEL stress assessment questionnaires with the Special Forces Assessment and Evaluation (SFAS) course might provide high stress data for soldiers, which would meet HEL's needs, and data predicting success or failure in the course, which could be valuable for reducing training costs for JFKSWCS.

Also the fall of 1990, a request for funding of stress assessments was submitted by the HEL Stress and Performance Team to the Army's Physiological and Psychological Effects of Nuclear, Biological, and Chemical (NBC) Environments and Sustained Operations on Systems in Combat (P^2NBC^2) program managed by the U.S. Army Chemical School, Fort McClellan, Alabama. Funding was subsequently provided by the P^2NBC^2 program for HEL to conduct stress assessments in situations relating to NBC-contaminated environments and sustained operations. Although the SFAS course did not involve operations in chemical protection garments, the P^2NBC^2 program agreed to allow part of the 1991 funding to be applied to the SFAS stress evaluation in the interest of furthering the more rapid development of a more sensitive and better validated stress assessment methodology which, in turn, could enhance the psychological effects measurement capability in future P^2NBC^2 studies. This evaluation includes data obtained using the State-Trait Anxiety Index and the Mood Questionnaire, both of which have been used in past P^2NBC^2 studies.

Thus, in support of the JFKSWCS, the P^2NBC^2 program, and the HEL Stress and Performance Program, a stress evaluation involving soldiers in an SFAS course was conducted during January 1991. The following objectives were to be met:

1. Obtain data indicating the degree of stress experienced by soldiers in the SFAS course to be used in validating HEL stress assessment methodologies.

2. Evaluate the usefulness of trait measures obtained at the beginning of the SFAS course for predicting success in the course. Because of SFAS course procedures, this objective could not be met (see Discussion section).

The stress evaluation followed procedures that are being developed and evaluated for validity and reliability by HEL (Hudgens, Fatkin, Torre, King, Slager, & Chatterton, 1991; Fatkin, Hudgens, Torre, King, & Chatterton, 1991; Hudgens, Malto, Geddie, & Fatkin, 1991). As for the Hudgens, Malto, Geddie, and Fatkin (1991) evaluation, this evaluation was limited to the use of psychological instruments that have been shown in previous work (Hudgens et al., 1991; Fatkin et al., 1991) to yield results similar to those for hormone measures across a variety of stressful situations.

METHOD

Subjects

The subjects in this evaluation were 260 male soldiers who were voluntarily participating in the SFAS course with the hope of successfully completing the 3-week course and being selected for further training to become members of the Army's Special Forces (SF). They included enlisted grades E1 (N = 5), E2 (N = 3), E3 (N = 7), E4 (N = 114), E5 (N = 83), E6 (N = 27), and E7 (N = 4) and officers O2 (N = 7) and O3 (N = 10). Their ages ranged from 18 to 42 years (mean = 24.59, standard error of the mean [SEM] = 0.23, median = 24 years). Based on their course outcome, each subject was assigned to one of seven outcome groups. Of the 260 subjects who began the course, 41 were dropped during the first 2 days because they did not pass physical fitness or swim tests (DROPPT); 61 voluntarily withdrew during the course (VOLWD); 12 were dropped for medical reasons (DROPMED); 14 were dropped midway through the course by review board No. 1 (DROPBD1); 3 were involuntarily withdrawn from the course at other times (INVWD); 26 of the remaining 129 were not selected (DROPBD2) and 103 were selected (SELECT) to return to the JFKSWCS for further training to become members of the Army's Special Forces.

Apparatus

Walter Reed Army Institute of Research (WRAIR)/Precision Control Design Wrist Activity Monitoring Systems (Redmond & Hegge, 1985), provided by WRAIR, were used to monitor activity in sequential 2-minute time periods. The devices are small, unobtrusive, and have been successfully used in numerous field exercises without complication (e.g., Krueger, Redmond, Belenky, & Angus, 1987). They are low power (similar to a quartz watch), battery operated, self-contained, and sealed, and involve no electrical contact with the subject. They normally cause no interference with the subject's personal or duty activity since they are worn like a slightly bulky wristwatch. Mole skin, wrist bands, or other padding is used to eliminate skin irritation that might occur with extended wear. There is no health risk in wearing these devices. The system is described in detail in Appendix A. The activity monitors were used to determine the sleep or rest patterns of the subjects during the course. Use of the monitors represents a way to assess one possible source of stress, fatigue.

The stress evaluation employed questionnaires that had been used in HEL-sponsored or in-house protocols, including the HEL Salvo Stress Study and Northwestern University stress protocols under contract (Fatkin et al., 1991; Hudgens et al., 1991). Three types of questionnaires were employed:

1. Survey questionnaires (approximately 5 minutes):

a. General Information and Health History Questionnaire.

b. Life Events (Form I, Recent) that asks subjects to rate the amount and type of stress they have "recently" experienced.

2. Trait questionnaires (approximately 40 minutes):

a. 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.

b. The Multiple Affect Adjective Checklist-Revised (MAACL-R), general form (Zuckerman & Lubin, 1985). This general or trait form 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 subscale scores. The respondents are instructed to check all the words that describe how they "generally" feel.

c. 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 is the result of luck, chance, fate, or is controlled by powerful others, it constitutes a belief in external control. If they perceive that the event is contingent upon their own behavior or their own relatively permanent characteristics, it is considered a belief in internal control.

d. The Eysenck Personality Questionnaire (EPQ) Short Form recognizes three distinct dimensions of personality: Extraversion-Introversion (E), Neuroticism (N), and Psychoticism (P) (Eysenck & Eysenck, 1975). The EPQ-E scale reflects the degree of a person's outgoing and assertive tendencies. When the EPQ-P and EPQ-N scales are used for the measurement of personality traits in normal persons, Eysenck and Eysenck describe them as measures of "emotionality," "tough-mindedness," or "stability-instability."

3. State (stress perception) questionnaires (approximately 15 minutes). A battery of stress perception measures that included

a. 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." State STAI anxiety data are abbreviated SSANX.

b. 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." State MAACL-R anxiety, depression, hostility, dysphoria, and positive affect data are abbreviated MSANX, MSDEP, MSHOS, MSDYS, and MSPA, respectively.

c. The Subjective Stress Scale (SUBJ STRESS) 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."

d. The Specific Rating of Events scale (SRE) is a measure designed for the HEL stress program, wherein the subjects rate (on a scale of 0 for "not at all stressful" to 100 for "most stress possible") how stressful an event or time period was to them.

e. The Comparative Rating of Events scale (CRE), like the SRE, is also a measure designed for the HEL stress program, wherein the subjects rate (on the same scale of 0 to 100) how stressful an event or time period was to them, as compared with the most stressful event previously experienced during their lifetimes.

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

g. 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 "within the last 24 hours."

h. The Stanford Sleepiness Scale (SLEEP) (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.

i. The Revised Ways of Coping Checklist (RWCCL) (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).

At the request of the P^2NBC^2 Joint Working Group, a modified version of the Mood Questionnaire (Ryman, Biersner, & La Rocco, 1974) was added to the HEL battery of state measures. This questionnaire had been used by investigators from WRAIR in an earlier stress assessment of training with toxic agents in the Chemical Decontamination Training Facility at the U.S. Army Chemical School, Fort McClellan, Alabama (Tyner, Manning, & Oleshansky, 1989). This questionnaire was a mood adjective checklist, which included 36 of the 40 adjectives originally used by Ryman et al. (1974). The subjects were asked to "describe your feelings right now" by circling a number from 0 (for "not at all") to 6 (for "very much so") beside each adjective (the original measure had included a 3-point scale). The following subscales were scored: Activity, Anger, Depression, Fatigue, Fear, and Happiness.

Procedures and Subject Scenario

The SFAS course lasted 21 days and was designed to evaluate volunteer candidates for SF training and to select only the best qualified and most highly motivated individuals for entry into the training program. The following traits were addressed: physical fitness, motivation, intelligence, responsibility, stability, trustworthiness, sociability, and leadership. These traits were assessed for each candidate from both the individual and team-member perspectives. The candidates were evaluated according to their abilities to handle physical challenges (physical fitness, swimming, running various distances, traversing an obstacle course, log drills, and moving various distances under load with weapons and field equipment) and mental challenges (military orienteering exercises and problem-solving events) (Velky, 1990).

At the request of the SFAS course cadre, certain details regarding course events and procedures are not included in this report for unlimited distribution. The following description provides, in general terms, the course times and events relative to the administration of trait and state batteries to the subjects. In all cases, the subjects were moved to a classroom setting to complete the questionnaires. The trait battery was administered to all subjects on Day 2 of the course, between 0930 and 1200 hours. This was an administrative day; no physical or other mental testing was scheduled. All subjects had taken physical fitness (PT) and swim tests on Day 1. Of the 260 subjects, 86 did not pass both tests and were scheduled to retake them early on Day 3. The trait battery, however, should (theoretically) be relatively free from the influence of events such as these.

The state battery was administered seven times (Sessions 1 through 7) during the remainder of the course to all subjects still in the course at the time. Subjects who left the course after Session 1 were administered a final battery by SFAS cadre on the day of withdrawal; this was considered a Session 7 battery for outcome group comparisons. The questionnaires included in the state batteries varied a little over the sessions. All state questionnaires were included for all sessions with the following exceptions: the CRE was administered during Sessions 1, 3, 6, and 7; the Mood Questionnaire was administered during Sessions 1, 3, and 7 only; and the RWCCL was administered during Session 7 only. During the brief oral instructions for Sessions 1 through 5, the term "right now" in the written instructions of the state questionnaires was defined to mean "at this point in the SFAS course." For Sessions 6 and 7, the term "right now" was redefined to mean "at this moment." An error in the written instructions for the CRE administered during Session 7 invalidated the results obtained for that measurement.

Session 1. The state battery was administered on Day 3 at about 1600 hours. This day was also an administrative day except that those candidates who had failed the PT or swim tests on Day 1 took makeup tests in the early morning of this day.

Session 2. This was administered on Day 6 at about 1100 hours. The primary activities of this day involved preparation for the next 4 days of day and night military orienteering (ground navigation, on foot, over courses involving multiple course changes).

Session 3. This was administered on Day 10 at about 1400 hours following the last in the series of orienteering exercises. The next day, Day 11, the first review board met and decided which candidates were to be dropped

from the course because of unsatisfactory performance. At this point in the course, other candidates were allowed to withdraw voluntarily.

Session 4. This was administered on Day 13 at about 0830 hours. The day's activity primarily involved administrative duties and preparation for 5 days of situation-reaction (problem-solving) exercises.

Session 5. This was administered on Day 16 at about 2000 hours, at the conclusion of the third day of situation-reaction exercises.

Session Missed. A session scheduled for Day 18, at the conclusion of the final day of situation-reaction exercises, was not accomplished because of a cadre command decision.

Session 6. This was administered on Day 20 at about 1330 hours. The day involved primarily administrative activities until the time the candidate subjects were assembled to learn the results of the second review board which had met that morning to select candidates for SF training. The session was initiated 15 minutes before subjects were to learn the outcome.

Session 7. This was administered on Day 20 at about 1430 hours, about 15 minutes after the subjects had learned whether they had been selected by the second review board for SF training.

Volunteers were solicited at the time of Session 1 to wear activity monitors during the remainder of the course. A subsample of 29 subjects was issued and fitted with the activity monitors at the conclusion of that session. The monitors were either collected by cadre at the time of dropout from those terminating early, or by research personnel at the conclusion of Session 7 from those who completed the course. Five monitors, collected from dropouts during the first week after issue, were reissued to five other volunteers. At the request of course cadre, the sleep and rest data are not included in this publication. Anyone interested in those data may request a separate report of results from WRAIR.

Experimental Design and Data Analysis

To assess the stress experienced by the subjects, two approaches were followed. First, the state data were analyzed by multivariate analysis of variance (MANOVA) over sessions for the SELECT and DROPBD2 outcome groups, the two groups with complete data for all seven sessions. Mean state data for the remaining outcome groups are presented in Appendix B. No state data were obtained for the DROPPT outcome group. The Groups (2) x Sessions (7) design allowed for comparison of the groups' reactions to the course and to course events. Second, the state data for the outcome groups were compared with either prestress or poststress data for several referent groups. Referent data were representative of response data for a variety of kinds and levels of stress. Previous stress evaluations have demonstrated the utility of such comparisons for estimating the relative stress experienced in a given situation (Fatkin et al., 1991; Hudgens, Malto, Geddie, & Fatkin, 1991). The referent protocols for the present evaluation are as follow:

ONCOSURG - men visiting a hospital on a day when their wives were facing cancer surgery.

ABDMSURG - men visiting a hospital on a day when their wives were facing abdominal surgery under general anesthesia.

WREXAM - third-year male medical students taking a written examination required for completion of the clerkship portion of their medical training.

SSCOMP - male soldiers representing elite units in marksmanship competition.

INDCNTRL - men investigated during normal work days when they were experiencing no unusual stress.

These group comparisons were accomplished using a MANOVA and Dunn's multiple comparison procedure (also known as Bonferroni t statistics [Kirk, 1968]) with $\alpha = .01$ for each of the five a priori comparisons with referent groups for an overall $\alpha = .05$.

RESULTS

Psychological State Responses for Subjects Completing the SFAS Course

Of 260 candidates, 129 completed the course. Of those, 103 were selected for SF training (SELECT), and 26 were not (DROPBD2). Data for these two groups were selected for analysis for the following reasons:

1. Data for these groups were nearly complete for all seven data collection sessions. Data for other outcome groups were missing for several sessions because of early withdrawal from the course.

2. Analysis of these complete data over sessions reveals the reactions of the same candidates to events during the entire course.

3. Such analysis allows characterization of possible distinct response profiles for the two outcome groups.

4. The profiles of responses for all measures over sessions for all nonselected candidates available each session were almost indistinguishable from those for the DROPBD2 subgroup. Preliminary MANOVAs of state response data for candidates still in the course at each session for the DROPBD2, DROPBD1, VOLWD, INVWD, DROPMED, and DROPPT subgroups were conducted for each of Sessions 1 through 4 (there were not enough candidates remaining in any of these groups except DROPBD2 for meaningful analysis of Sessions 5 through 7). Since none of the MANOVAs yielded a significant Subgroup effect, it was concluded that the DROPBD2 subgroup was representative of all the subgroups of candidates other than those selected for further training at the conclusion of the SFAS course. State data for these subgroups are presented by sessions in Appendix B.

The state data were analyzed by a MANOVA using the SYSTAT MGLH module (Wilkinson, 1990). MAACL-R data were analyzed in a Groups (2) x Subscale (MAACL-R) (5) x Sessions (7) design. The Groups, Subscale, and Sessions main effects and all interactions among variables were highly significant by univariate and multivariate tests ($p < .000$ in all cases). SSANX, SRE, SUBJSTRESS, SEFF, and SLEEP data were also analyzed in a Groups (2) x Scale (5) x Sessions (7) design. Again, all main effects and interaction effects were highly significant by univariate and multivariate tests ($p < .000$ in all cases). Based on the significant results of these MANOVAs, separate Groups (2) x Sessions (7) MANOVAs were conducted for each of the 10 measures. The six subscales of the Mood Questionnaire were analyzed in a Groups (2) x

Subscale (Mood) (6) x Sessions (3) design. In this case, only the Subscale x Sessions interaction was significant (Wilks' λ = 0.406; df = 10, 117; Multivariate F = 17.09; $p < .000$). Sessions were subsequently analyzed for each subscale by within-subjects ANOVA for subjects combined over groups.

In all 10 MANOVAs involving Groups (2) x Sessions (7), the Sessions main effect was highly significant ($p < .000$ in all cases, thus assuring $\alpha < .05$ for the 10 separate MANOVAs). To better describe this main effect and illustrate sensitivity of the measures to course events, Table 1 shows the mean state responses for the two combined groups over the seven data collection sessions. The Tukey-Kramer modification of the Tukey honestly significant difference (HSD) post hoc procedure (Wilkinson, 1990) was used to determine critical values for significant differences between means. The critical values for $p < .05$ ($CV_{.05}$) and for $p < .01$ ($CV_{.01}$) for differences between all means for each measure are also presented in Table 1. Significant differences between adjacent means only are indicated by either *($p < .05$) or **($p < .01$). These differences indicate the differential sensitivity of the various measures to course events.

The anxiety measures (MSANX and SSANX) were high at the beginning of the course, dropping significantly by Session 2; they rose significantly immediately before subjects learned if they succeeded in the course and dropped significantly again when most subjects learned they had succeeded. MSDEP was significantly elevated during and after the long series of exercises and sleep deprivation and after subjects learned their course outcome. MSHOS was significantly elevated during the orienteering and situation-reaction exercises. Although MSDYS is a subscale derived from anxiety, depression, and hostility scores, its response pattern followed most closely that for anxiety. The MSPA subscale showed sensitivity to events that was characterized by a pattern that was the inverse of that for MSDYS over sessions. The SRE showed general increase in reported stress over sessions with a significant drop at Session 4 and again at the final session after subjects learned of their course outcome. While the SUBJ Stress measure shows the same significant drops in stress for Sessions 4 and 7, it does not reflect the same pattern of increase from Session 1 to 5 or 6. The SEFF measure shows only a moderately significant increase for subjects for Session 6 relative to previous sessions. The SLEEP measure indicated the subjects reported being significantly sleepier at Sessions 3 and 5 than for the other sessions.

A MANOVA of the CRE data, involving Groups (7) x Sessions (3) yielded a highly significant Sessions main effect (Univariate F = 10.89; df = 2, 220; p = .000; Wilks' λ = 0.851; Multivariate F = 9.56; df = 2, 109; p = .000). Means for the combined groups during sessions are shown in Table 1. Tukey HSD post hoc analysis indicated the comparative stress ratings for Session 6 were significantly higher than those for Sessions 1 and 3 ($p < .01$ for both comparisons).

An ANOVA of Mood Questionnaire data indicated highly significant Sessions main effects for the Activity, Anger, Fatigue, and Fear subscales ($p < .001$ in all cases) but not for the Depression or Happiness subscales ($p > .05$ in both cases). Table 2 shows the mean subscale scores for the Mood Questionnaire for Sessions 1, 3, and 6. Post hoc paired t-tests (α = .01) were conducted to compare individual sessions for each of the four measures with a significant Sessions main effect. Results indicated that activity was significantly higher Session 1 than either Session 3 or 6 ($p < .01$). Anger was significantly lower Session 1 than Session 3 or 6 ($p < .01$). Fatigue was lowest Session 1 and highest Session 3 with all session differences

significant ($p < .01$). Fear was highest Session 6 and lowest Session 3 with all session differences significant.

Table 1

Mean (± SEM) State Response Data for Combined SELECT and DROPBD2 Groups (N = 129) for Seven Sessions of the SFAS Course

State measure	Sessions 1	2	3	4	5	6	7	CV+ .05	CV+ .01
MSANX	56.7 **	50.8	51.0	50.1	51.1 **	64.4 **	46.5	4.7	5.5
	(1.6)	(1.5)	(1.1)	(1.1)	(1.2)	(2.2)	(0.8)		
MSDEP	54.3	48.9 *	55.3 *	49.2 **	62.6 **	54.3	59.6	5.9	6.9
	(1.6)	(1.0)	(1.6)	(0.9)	(2.2)	(1.7)	(3.0)		
MSHOS	48.0	45.7 *	49.5	46.5 **	52.1 *	48.0	49.4	3.7	4.3
	(0.9)	(0.5)	(1.3)	(0.5)	(1.4)	(0.7)	(1.4)		
MSDYS	53.7 **	47.8	51.7	47.7 **	55.0	58.1 **	50.6	4.3	5.1
	(1.5)	(1.0)	(1.3)	(0.9)	(1.6)	(1.7)	(1.8)		
MSPA	53.0	54.8 **	52.3	53.7 *	52.0	53.2 **	56.6	2.1	2.5
	(0.6)	(0.6)	(0.7)	(0.7)	(0.7)	(0.8)	(0.8)		
SSANX	45.0 **	42.7	44.4 **	42.0 **	44.6 **	46.7 **	38.5	1.9	2.2
	(0.7)	(0.6)	(0.7)	(0.7)	(0.7)	(0.9)	(0.8)		
SUBJ	32.3 *	23.4 **	33.7 **	22.9 *	31.8	35.3 **	12.9	8.7	10.2
	(2.0)	(1.5)	(3.8)	(1.6)	(2.4)	(2.6)	(2.1)		
SRE	20.9 **	29.9	34.2 **	24.0 **	42.7	39.9 **	24.3	7.2	8.4
	(1.8)	(1.9)	(2.3)	(2.0)	(2.6)	(2.8)	(2.9)		
CRE	45.3		43.5		**	55.0		5.9	7.3
	(2.9)		(2.6)			(2.7)			
SEFF	8.90	8.98	8.81	9.02	9.19	9.49	9.45	.31	.36
	(0.11)	(0.10)	(0.12)	(0.10)	(0.11)	(0.08)	(0.14)		
SLEEP	1.91	1.69 **	2.91 **	1.77 **	3.00 **	1.80	1.68	.36	.43
	(0.08)	(0.07)	(0.12)	(0.11)	(0.12)	(0.07)	(0.11)		

+ Critical value for between sessions effects
* = $p < .05$
** = $p < .01$

Table 2

Mean (± SEM) Mood Scores for Combined SELECT and DROPBD2 Groups (N = 129) for Three Sessions of the SFAS Course

Mood subscale	Sessions 1	3	6	Session comparison	Significance
Activity	23.2 (0.6)	19.5 (0.7)	19.7 (0.7)	1 versus 3	$p < .000$
				1 versus 6	$< .000$
				3 versus 6	NS
Anger	2.9 (0.4)	4.6 (0.5)	4.3 (0.5)	1 versus 3	$< .000$
				1 versus 6	$< .004$
				3 versus 6	NS
Depression	4.1 (0.5)	4.1 (0.5)	3.2 (0.5)	1 versus 3	NS
				1 versus 6	NS
				3 versus 6	NS
Fatigue	3.9 (0.3)	8.7 (0.5)	6.1 (0.5)	1 versus 3	$< .000$
				1 versus 6	$< .000$
				3 versus 6	$< .000$
Fear	4.2 (0.5)	3.2 (0.4)	5.6 (0.6)	1 versus 3	$< .007$
				1 versus 6	$< .006$
				3 versus 6	$< .000$
Happiness	26.5 (0.7)	25.9 (0.8)	26.9 (0.8)	1 versus 3	NS
				1 versus 6	NS
				3 versus 6	NS

The Groups x Sessions MANOVAs for the several individual state measures yielded many significant effects indicating differences between the SELECT and DROPBD2 outcome groups.

Table 3 shows the two groups' MAACL-R subscale means for the seven data-collection sessions during the SFAS course. The Tukey HSD post hoc procedure was used to determine the critical values for significant group differences over sessions when significant Groups x Sessions interaction effects were indicated. For MSANX, a significant Groups main effect was obtained (Univariate $F = 9.85$; $df = 1, 115$; $p = .002$). As shown in Table 3, the DROPBD2 subgroup exhibited greater anxiety than the SELECT group did over all the sessions. No significant Groups x Session interaction effect was obtained. The other MAACL-R subscale effects are best described by their significant Groups x Sessions interaction effects. For MSDEP (Univariate $F = 36.64$; $df = 6, 690$; $p = .000$; Wilks' $\lambda = 0.432$; Multivariate $F = 24.15$; $df = 6, 110$; $p = .000$), the DROPBD2 group depression was significantly greater than that for the SELECT group at Sessions 1 and 7 ($p < .01$ for both). For MSHOS (Univariate $F = 15.00$; $df = 6, 690$; $p = .000$; Wilks' $\lambda = 0.570$; Multivariate $F = 13.83$; $df = 6, 110$; $p = .000$), the DROPBD2 group hostility was significantly greater than that for the SELECT group at Sessions 5 and 7 ($p <$

.01 for both). For MSDYS (Univariate F = 17.69; df = 6, 690; p = .000; Wilks' λ = 0.479; Multivariate F = 19.92; df = 6, 110; p = .000), the DROPBD2 group dysphoria was significantly greater than that for the SELECT group at $p < .01$ for Sessions 1, 4, 5, and 7 and at $p < .05$ for Sessions 2 and 6. For MSPA (Univariate F = 16.07; df = 6, 690; p = .000; Wilks' λ = 0.581; Multivariate F = 13.21; df = 6, 110; p = .000), the DROPBD2 positive affect was significantly lower than that for the SELECT group for Session 7.

Table 3

Mean (± SEM) State MAACL-R Scores for SELECT and DROPBD2 Groups for Seven Sessions of the SFAS Course

MAACL-R subscale	Outcome group	Sessions 1	2	3	4	5	6	7	CV+ .05	CV+ .01
MSANX	SELECT **	55.1 (1.7)	49.2 (1.4)	50.5 (1.1)	48.4 (0.9)	48.7 (1.0)	63.0 (2.3)	44.9 (0.6)		
	DROPBD2	62.8 (3.9)	57.4 (4.7)	53.2 (3.1)	56.7 (4.2)	60.1 (3.9)	70.5 (6.1)	53.3 (3.3)		
MSDEP	SELECT	52.2 (1.5) **	48.0 (0.9)	54.8 (1.7)	49.0 (1.0)	59.9 (2.2)	53.1 (1.7)	48.3 (1.1) **	6.80	8.94
	DROPBD2	62.5 (5.3)	52.2 (3.3)	57.7 (3.9)	50.1 (1.9)	72.7 (6.0)	59.2 (5.1)	108.1 (10.5)		
MSHOS	SELECT	47.2 (0.8)	45.7 (0.5)	48.9 (1.5)	45.9 (0.5)	50.4 (1.3) **	48.1 (0.8)	45.0 (0.4) **	4.27	5.62
	DROPBD2	51.0 (3.4)	45.7 (1.2)	49.6 (2.6)	48.5 (2.0)	58.4 (4.6)	47.4 (1.6)	68.1 (5.8)		
MSDYS	SELECT	52.0 (1.4) **	46.6 (1.0) *	51.1 (1.4)	46.4 (0.8) **	52.1 (1.3) **	57.0 (1.7) *	44.1 (0.6) **	5.00	6.57
	DROPBD2	60.7 (4.2)	52.1 (3.4)	54.0 (3.5)	53.0 (3.3)	66.1 (5.2)	62.6 (5.0)	78.3 (6.7)		
MSPA	SELECT	53.0 (0.7)	54.7 (0.7)	52.4 (0.8)	53.3 (0.8)	52.1 (0.8)	53.6 (0.9)	58.8 (0.8) **	2.44	3.21
	DROPBD2	53.2 (1.4)	55.3 (1.6)	51.8 (1.5)	55.2 (1.8)	51.6 (1.4)	51.4 (1.8)	46.9 (1.5)		

+ Critical value for groups effects at each session
* = $p < .05$
** = $p < .01$

Table 4 shows the two groups' means for the seven sessions for six other state measures of the HEL stress battery. Significant Groups x Sessions interaction effects were obtained for all but the CRE and SLEEP measures. For SSANX (Univariate F = 16.91; df = 6, 684; p = .000; Wilks' λ = 0.588; Multivariate F = 12.73; df = 6, 109; p = .000), the DROPBD2 group STAI Anxiety was significantly higher than that for the SELECT group at $p < .01$ for Sessions 1, 5, 6, and 7 and at $p < .05$ for Sessions 2, 3, and 4. For SRE (Univariate F = 4.81; df = 6, 696; p = .000; Wilks' λ = 0.819; Multivariate F = 4.08; df = 6, 111; p = .001), the DROPBD2 reported stress was significantly greater than that for the SELECT group at $p < .05$ for Sessions 1 and 2 and at $p < .01$ for Sessions 3, 4, 5, 6, and 7. For SUBJ (Univariate F = 7.56; df = 6, 678; p = .000; Wilks' λ = 0.607; Multivariate F = 11.66; df = 6, 108; p = .000), the DROPBD2 subjective stress rating was significantly greater at $p < .05$ for Sessions 5 and 6 and at $p < .01$ for Session 7. For SEFF (Univariate F = 12.40; df = 6, 684; p = .000; Wilks' λ = 0.660; Multivariate F = 9.36; df = 6, 109; p = .000), the DROPBD2 self-efficacy rating was significantly lower than that for the SELECT group at $p < .01$ for Sessions 1, 3, 5, and 7 and at $p < .05$ for Session 2. For SLEEP, the Groups main effect approached significance (Univariate F = 3.54; df = 1, 112; p = .063) reflecting a consistent slightly greater level of sleepiness reported by the DROPBD2 group.

No significant main effect or interaction effects involving the Groups factor were obtained for analysis of Mood Questionnaire data.

RWCCL state data were obtained only at the final session, after subjects had either terminated early or had completed the SFAS course. Subjects were instructed to indicate on a 4-point scale, from never used to regularly used, the extent to which they used each of 42 thoughts or behaviors in confronting their experiences in the SFAS course. For this measure, adequate data for analysis were collected from subjects in four outcome groups (SELECT, DROPBD2, DROPBD1, and VOLWD). MANOVA was conducted for a Groups (4) x Subscale (5) design and yielded a significant Groups x Subscale interaction effect (Univariate F = 5.09; df = 4, 496; p = .000; Wilks' λ = 0.915; Multivariate F = 2.81; df = 4, 121; p = .028). Table 5 shows group means for the five subscales. As shown in the table, the SELECT group used avoidance behaviors and thoughts less than the other groups did. The difference achieved statistical significance only between the SELECT and VOLWD groups. The SELECT group, however, used problem-focused behaviors and thoughts more than the other groups did. The differences were highly significant between the SELECT and DROPBD2 and VOLWD groups, but only approached statistical significance between the SELECT and DROPBD1 groups.

State Measures Comparisons With Other Protocols

To estimate the stress experienced by the soldiers during the SFAS course, data for the SELECT and DROPBD2 outcome groups were compared with data for the ONCOSURG, ABDMSURG, WREXAM, SSCOMP, and INDCNTRL referent groups. Multiple MANOVAs were conducted comparing the referent groups' prestress or poststress data with that for the two outcome groups' data for each session. For these comparisons, Sessions 1, 2, 4, and 6 were considered "pre" sessions, and Sessions 3, 5, and 7 were considered "post" sessions. This was done for two reasons: first, to reduce the total number of comparisons made, and second, based on course events surrounding each session, to compare session data with the more appropriate referent data. Because each highly significant groups effect ($p < .001$ in all cases) involved five a priori comparisons with

referent groups, Dunn's multiple comparison procedure (Kirk, 1968) was employed with $\alpha = .01$ for each contrast for an overall $\alpha = .05$.

Table 4

Means (± SEM) for Several State Measures for SELECT and DROPBD2 Groups for Seven Sessions of the SFAS Course

State measure	Outcome group	Sessions 1	2	3	4	5	6	7	CV+ .05	CV+ .01
SSANX	SELECT	44.0 (0.8) **	42.2 (0.7) *	43.9 (0.8) *	41.6 (0.7) *	43.7 (0.8) **	45.7 (0.9) **	35.7 (0.5) **	2.19	2.88
	DROPBD2	49.0 (1.5)	45.0 (1.5)	46.2 (1.6)	43.8 (1.6)	48.1 (1.8)	52.2 (2.2)	50.5 (2.4)		
SUBJ	SELECT	30.5 (2.2)	22.2 (1.7)	29.3 (2.4)	21.7 (1.8)	29.2 (2.7) *	33.1 (2.8) *	4.3 (1.1) **	10.00	13.15
	DROPBD2	39.3 (4.7)	28.5 (3.2)	35.7 (3.8)	27.9 (3.3)	41.8 (4.8)	44.4 (5.8)	49.6 (5.7)		
SRE	SELECT	18.9 (1.9) *	28.0 (2.1) *	31.3 (2.5) **	21.8 (2.3) **	39.7 (2.9) **	35.9 (3.0) **	18.1 (2.8) **	8.27	10.87
	DROPBD2	29.0 (4.5)	37.5 (4.0)	45.6 (4.9)	32.8 (4.0)	54.3 (5.5)	56.6 (6.3)	50.6 (7.0)		
CRE	SELECT	44.7 (3.2)		40.8 (2.9)			52.4 (3.0)		N.S.	
	DROPBD2	47.7 (6.7)		53.7 (5.3)			65.0 (5.7)			
SEFF	SELECT	8.98 (0.11) **	9.07 (0.10) *	8.91 (0.12) **	9.07 (0.11)	9.34 (0.11) **	9.54 (0.08)	9.84 (0.04) **	0.36	0.47
	DROPBD2	8.46 (0.30)	8.65 (0.25)	8.38 (0.32)	8.85 (0.27)	8.64 (0.28)	9.28 (0.23)	7.70 (0.66)		
SLEEP	SELECT	1.87 (0.08)	1.63 (0.07)	2.86 (0.14)	1.74 (0.13)	2.93 (0.14)	1.74 (0.08)	1.56 (0.12)		
	$p = .06$									
	DROPBD2	2.08 (0.22)	1.92 (0.17)	3.08 (0.27)	1.97 (0.20)	3.28 (0.25)	2.08 (0.16)	2.17 (0.19)		

+ Critical value for groups effects at each session.
* = $p < .05$
** = $p < .01$

Table 5

Mean (± SEM) RWCCL Subscale Scores for Four SFAS Course Outcome Groups

Outcome group	Subscale AVOID		BLAME	PROBFOC		SUPPORT	WISH
SELECT	12.01		19.54	33.72		21.46	13.27
N = 103	(.41)		(.84)	(.89)		(.71)	(.74)
DROPBD1	14.63		24.05	28.04	**	20.83	12.44
N = 26	(1.37)	**	(1.27)	(1.47)	**	(2.03)	(2.05)
DROPBD2	13.25		22.95	27.12		20.02	16.66
N = 26	(.93)		(1.33)	(1.59)		(1.00)	(1.80)
VOLWD	14.54		22.22	28.66		20.14	14.45
N = 61	(.56)		(.86)	(1.14)		(.90)	(.98)

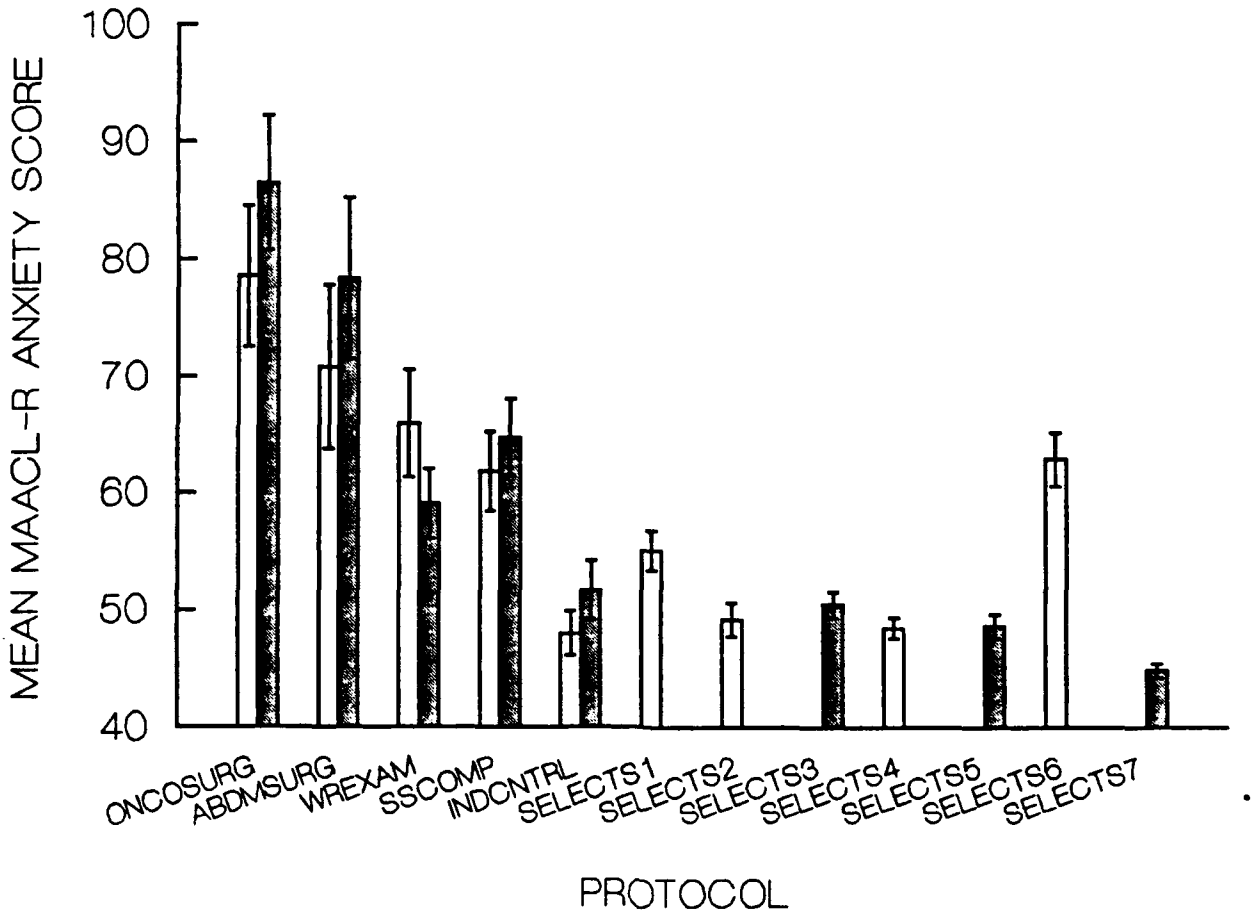
** = $p < .01$

Figures 1 through 18 show data for nine state measures separately for the SELECT and DROPBD2 outcome groups. In each figure, data for each of the seven sessions for one of the outcome groups are shown relative to the prestress and poststress data for the five referent groups. The tables associated with each of the figures indicate for each session mean which referent means differ significantly ($p \leq .01$) and the direction of the difference.

MAACL-R Anxiety

Figure 1 shows mean MAACL-R Anxiety scores for seven sessions obtained during the SFAS course for the SELECT group as compared to five referent groups' mean prestress or poststress scores. Inspection of the figure shows generally substress levels of anxiety for the SELECT group over the SFAS course. Over Sessions 2 through 5, their anxiety levels were significantly lower than those for the moderate stress referent groups WREXAM and SSCOMP. Only during Session 6, when the soldiers were waiting to find out if they were among those selected for SF training, did their anxiety levels significantly exceed those for the INDCNTRL group.

Figure 2 shows the comparative anxiety scores for the DROPBD2 group. Their anxiety levels followed a pattern virtually identical with that for the SELECT group except their anxiety levels were never significantly lower than those of either the WREXAM or SSCOMP group.

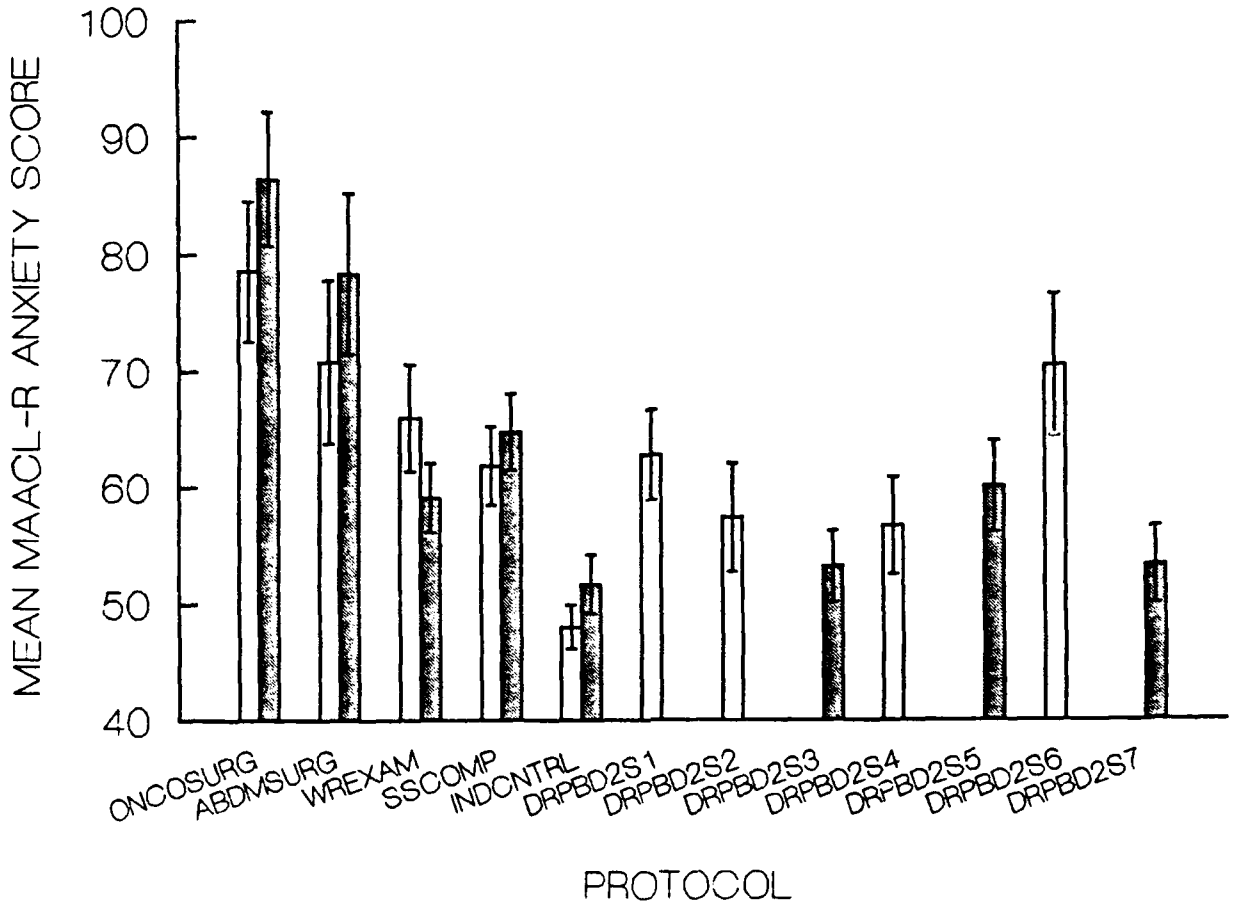


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 1. Comparison of mean (± SEM) MAACL-R Anxiety scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
Referent group	S1 (Pre)	S2 (Pre)	S3 (Post)	S4 (Pre)	S5 (Post)	S6 (Pre)	S7 (Post)
ONCOSURG	<	<	<	<	<	<	<
ADBMSURG	<	<	<	<	<		<
WREXAM		<	<	<	<		<
SSCOMP		<	<	<	<		<
INDCNTRL						>	

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.



Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 2. Comparison of mean (± SEM) MAACL-R Anxiety scores for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG		<	<	<	<		<
ADBMSURG			<		<		<
WREXAM							
SSCOMP							
INDCNTRL						>	

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

MAACL-R Depression

Figure 3 shows the SELECT group depression scores during the SFAS course relative to the referent groups. During most sessions, their depression scores were significantly lower than those of the high stress surgery groups but not significantly different from those of the moderate stress (WREXAM and SSCOMP) or control (INDCNTRL) referent groups.

Figure 4 shows DROPBD2 group depression comparative scores. In contrast with the SELECT group, their depression scores did not differ significantly from the high stress referent groups during the first six sessions and were significantly elevated relative to the moderate stress or control groups during four sessions.

MAACL-R Hostility

Figure 5 shows comparative hostility scores for the SELECT group. Those hostility scores were not significantly higher than control levels during any of the seven sessions of the SFAS course.

Similarly, as shown in Figure 6, the DROPBD2 hostility levels were not significantly higher than control levels until Session 7 which immediately followed the members of this group learning they were among those who had completed the 3-week course but were not selected for SF training.

MAACL-R Positive Affect

As shown in Figure 7, the SELECT group soldiers' positive affect score was significantly lower than that of the INDCNTRL group during Session 5 but remained above the levels of the referent stress groups.

Figure 8 shows a similar pattern for the DROPBD2 group for Sessions 1 through 6. For Session 7, however, the DROPBD2 group's positive affect score was significantly lower than that for the INDCNTRL group.

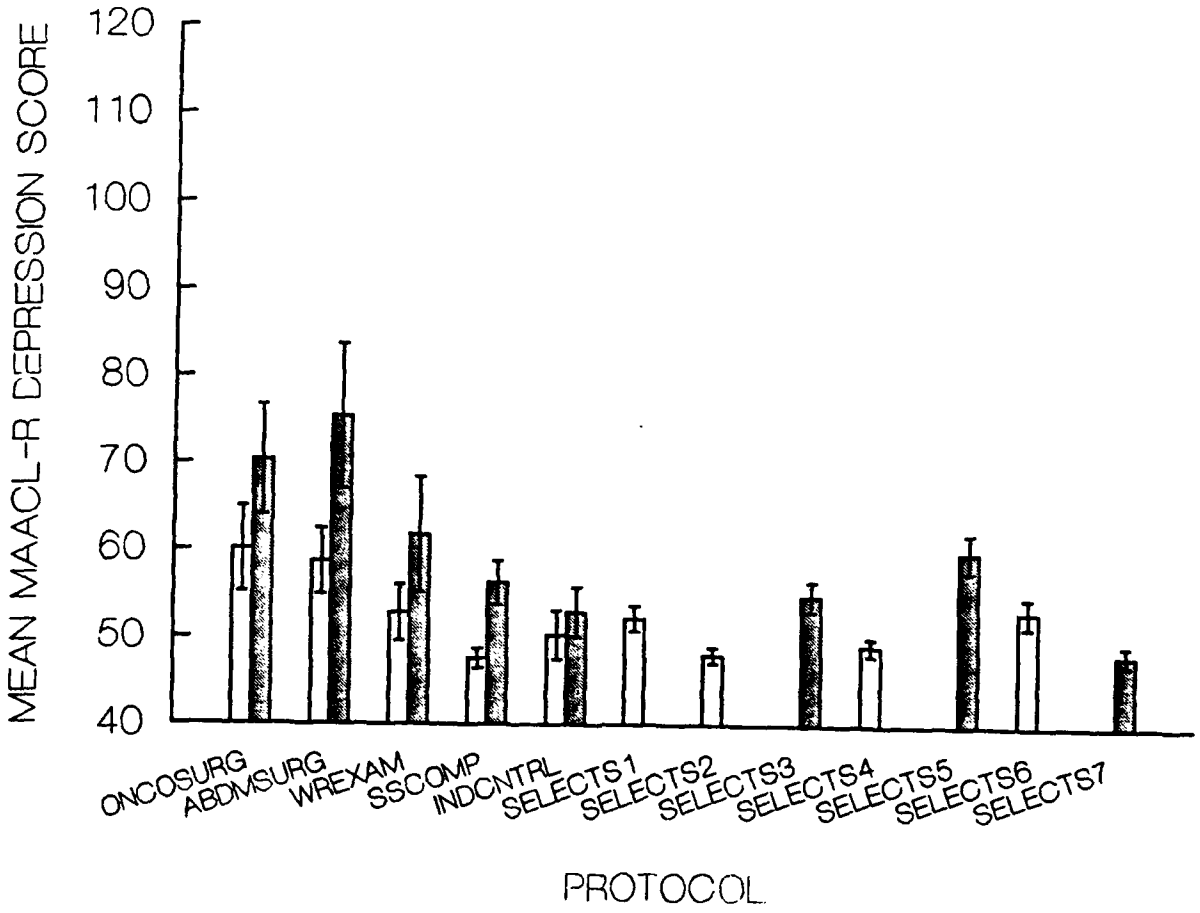
MAACL-R Dysphoria

Figure 9 shows the SELECT group comparative dysphoria scores which are composite negative affect (anxiety + depression + hostility) scores. Their dysphoria scores did not differ significantly from the control levels at any time during the seven sessions of the SFAS course. Generally, they were significantly below even the moderate stress referent group levels.

As shown in Figure 10, however, dysphoria scores for the DROPBD2 group were significantly higher than control levels for Sessions 1, 6, and 7 but were significantly lower than those for the ONCOSURG and SSCOMP groups for Session 3.

STAI Anxiety

Figure 11 shows the SELECT group STAI Anxiety levels were generally significantly below moderate stress referent group levels and at or below referent control levels over the seven sessions of the SFAS course. During Session 4, their measured STAI anxiety levels were significantly lower than control levels.

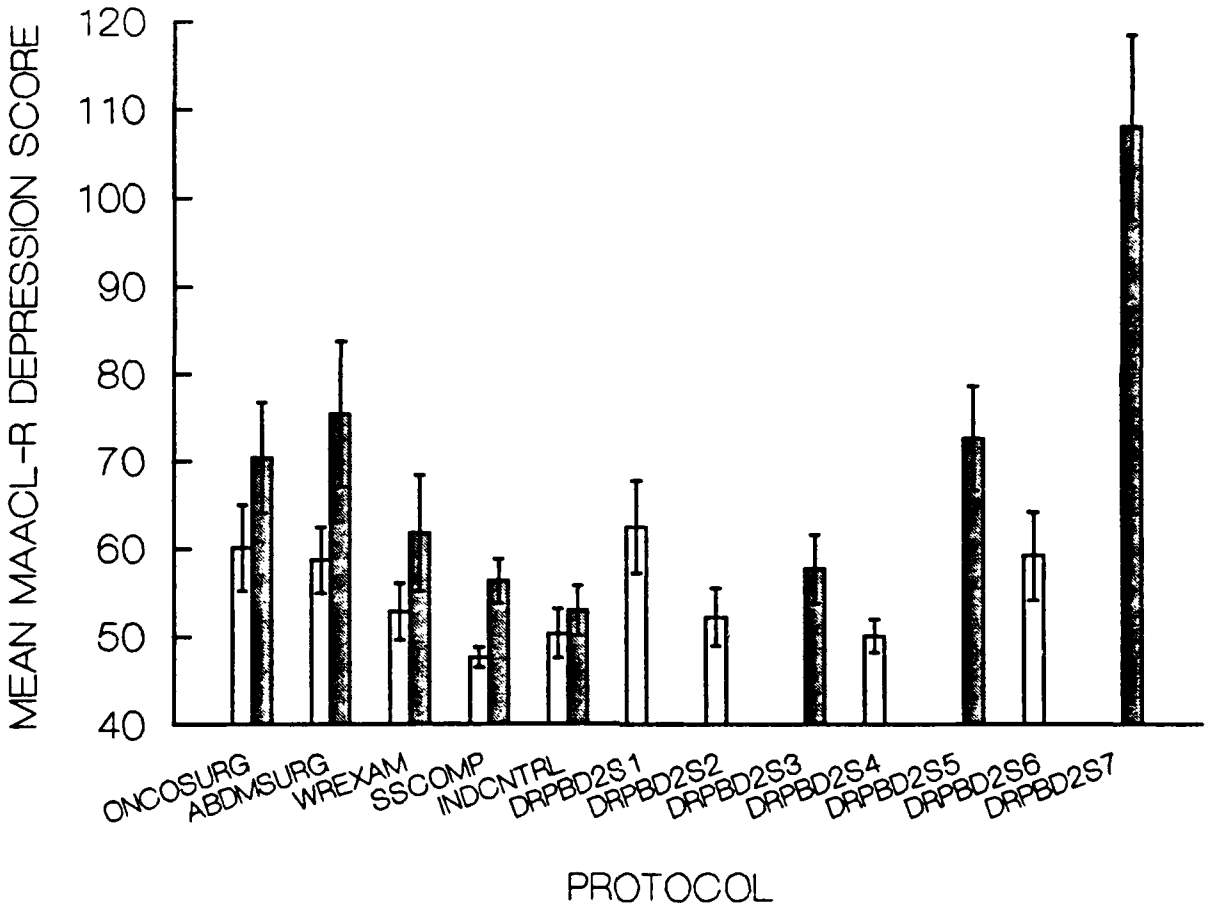


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 3. Comparison of mean (± SEM) MAACL-R Depression scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
Referent Group	S1 (Pre)	S2 (Pre)	S3 (Post)	S4 (Pre)	S5 (Post)	S6 (Pre)	S7 (Post)
ONCOSURG		<	<	<			<
ADBMSURG		<	<	<			<
WREXAM							<
SSCOMP							
INDCNTRL							

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

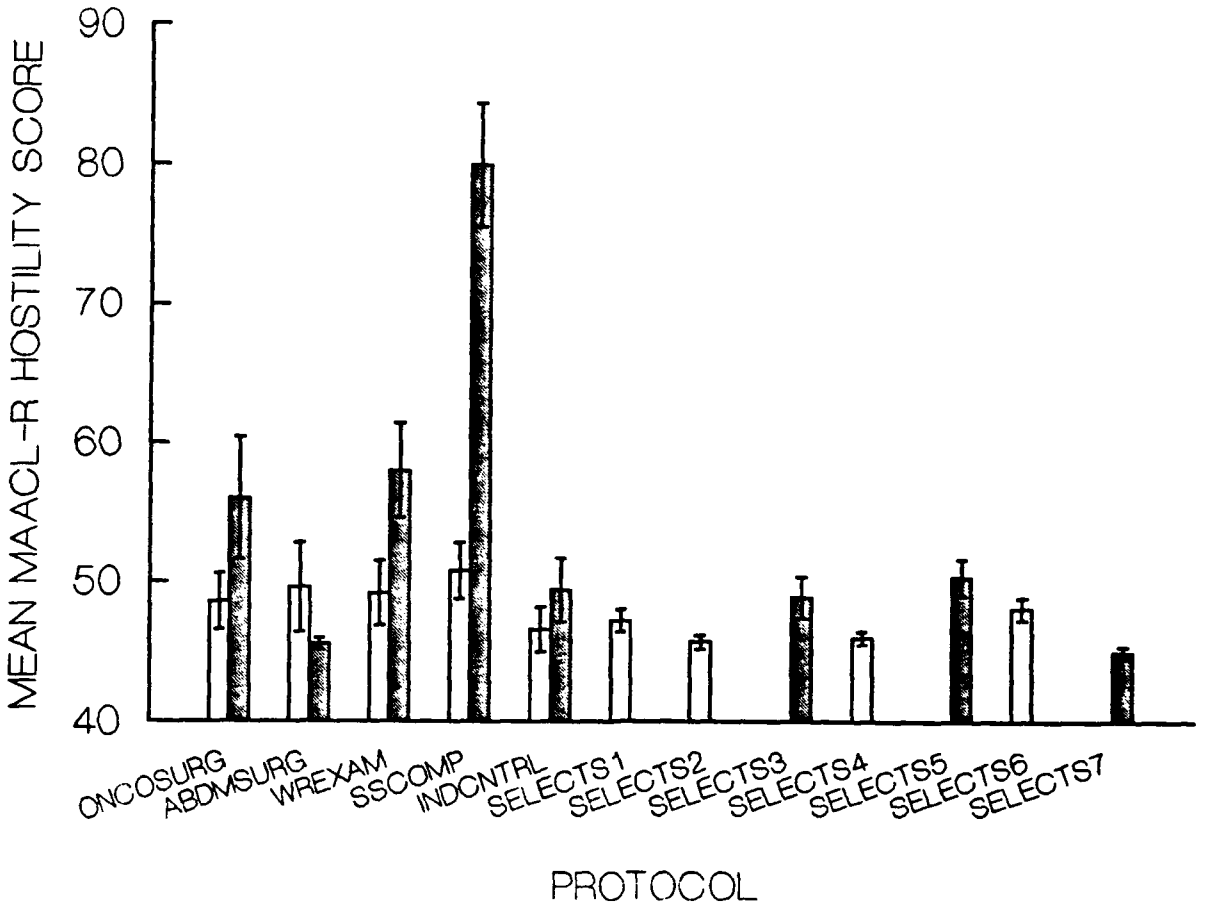


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 4. Comparison of mean (± SEM) MAACL-R Depression scores for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG							>
ADBMSURG							>
WREXAM							>
SSCOMP	>					>	>
INDCNTRL					>		>

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

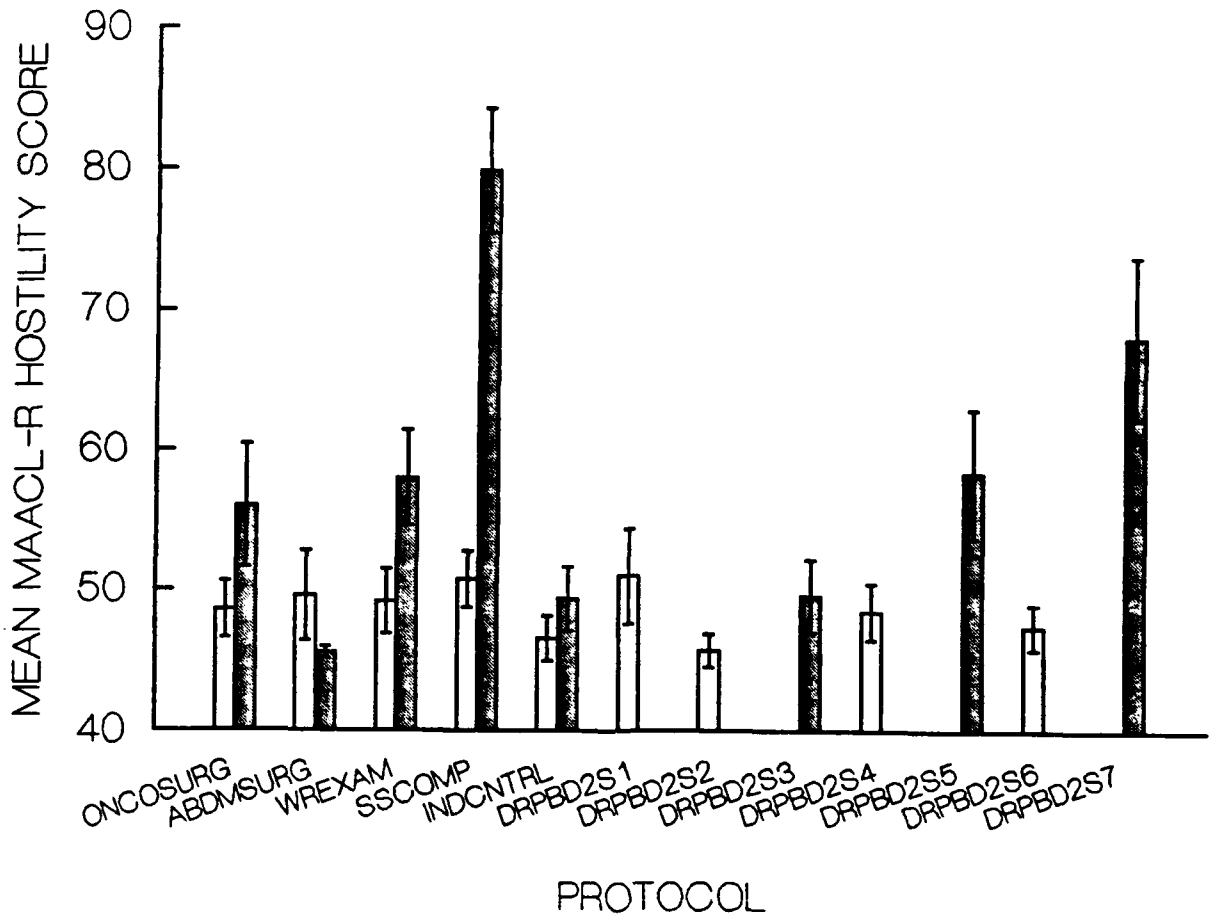


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 5. Comparison of mean (± SEM) MAACL-R Hostility scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG							<
ADBMSURG							
WREXAM							<
SSCOMP		<	<		<		<
INDCNTRL							

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

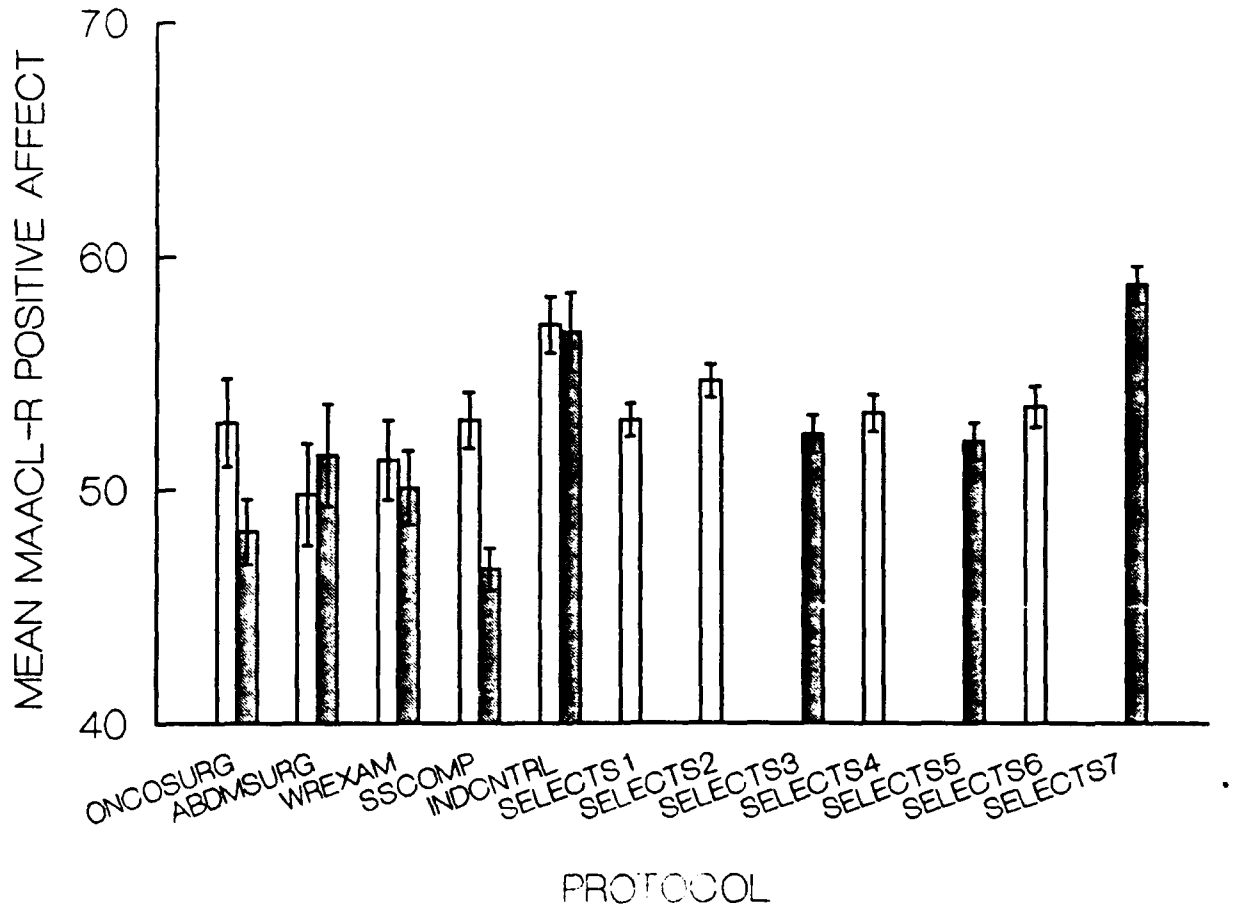


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 6. Comparison of mean (± SEM) MAACL-R Hostility scores for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG							
ADBMSURG							>
WREXAM							
SSCOMP			<		<		
INDCNTRL							>

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

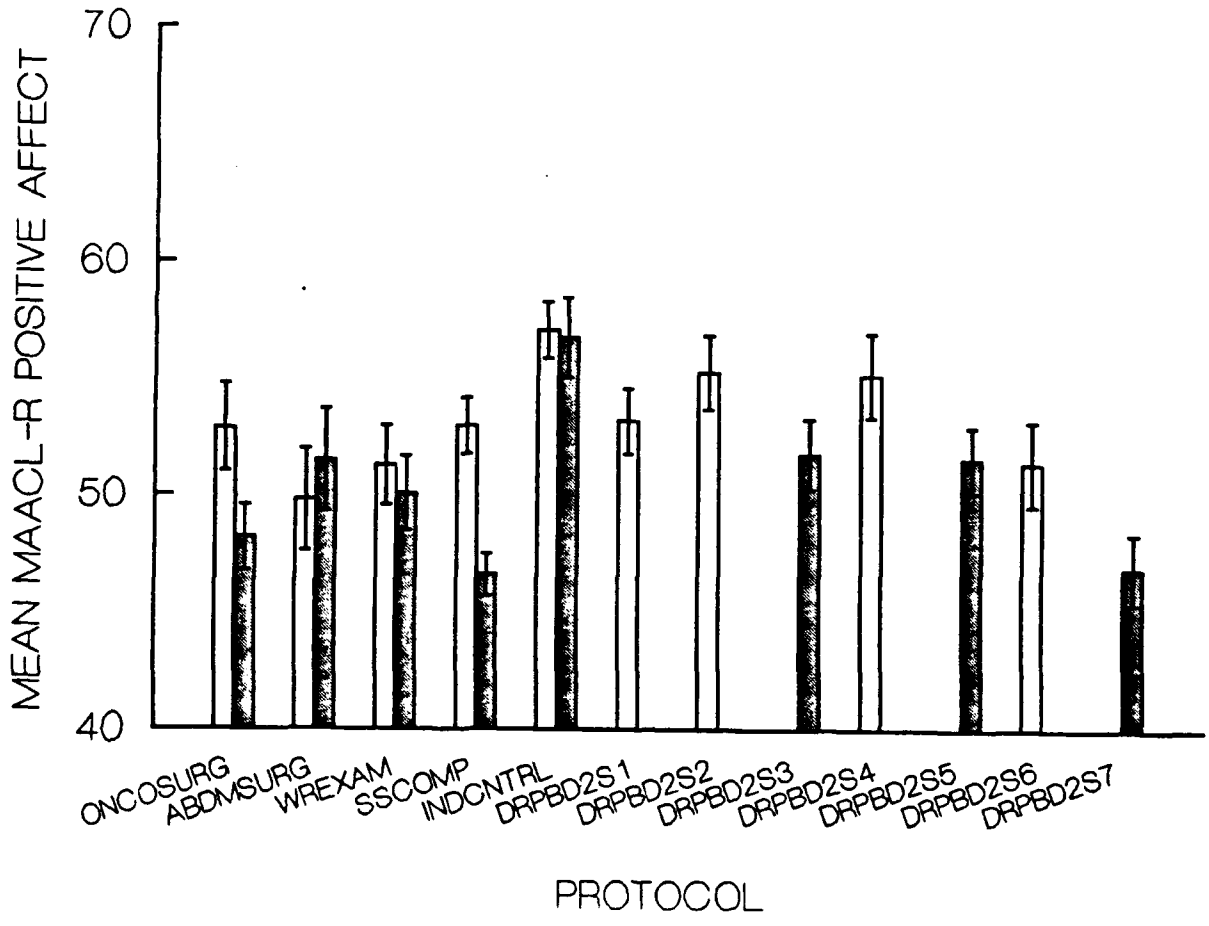


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 7. Comparison of mean (± SEM) MAACL-R Positive Affect scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG							>
ADBMSURG							>
WREXAM							>
SSCOMP			>		>		>
INDCNTRL					<		

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

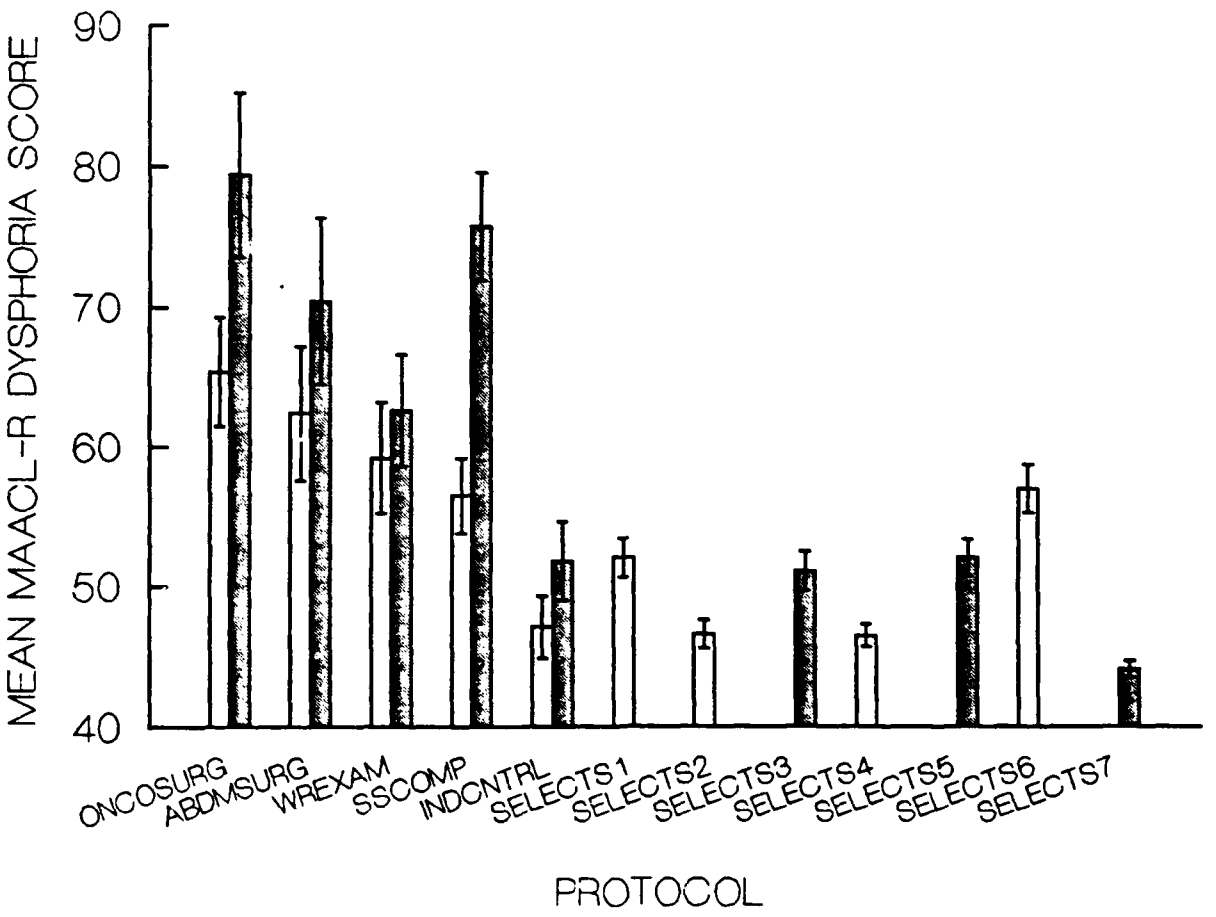


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 8. Comparison of mean (± SEM) MAACL-R Positive Affect scores for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG							
ADBMSURG							
WREXAM							
SSCOMP			>		>		
INDCNTRL							<

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

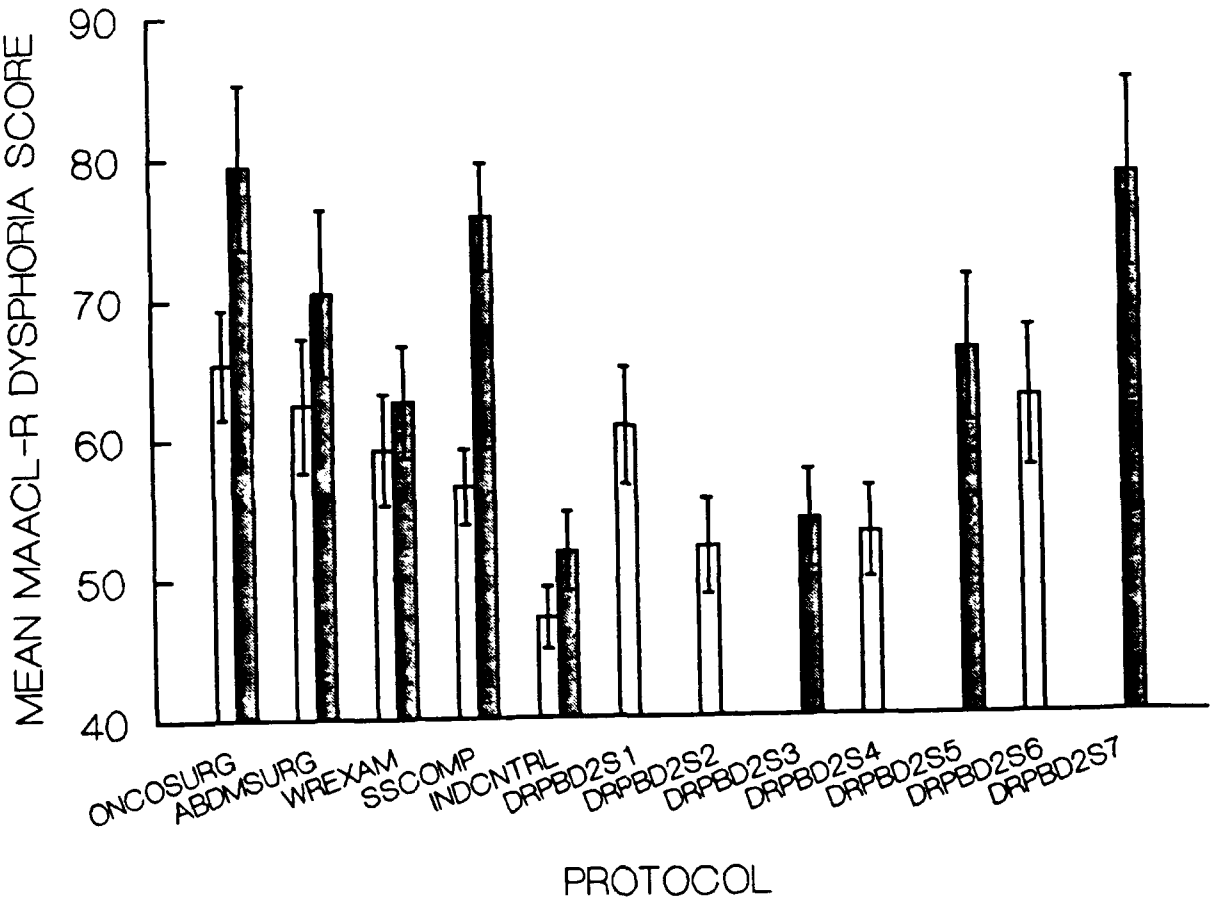


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 9. Comparison of mean (± SEM) MAACL-R Dysphoria scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
Referent Group	S1 (Pre)	S2 (Pre)	S3 (Post)	S4 (Pre)	S5 (Post)	S6 (Pre)	S7 (Post)
ONCOSURG	<	<	<	<	<		<
ADBMSURG		<	<	<	<		<
WREXAM		<	<	<			<
SSCOMP		<	<	<	<		<
INDCNTRL							

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

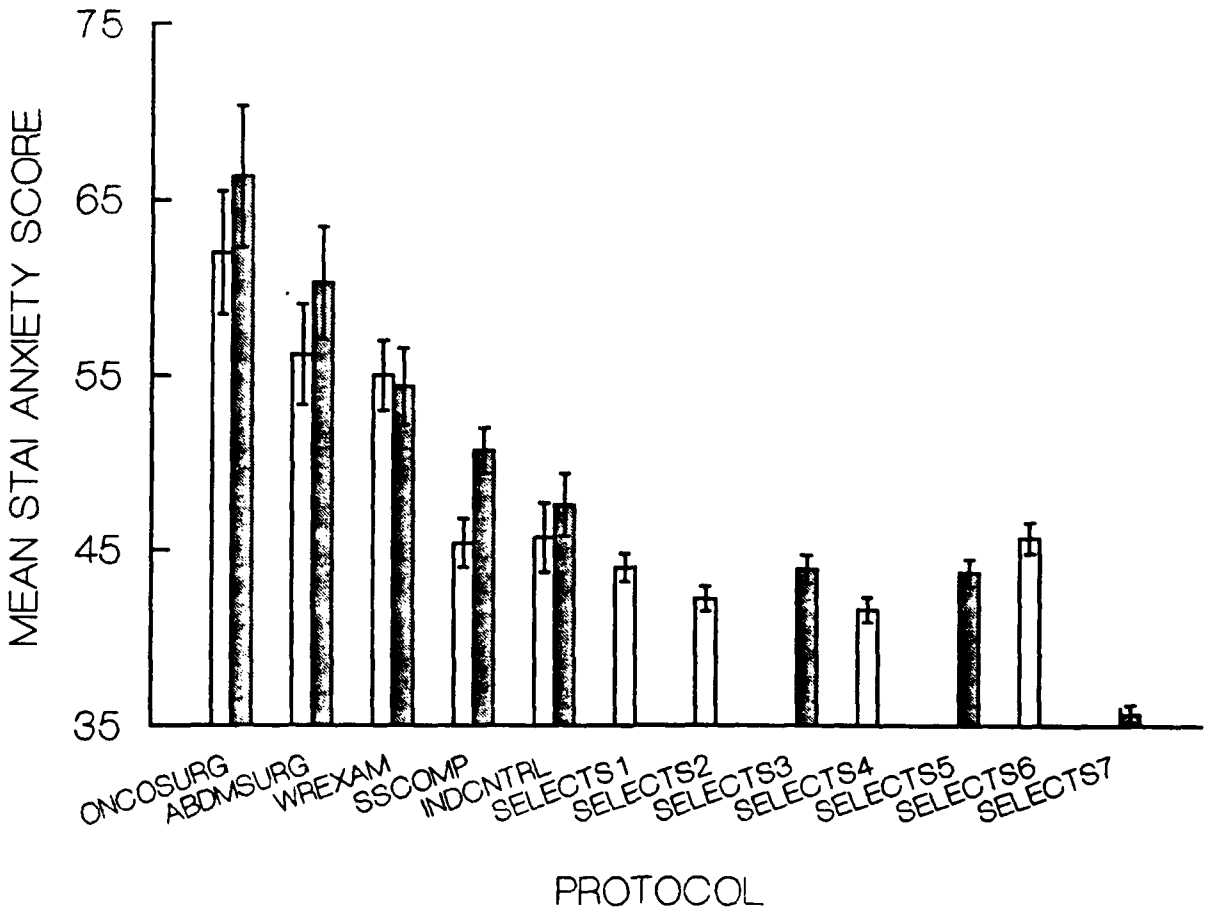


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 10. Comparison of mean (± SEM) MAACL-R Dysphoria scores for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
Referent Group	S1 (Pre)	S2 (Pre)	S3 (Post)	S4 (Pre)	S5 (Post)	S6 (Pre)	S7 (Post)
ONCOSURG		<	<	<			
ADBMSURG							
WREXAM							
SSCOMP			<				
INDCNTRL	>					>	>

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.



Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 11. Comparison of mean (± SEM) STAI Anxiety scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
Referent Group	S1 (Pre)	S2 (Pre)	S3 (Post)	S4 (Pre)	S5 (Post)	S6 (Pre)	S7 (Post)
ONCOSURG	<	<	<	<	<	<	<
ADBMSURG	<	<	<	<	<	<	<
WREXAM	<	<	<	<	<	<	<
SSCOMP			<		<		<
INDCNTRL							<

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

Figure 12 shows that STAI Anxiety levels for the DROPBD2 group were similar except they were not significantly below moderate stress referent group levels for Sessions 1, 5, 6, or 7.

Subjective Stress

SELECT group Subjective Stress Scale comparative stress scores are shown in Figure 13. Their stress scores remained significantly below high stress levels throughout, and below moderate stress levels Sessions 2, 4, and 5. They did not differ significantly from control levels except that they were below control levels for Session 7.

As shown in Figure 14 for the DROPBD2 group, however, subjective stress scores were significantly higher than control levels Sessions 1, 5, 6, and 7. They were significantly below high stress levels but did not differ significantly from moderate stress over Sessions 2 through 5. For Sessions 1, 6, and 7, however, they were not significantly different from high stress referent group levels.

Specific Rating of Events

Figure 15 shows that, according to this measure, the SELECT group stress ratings remained significantly below those for the referent stress groups during the SFAS course except for during Session 5 when it was significantly below that for the ABDSURG group. Their stress ratings were significantly higher than control levels, however, for Sessions 3, 5, and 6.

Figure 16 shows that the stress ratings for the DROPBD2 group were significantly below referent stress group levels only during Sessions 1, 2, and 4. Their stress ratings were significantly higher than control levels during Sessions 2, 3, 5, 6, and 7.

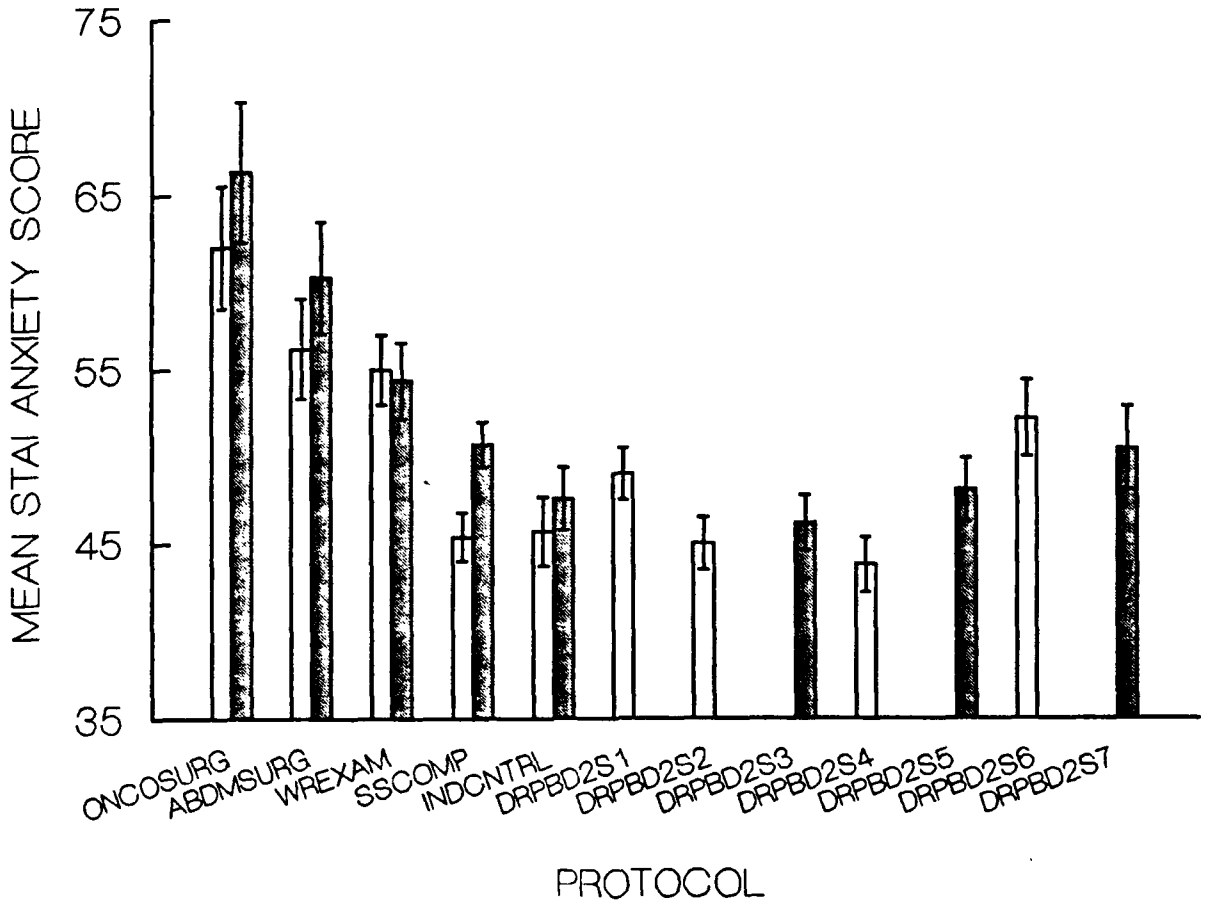
Comparative Rating of Events

Figure 17 shows that SELECT group comparative stress ratings (compared with the previously most stressful event in their lives) were significantly higher than referent control group levels Sessions 1 and 3 and higher than that of the moderate stress referent groups during Session 6. During Session 3, their stress rating was still, however, significantly lower than the highest comparative stress rating (for the ABDMSURG group).

The DROPBD2 group expressed similar ratings as shown in Figure 18. They showed different relative ratings only during Session 3 when they rated the stress as significantly higher than moderate stress referent groups ratings and not significantly different from either high stress referent group.

Considering all state measures with complete data obtained for all sessions, the SELECT subgroup differed significantly from the INDCNTRL protocol only a total of seven times of a possible 56, and only five of those indicated negative affect was greater for the SELECT subgroup than for the INDCNTRL protocol. The DROPBD2 subgroup, however, differed significantly from the INDCNTRL protocol 17 times, all of which indicated greater negative affect for the DROPBD2 subgroup. Thus, the DROPBD2 subgroup differed more from the INDCNTRL protocol than did the SELECT subgroup. Furthermore, the SELECT subgroup exhibited 130 significant differences of a possible 224 (reflecting less negative affect) from the four stress protocols, while the DROPBD2

subgroup exhibited only 50 such differences. Thus, the SELECT subgroup differed more from the stress protocols than did the DROPBD2 subgroup.

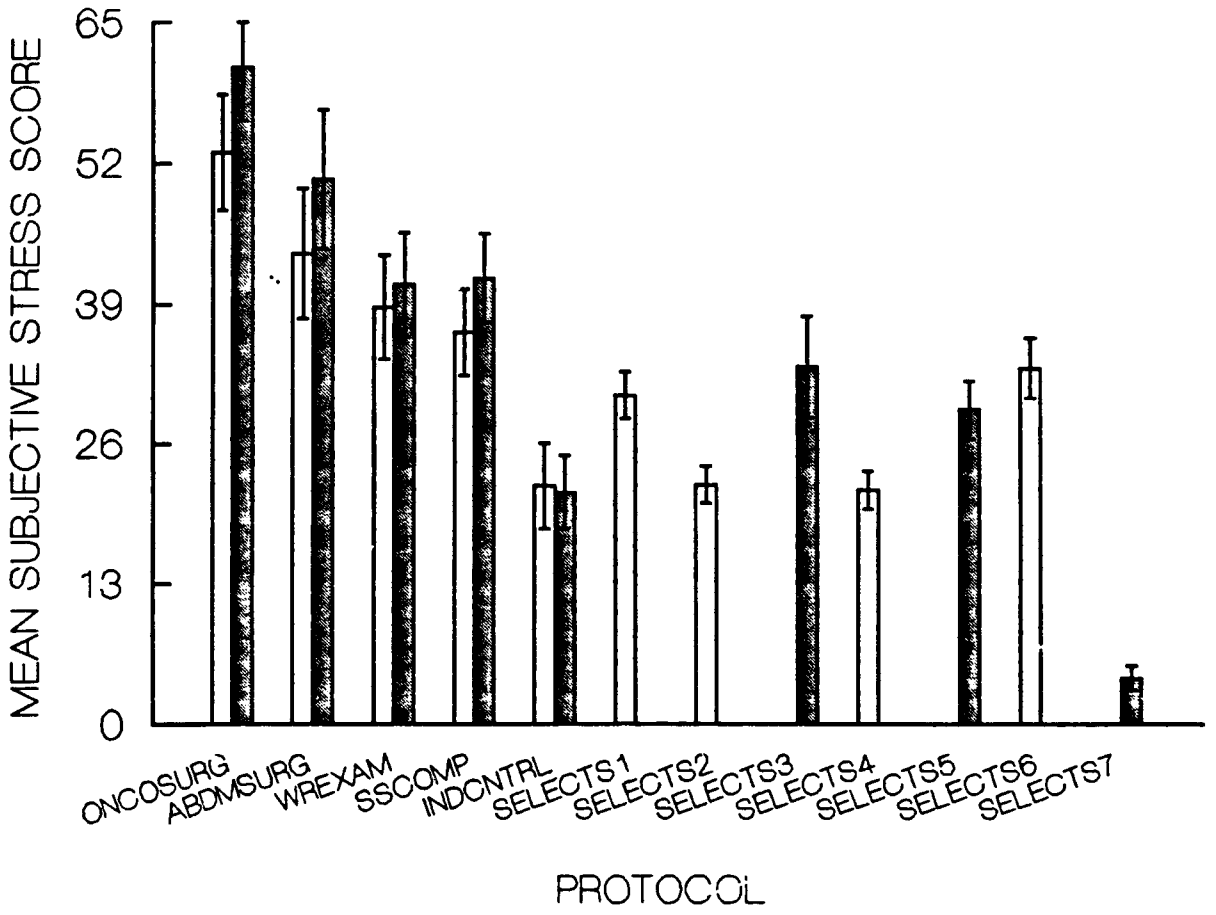


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 12. Comparison of mean (± SEM) STAI Anxiety scores for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG	<	<	<	<	<	<	<
ADBMSURG		<	<	<	<		<
WREXAM		<	<	<			
SSCOMP							
INDCNTRL							

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

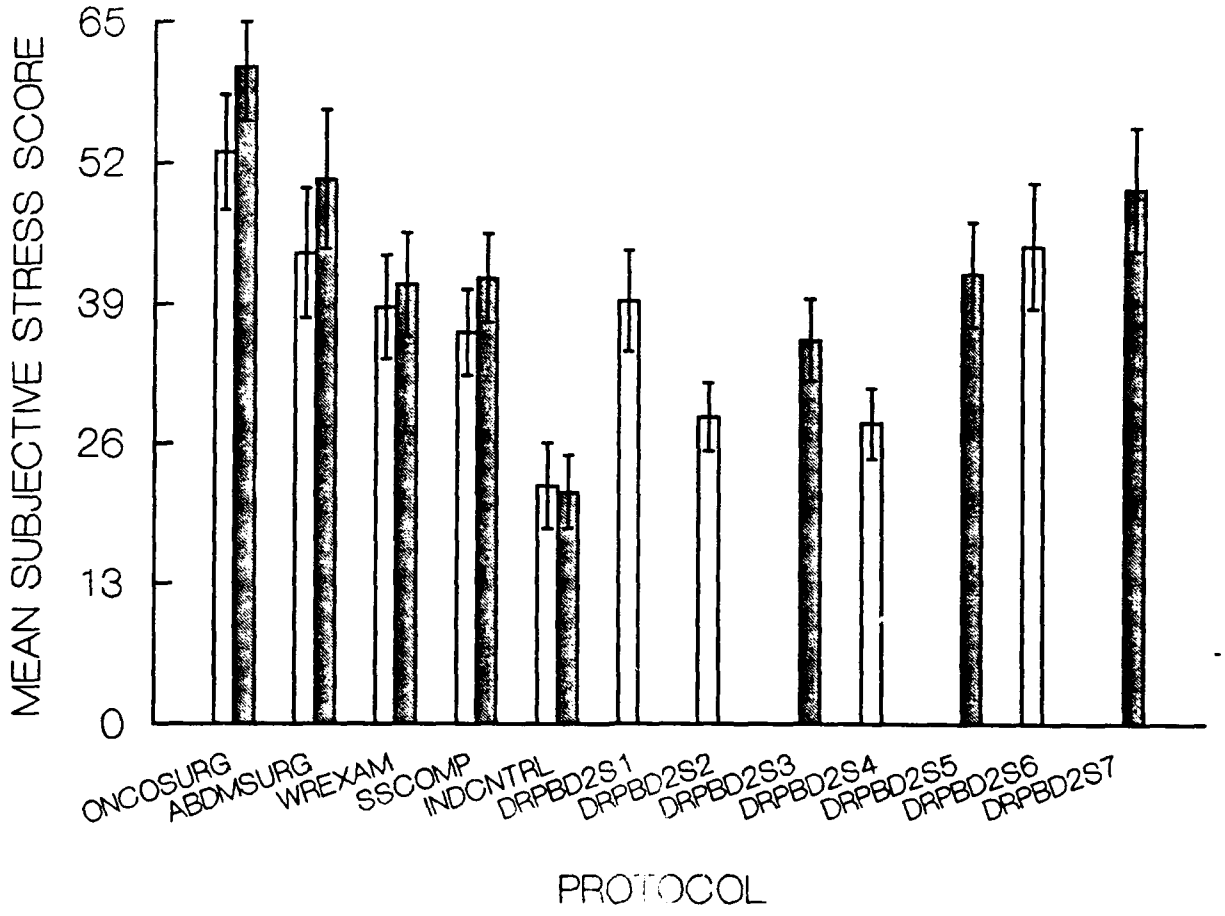


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 13. Comparison of mean (± SEM) Subjective Stress scores for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
Referent Group	S1 (Pre)	S2 (Pre)	S3 (Post)	S4 (Pre)	S5 (Post)	S6 (Pre)	S7 (Post)
ONCOSURG	<	<	<	<	<	<	<
ADBMSURG		<		<	<		<
WREXAM		<		<			<
SSCOMP		<		<	<		<
INDCNTRL							<

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

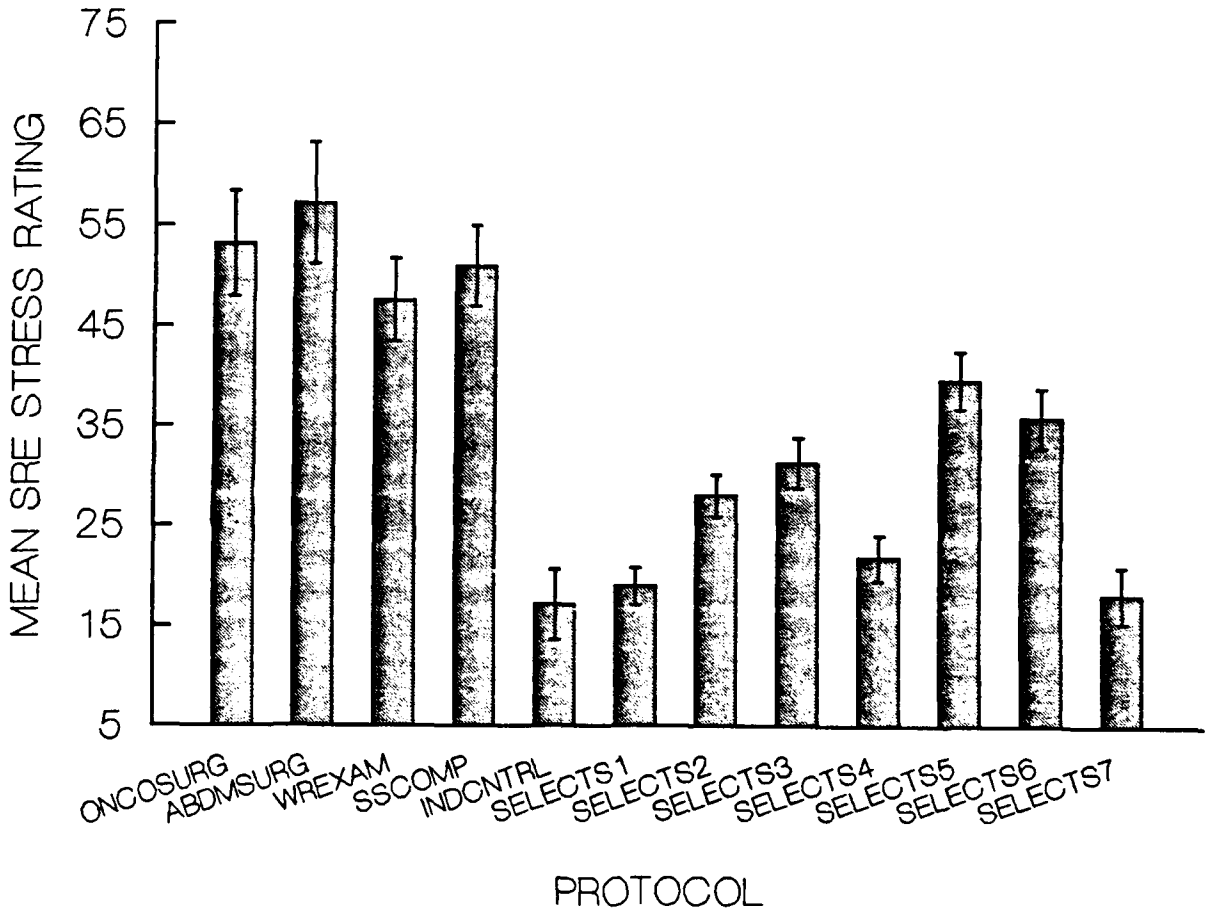


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 14. Comparison of mean (± SEM) Subjective Stress scores for DROBPD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Pre)	(Pre)	(Post)	(Pre)	(Post)	(Pre)	(Post)
ONCOSURG		<	<	<	<		
ADBMSURG							
WREXAM							
SSCOMP							
INDCNTRL	>				>	>	>

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

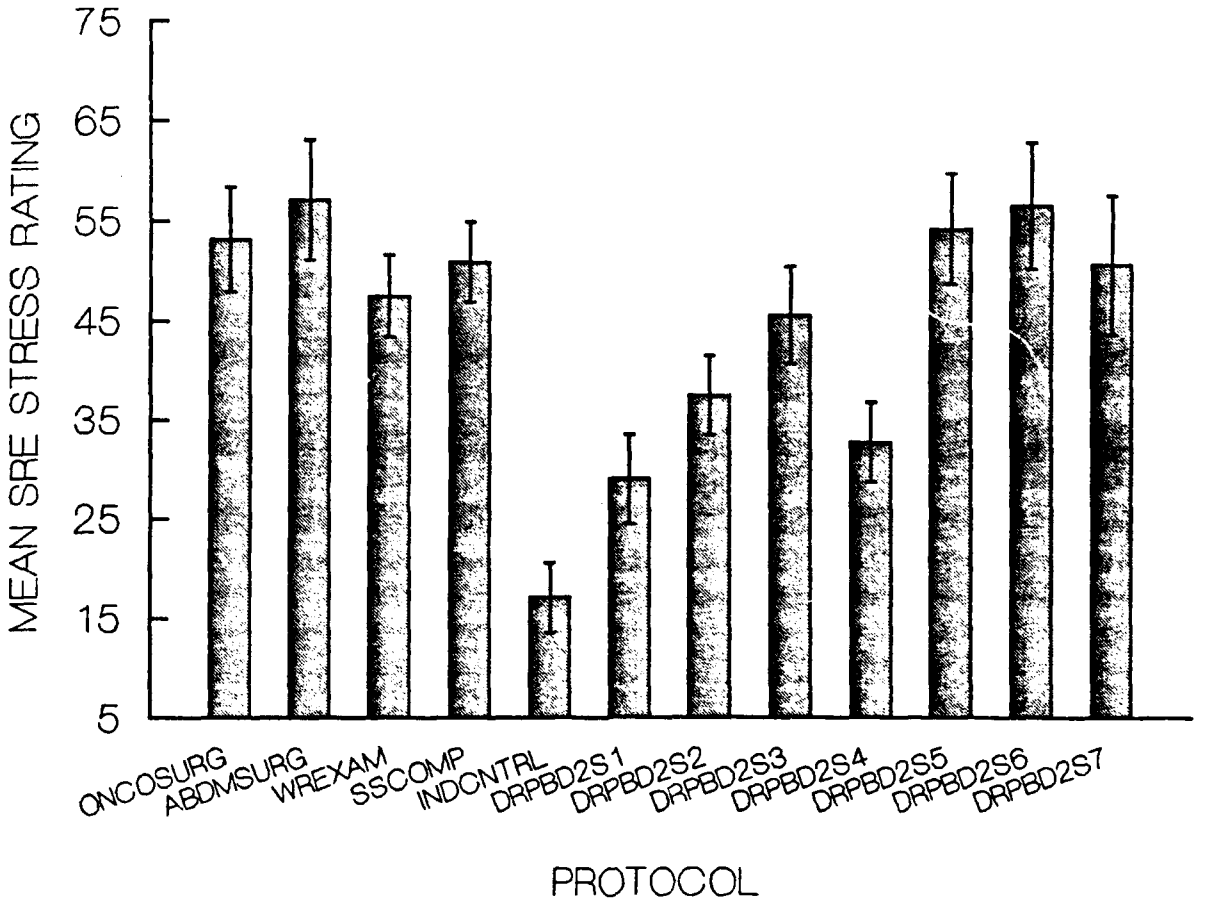


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 15. Comparison of mean (± SEM) SRE stress ratings for SELECT candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Post)	(Post)	(Post)	(Post)	(Post)	(Post)	(Post)
ONCOSURG	<	<	<	<		<	<
ADBMSURG	<	<	<	<	<	<	<
WREXAM	<	<	<	<			<
SSCOMP	<	<	<	<		<	<
INDCNTRL			>		>	>	

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.

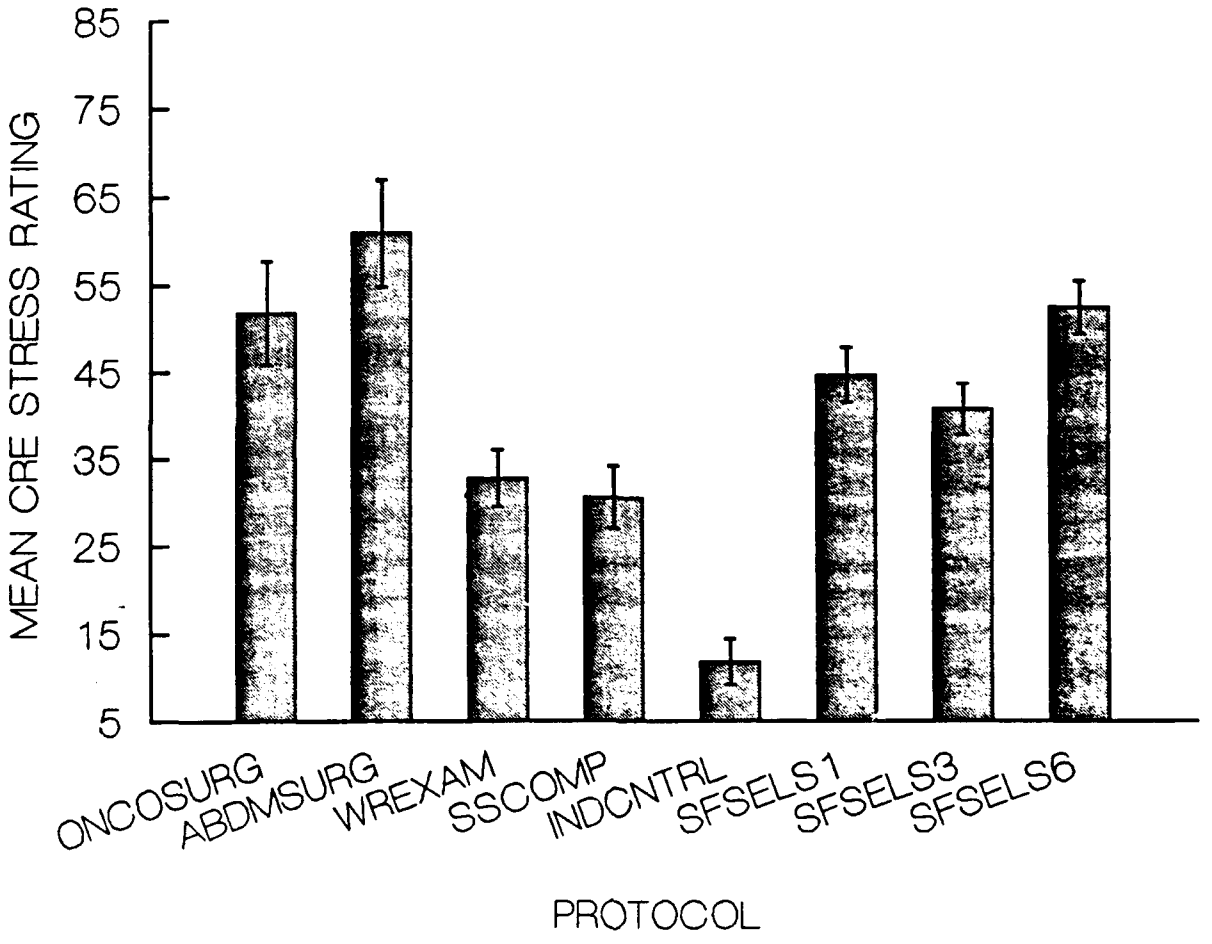


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 16. Comparison of mean (± SEM) SRE stress ratings for DROPBD2 candidates over seven sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Post)	(Post)	(Post)	(Post)	(Post)	(Post)	(Post)
ONCOSURG	<			<			
ADBMSURG	<	<		<			
WREXAM	<						
SSCOMP	<			<			
INDCNTRL		>	>		>	>	>

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

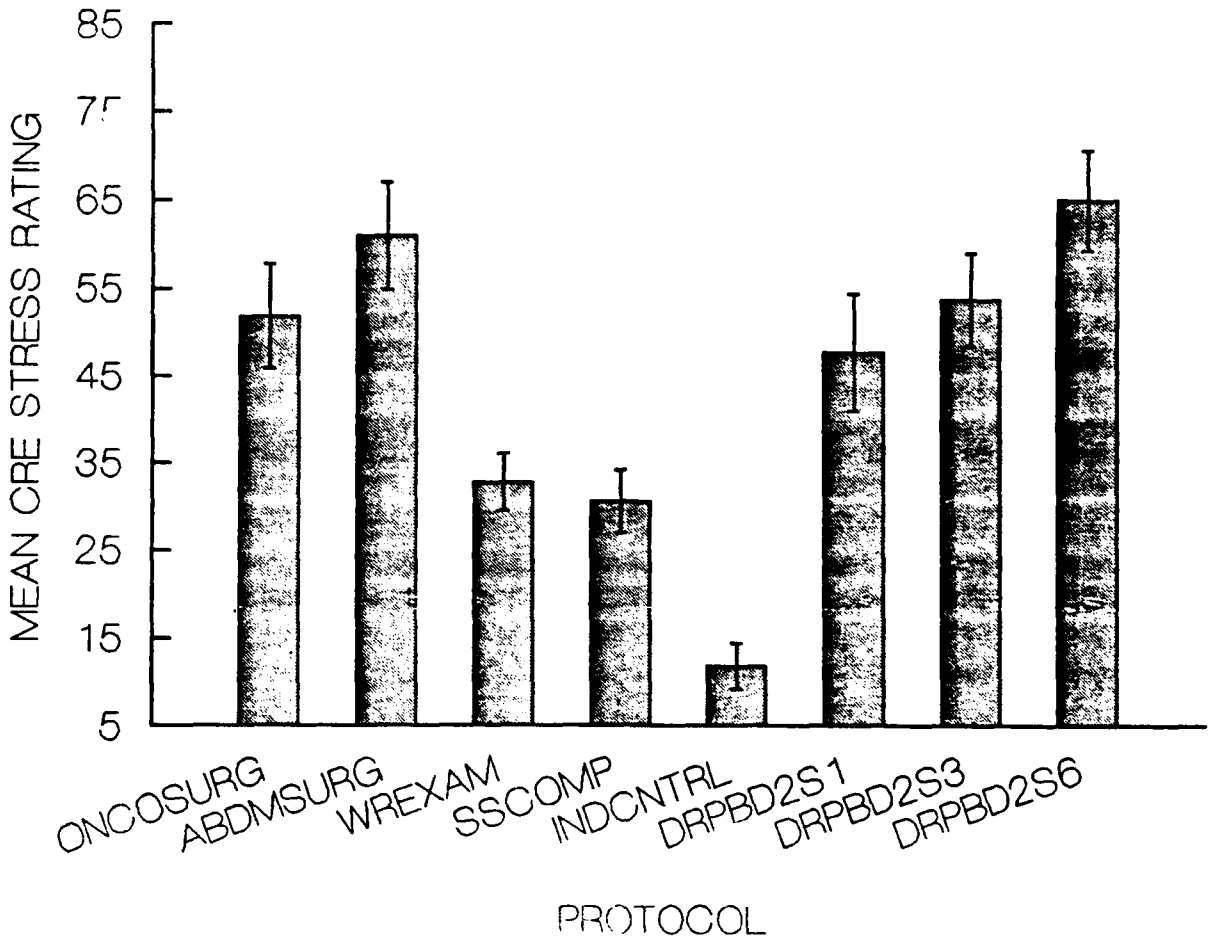


Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 17. Comparison of mean (± SEM) CRE stress ratings for SELECT candidates over three sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Post)		(Post)			(Post)	
ONCOSURG							
ADBMSURG			<				
WREXAM						>	
SSCOMP						>	
INDCNTRL	>		>			>	

< = SELECT mean significantly less than referent group mean.
> = SELECT mean significantly greater than referent group mean.



Note. For the referent protocols, open bars represent pre data, and shaded bars represent post data. The remaining seven bars are open or shaded appropriately to indicate whether they were compared with referent pre or post data.

Figure 18. Comparison of mean (± SEM) CRE stress ratings for DROPBD2 candidates over three sessions with appropriate pre or post event scores for men in referent protocols. Differences between means that achieved statistical significance at $p < .01$ are indicated below:

	Sessions (Referent time period)						
	S1	S2	S3	S4	S5	S6	S7
Referent Group	(Post)		(Post)			(Post)	
ONCOSURG							
ADBMSURG							
WREXAM			>			>	
SSCOMP	>		>			>	
INDCNTRL	>		>			>	

< = DROPBD2 mean significantly less than referent group mean.
> = DROPBD2 mean significantly greater than referent group mean.

Visual inspections of Figures 1 through 16 were conducted to determine for the SELECT and DROPBD2 subgroups for each session whether their responses were closest to the level of the INDCNTRL protocol (considered no stress to low stress), the SSCOMP or WREXAM protocols (considered relatively moderate stress), or the ABDMSURG or ONCOSURG protocols (considered relatively high stress). Table 6 shows the frequencies of low, moderate, and high stress indications for the subgroups over the seven sessions of the SFAS course. The SELECT subgroup displayed predominantly low stress responses for all sessions except Session 1 and Session 6 when their responses were better characterized as moderate. Except for Session 4, when their responses were predominantly low, the DROPBD2 subgroup displayed consistently higher stress levels. Like the SELECT subgroup; the DROPBD2 subgroup had five of eight indicators above the low stress level for Session 1. However, two of those were in the high stress range. For Sessions 2 and 3, their responses were in the low to moderate ranges; for Sessions 5 and 7, they were in the moderate to high ranges; and for Session 6, they were predominantly high stress.

Table 6

Frequency Distributions of Eight Response Measures Indicating Low, Moderate, or High Stress for SELECT and DROPBD2 Subgroups for Seven Sessions of the SFAS Course

Stress category	Sessions SELECT 1	2	3	4	5	6	7	DROPBD2 1	2	3	4	5	6	7
Low[a]	3	8	5	7	5	2	8	3	4	4	6	1	1	1
Moderate[b]	5	0	2	1	2	5	0	3	4	3	2	3	2	4
High[c]	0	0	1	0	1	1	0	2	0	1	0	4	5	3

a = Response means closest to INDCNTRL protocol means.
b = Response means closest to SSCOMP or WREXAM protocol means.
c = Response means closest to ABDMSURG or ONCOSURG protocol means.

Data Relating to Prediction of Success in SFAS Course

One of the objectives of this investigation was to evaluate the usefulness of trait measures for predicting success in the SFAS course. Preliminary analysis of the trait data, however, revealed the possibility of a confounding factor in the collection of those data.

The SFAS course schedule allowed time during the morning of the second course day for psychological testing by school staff psychologists. One hour at the beginning of that time was allowed for administering the trait battery for this investigation. The candidates had taken physical fitness and swim tests, which they were required to pass to continue in the course, the previous morning. Eighty-six of the candidates who failed the tests were scheduled for a final opportunity to pass them the following morning. Since psychological trait measures are generally constructed in a manner that minimizes their sensitivity to transient events and they are often tested for this insensitivity (Zuckerman, 1983), it was decided that the time period

allowed should be satisfactory for collecting trait data to meet the purposes of this investigation.

Because of the importance to the candidates of passing the physical fitness and swim tests, and because more than a third of the candidates had failed before taking the trait measures, it was obvious that the outcomes of those tests represented a potential source of significant influence on the subsequent mental states of the candidates. To verify that the trait measures were insensitive to the outcomes of that important event, the trait data for those who passed the initial tests were compared with those for those who failed, regardless of the subsequent course outcomes. The several trait means (± SEM) for those two outcome groups are shown in Table 7.

As indicated in Table 7, those candidates who failed the initial physical fitness or swim tests differed significantly ($p < .05$) from those who passed for MAACL-R and STAI trait Anxiety, EPQ Neuroticism, and the RWCCL Blame, Avoidance, and Wish subscales. Differences for these two subgroups of candidates were highly significant ($p < .01$) for MAACL-R Depression, Dysphoria, and Sensation Seeking. Even if the Bonferroni procedure were applied (which in this case would be a very liberal decision), yielding a critical $p = .003$ (for an overall $p < .05$), the groups still differ significantly for MAACL-R Dysphoria and Sensation Seeking.

Because the trait measures were obtained after the initial physical fitness and swim tests, and because the candidates in subgroups of those who passed or failed these tests were clearly different in their responses to many of those measures, the possibility that the outcome of those tests significantly affected the trait measurements is open to question. Since any analyses of data leading to conclusions regarding the use of these measures to predict ultimate success or failure in the SFAS course, therefore, would be invalidated, none are presented in this report. Trait data for SELECT candidates and for all others combined are presented in Appendix C.

DISCUSSION

In support of the JFKSWCS, the Army's P^2NBC^2 program and the HEL Stress and Performance Program, the stress evaluation described in this report assessed the state responses to stress experienced by SFAS candidates at various critical times during the SFAS course. The data obtained were analyzed and evaluated by procedures being developed by the HEL Stress and Performance Program to provide information about when and to what extent the candidates were stressed. In turn, the data and results obtained added to the program data bank necessary for the validation of procedures being developed. Because the SFAS course allowed adequate time for obtaining trait data only on Day 2 following initial physical fitness and swim tests, and because there was evidence that the candidates' outcomes for those tests could have influenced their responses to the trait measures, valid evaluation of the usefulness of those measures for predicting course success could not be accomplished.

Psychological State Responses During SFAS Course

The psychological state measurements were obtained seven times distributed throughout the course. The first session occurred on Day 3, which was primarily an administrative day and which, based on a course description, appeared to be the day associated with the least likelihood of stress. The remaining six sessions were at times immediately before or after course events

Table 7

Mean (± SEM) Trait Data for Candidates Who Passed and Candidates Who Failed Their Initial Physical Fitness or Swim Tests

Trait measure	Physical Fitness or Swim Test Outcome			
	Pass (N = 174)	Fail (N = 86)	t (df = 1)	
MAACL-R				
Anxiety	55.4 (1.1)	60.4 (1.9)	2.40	$p = .017$
Depression	52.3 (1.0)	57.9 (2.0)	2.82	$p = .005$
Hostility	48.6 (0.7)	50.6 (1.2)	1.55	N.S.
Dysphoria	52.0 (0.9)	57.5 (1.7)	3.23	$p = .001$
Positive Affect	45.0 (0.8)	44.1 (1.3)	0.62	N.S.
Sensation Seeking	58.7 (0.7)	54.0 (1.2)	3.42	$p = .001$
STAI Anxiety	46.6 (0.6)	49.1 (1.1)	2.12	$p = .035$
External Locus of Control	7.98 (.30)	8.16 (.42)	0.34	N.S.
EPQ				
Psychoticism	3.20 (.18)	3.40 (.27)	0.61	N.S.
Neuroticism	6.24 (.35)	7.62 (.59)	2.11	$p = .036$
Extraversion	14.96 (.30)	15.43 (.45)	0.88	N.S.
RWCCL				
Problem Focused	26.5 (.35)	25.5 (.54)	1.56	N.S.
Blamed Self	20.9 (.37)	19.6 (.54)	2.12	$p = .035$
Social Support	22.2 (.33)	21.8 (.53)	0.55	N.S.
Avoidance	15.0 (.29)	16.1 (.43)	2.15	$p = .033$
Wishful Thinking	15.4 (.42)	16.9 (.58)	2.18	$p = .030$

which, based on the course description, appeared to be times with the greatest likelihood of being stressful.

The battery of state measures tracked significant events during the SFAS course as indicated by the patterns of significant differences in state responses between adjacent sessions for the combined SELECT and DROPBD2 groups. Between Sessions 1 and 2, significant decreases were obtained for reported MSANX, SSANX, MSDYS, and SUBJ. For SRE, however, a significant increase was obtained. Thus, the two global measures of situational stress perception appear to contradict each other. A speculative answer to this is that the SUBJ scale might be more heavily weighted with an anxiety component of stress perception than the SRE. This explanation is consistent with the evidence provided by the other significant effects indicating significantly greater anxiety for Session 1 than Session 2. However, since even the measures of negative affect that did not change significantly showed decreases from Session 1 to Session 2, no explanation is provided for the significant increase in perceived stress between the sessions for the SRE scale.

Between Sessions 2 and 3, MSDEP, MSHOS, SUBJ, and SLEEP increased significantly and MSPA decreased significantly. Between Sessions 3 and 4, MSDEP, SSANX, SUBJ, SRE, and SLEEP decreased significantly, and MSPA increased insignificantly. Between Sessions 4 and 5, MSDEP, MSHOS, MSDYS, SSANX, SUBJ, SRE, and SLEEP all increased significantly and MSPA decreased significantly. Between Sessions 5 and 6, MSANX and SSANX increased significantly, and MSDEP, MSHOS, and SLEEP decreased significantly. Between Sessions 6 and 7, MSANX, MSDYS, SSANX, SUBJ, and SRE decreased significantly, and MSPA increased significantly. Thus, the data reflect an initial period of relatively high anxiety followed by a period of lower anxiety but possible increased generalized stress associated with preparations for military orienteering exercises. A period of higher generalized stress associated with the military orienteering exercises followed, probably because of physical aspects of the exercises and sleep deprivation. The next period, which was associated with administrative duties and preparations for situation-reaction exercises, was characterized by lower generalized stress and sleepiness. The next period, which was associated with the situation-reaction exercises themselves, was characterized by increased generalized stress again probably because of physical aspects of the exercises and sleep deprivation. This was followed by a measurement session associated quite specifically with the event of surviving candidates waiting to learn their outcomes in the SFAS course. Their responses to that situation were characterized by increased anxiety but decreased generalized stress and sleepiness. The final measurement session, which was associated with candidates having learned their outcomes, was characterized by both decreased anxiety and decreased generalized stress for the group as a whole (the SELECT and DROPBD2 candidates subgroups differed considerably in their response profiles at this session).

While the two outcome subgroups, which were followed over all seven sessions displayed very similar response profiles over the sessions, the subgroups differed consistently with parallel levels of responses over Sessions 1 through 6, and divergent response patterns for Session 7 after learning their course outcomes. While subgroup differences were not significant for all measures at all sessions, generally, over Sessions 1 through 6 the SELECT subgroup displayed consistently lower responses for MSANX, MSDEP, MSHOS, MSDYS, SSANX, SUBJ, SRE, CRE, and SLEEP, and higher responses for MSPA and SEFF. It is noteworthy that the subgroups differed as they did in their state responses during nearly the entire course, and especially, that the subgroups differed as early in the course as Session 1

when so little had happened to have differentially affected them. For further discussion relating to this finding, see the section entitled Trait Measures and SFAS Course Outcome.

Comparisons With Other Protocols

To estimate the relative degree of stress experienced in a given situation, comparison of state responses in the situation with those obtained with the same measures and procedures in other stress and control protocols has proved useful (Fatkin et al., 1991; Hudgens, Malto, Geddie, & Fatkin, 1991). For this report, newly obtained data for men whose wives were facing cancer surgery, representing response data, which were higher for many measures than for previous protocols, were substituted for data previously obtained for a low stress control protocol associated with the SSCOMP protocol.

Comparison of their responses to those of subjects in referent protocols indicated that the SELECT candidates experienced low levels of stress during most of the SFAS course. Only at the time of Session 1, when they were new to the course, and at Session 6, when their fates were completely in others' hands, did they show evidence of moderate stress.

The DROPBD2 subgroup candidates, however, displayed predominantly low stress responses only at the time of Session 4, which was a time of break between several-day periods of intense activity and little sleep. Their responses indicated low to moderate stress for Sessions 2 and 3, moderate stress to high stress for Sessions 1, 5, and 7, and high stress for Session 6. Thus, the two subgroups tended to follow similar patterns of response over sessions; the DROPBD2 subgroup, however, tended to experience events at a higher stress level.

It is noteworthy that although the SFAS course is generally described and viewed as very demanding physically, the time of greatest stress response for both groups was Session 6, when they were waiting to hear what cadre members had decided about their course outcomes. It is also noteworthy that the self-efficacy data (SEFF) were generally consistent with the stress response data. That is, the SELECT subgroup reported higher self-efficacy than the DROPBD2 subgroup, particularly at times of greater stress. This was true except for Session 6, when the DROPBD2 candidates may well have engaged in much wishful thinking. The DROPBD2 candidates did report after Session 7 having used more (but not significantly more) wishing behaviors to cope with events than did SELECT candidates.

Contributions to the Improved Measurement of Stress

One of the objectives of this investigation was to obtain data that would provide the HEL Stress Program with information to support the validation of the HEL stress assessment methodologies. The present investigation contained several features promoting this objective. First, since most previous investigations involving the HEL methodologies had used civilian subject populations, it was important to obtain complete psychological data for a large military group performing in a relatively stressful situation. One concern was that military subjects might exhibit a stronger machismo than civilians and therefore, might not reveal expressions of the stress they were experiencing. Within the Army population, candidates for SF training might be expected to be highly macho. Results obtained in

this investigation indicate validity of the measures, first, by sensitivity to events during the course, second, by sensitivity to subgroup differences, and third, by the relatively high scores obtained by the candidates, particularly the DROPBD2 subgroup candidates, near and at the end of the course which indicated a willingness to admit being stressed when appropriate. The applicability of these methodologies to repeated measures investigations, such as sustained or continuous military operations exercises, is thus demonstrated.

At the foundation of the interaction model of stress developed for the HEL Stress Program is the definition of stress offered by Lazarus and Folkman (1984): "... a 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." Implicit to this definition of stress is the role played by the person's sense of control; that is, the greater the sense of control a person has in a situation, the less likely s/he is to feel stressed and the less the sense of control the more likely s/he is to feel stressed. The particularly high levels of distress expressed by the candidates at the end of the SFAS course, when there was no longer anything they could do to affect their course outcomes which were then in others' hands, are indicative of the validity of this notion of stress.

Trait Measures and SFAS Course Outcome

A second objective of the present investigation was to evaluate the usefulness of certain trait measures for predicting success in the SFAS course.

Because a number of significant differences were obtained when the trait data for those who passed and those who failed the initial physical fitness and swim tests were compared, and because those tests were conducted before the trait data were obtained in accordance with usual SFAS procedures, the possibility exists that the results of those tests influenced the trait data. For this reason, the relationship between traits and course outcome could not be validly determined, and the second objective could not be met in this investigation.

CONCLUSIONS AND RECOMMENDATIONS

1. The SFAS candidates experienced generally low to moderate levels of stress over the SFAS course before the day they were to learn their course outcomes. On that day, the levels increased to moderate to high stress, particularly for the DROPBD2 subgroup. There were no other indications of unusually high state responses over any session in any of the groups that did not complete the course.

2. Although the course was designed to be particularly physically demanding of the candidates, the only events that elicited measured state responses in the moderate to high ranges were waiting for and discovering course outcomes.

3. The low to moderate state response levels associated with events during most of the course are interpreted to reflect that the candidates generally perceived the course events as ones they could handle and were handling effectively. This suggests the possibility that most candidates who

did not complete the course were ones who dropped out or were terminated for reasons other than stress or their perceived lack of ability to cope.

4. Both the trait and state data obtained suggest that the SELECT candidates may have differed from the others at the start of the course. However, since the trait and initial state data were obtained after the candidates took their initial physical fitness and swim tests, such a conclusion cannot be drawn with any certainty.

5. Since knowledge of the real predictive ability of trait measures regarding success in the SFAS course is important to determining ways of reducing course costs through improved pre-SFAS selection, it is recommended that a minor change be made in the SFAS course schedule to allow the collection of trait data before any course events that serve to evaluate the candidates. Such data collected in this manner for several course iterations should provide an adequate sample of trait data that are not affected by course events to allow determination of predictive validity for the measures.

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APPENDIX A

THE WRAIR/PRECISION CONTROL DESIGN WRIST ACTIVITY MONITORING SYSTEM

THE WRAIR/PRECISION CONTROL DESIGN WRIST ACTIVITY MONITORING SYSTEM

The following description has been extracted from the following research protocol of Leu, J. R., Redmond, D. P., Belenky, G. L., Penetar, D. M., & O'Donnell, V. M. (1988). Sleep, activity and performance in military personnel during continuous simulated combat operations: 2nd Ranger battalion platoon evaluation. Washington, DC: Walter Reed Army Institute of Research, Department of Behavioral Biology, Division of Neuropsychiatry.

BACKGROUND

Activity monitoring, counting movement of the wrist, has been extensively cited in sleep/wake studies and hyperactivity. Activity monitoring is a powerful tool for the psychiatric and behavioral sciences. Movement of the non-dominant wrist has been described as an acceptable data base in sleep/wake studies, depression, hyperactivity and ergonomics. The psychiatrist can assess effects of therapy; the physician, the extent of sleep/wake disorders; the behavioral scientist, the efficacy of biofeedback; and the industrial engineer, fatigue and shift scheduling. Actigraphy is a continuous collection of wrist motion that describes one of the oscillators governing chronobiological behavior which is affected by sleep deprivation, jet travel and shift work. This data can also provide useful information in pharmacological therapeutic interventions.

The full impact of actigraphy as an important scientific and clinical instrument has been hampered by the lack of a reliable, accurate and repeatable Activity Monitor small enough for convenient data gathering. A new Activity Monitor design, based upon research and development conducted by Precision Control Design (PCD), incorporating new technology and benefitting from important discoveries made by others over many years, was introduced in January 1985. The new device is based on a low power microprocessor housed in a miniature wrist-worn enclosure. Consolidation of circuitry and improved methods of detection and signal processing has made possible a scientific tool exhibiting extraordinary capability and versatility. Being processor based, the Activity Monitor can perform many tasks normally associated with computers. The Activity Monitor and companion Terminal should interest researchers and clinicians studying human activity.

SYSTEM DESCRIPTION

The Activity Monitoring System is comprised of an Activity Monitor and a data programming and reading device. Activity data is collected by the Activity Monitor, a miniature battery driven computer with solid state memory and triaxial sensing. Programming and reading may be accomplished with virtually any personal computer by using a peripheral adapter and appropriate disc software. Alternatively, a special purpose stand alone Terminal has been developed along with all necessary software for logical step by step interaction with the Activity Monitor. Initialization data such as patient name, start/stop times and epoch interval may be programmed into the Activity Monitor by either method.

Activity data is normally collected by wearing the miniature Activity Monitor on the wrist or other body locations to suit a particular protocol. No special attention to the device is needed because of its rugged enclosure and water resistant design. Subtle arm and wrist movements are sensed by the

device's electronics and stored as a function of time in resident memory. Long battery life and extended memory of the Activity Monitor permit long intervals of data collection and storage, and a wear and forget convenience not possible before. At anytime during the data collection period, the Activity Monitor can be checked by plugging it into the Terminal or by use of an optional hand held test unit.

Data extraction is accomplished by using the Terminal in its reader mode. A 4 x 40 character display prompts the user through a series of menu items. Data may be scrolled for quick review. Alternatively, the Activity Monitor may be read by any RS-232C equipped computers by using an external box called a Peripheral Data Converter (PDC) which converts raw activity data into conventional RS-232. Custom programs for either method are available.

The Monitor

Wrist movement is sensed by piezoelectric bimorph bender elements. Bender output is threshold detected which accounts for the high noise immunity of the design. Data is read by a low power single chip computer which deposits number of activity counts per unit time (epoch) into 4K of resident memory. Communication with the device is accomplished through 6 external micropins on the enclosure's side. The water resistant case is 1.6" x 2.5" and weighs 3 oz.

The Terminal

Initialization data is programmed into the Activity Monitor with the Terminal which also reads data. The Terminal utilizes an 8 bit processor and is designed for easy mechanical interface to the Activity Monitor. Data may be transferred from the Terminal to peripheral computers and printers using a software configurable RS-232 data link. Activity counts may be observed during on-going testing by using the Terminal in its remote mode.

Data Characteristics

One activity count is defined to be the amount of acceleration needed for a threshold crossing in the Activity Monitor detection circuitry. Counts are accumulated for time intervals called epochs and stored in solid state memory. When read out and plotted, the resultant graph is a time series of activity counts, an actigraph. These graphs provide revealing information about the daily movements of humans, particularly during sleep periods. During periods of high activity, counts soar to many thousands in a typical 15 minute epoch. Sleep periods are characterized by far fewer counts and often revealing information about the individual's sleep patterns, particularly those related to stages of sleep can be obtained.

By utilizing the programming capability of the Activity Monitor, epoch times may be changed from 7.5 seconds to 16 minutes in 1/10 seconds which permit 11 hours to 650 hours (27 days) test time to fill the memory. More advanced versions of the Activity Monitor software are available that reduce the raw data according to a set of statistical algorithms. This option greatly increases the test time since only results are stored, and reduces the tedium of bulk data analysis.

APPENDIX B

TABLES OF MEAN STATE RESPONSE SCORES FOR DROPBD1, VOLWD, DROPMED, AND INVWD SUBGROUPS

TABLES OF MEAN STATE RESPONSE SCORES FOR DROPBD1, VOLWD, DROPMED, AND INVWD SUBGROUPS

Table B-1

Mean (± SEM) State Response Scores for DROPBD1 Subgroup over Sessions of the SFAS Course

Scale or subscale		Sessions 1	2	3	4	5	6	7
	N	14	14	13	0	0	0	14
MSANX		53.9	47.5	49.1	-	-	-	46.6
		(3.7)	(3.2)	(2.5)	-	-	-	(1.8)
MSDEP		52.9	47.1	61.1	-	-	-	70.6
		(3.3)	(1.2)	(8.2)	-	-	-	(9.4)
MSHOS		46.9	46.6	55.8	-	-	-	63.2
		(2.2)	(3.0)	(4.5)	-	-	-	(7.1)
MSDYS		52.8	46.7	53.2	-	-	-	61.1
		(3.8)	(2.8)	(5.4)	-	-	-	(6.8)
MSPA		54.0	56.3	54.3	-	-	-	48.1
		(1.8)	(2.3)	(2.6)	-	-	-	(1.7)
SSANX		44.5	41.7	45.5	-	-	-	47.3
		(1.8)	(1.7)	(2.1)	-	-	-	(2.7)
SUBJ		31.4	23.8	40.1	-	-	-	36.4
		(6.4)	(4.6)	(7.0)	-	-	-	(7.8)
SRE		21.3	37.1	50.4	-	-	-	50.8
		(4.7)	(5.5)	(8.1)	-	-	-	(9.2)
CRE		45.5		44.8			-	
		(8.2)		(8.0)			-	
SEFF		8.29	8.50	7.64	--	--	--	6.69
		(0.37)	(0.40)	(0.55)	--	--	--	(0.76)
SLEEP		1.86	1.64	3.07	--	--	--	2.00
		(0.21)	(0.17)	(0.44)	--	--	--	(0.23)

Table B-2

Mean (± SEM) State Response Scores for VOLWD Subgroup over Sessions of the SFAS Course

Scale or subscale	Sessions 1	2	3	4	5	6	7
N	61	48	25	25	2	0	61
MSANX	59.6 (2.4)	56.5 (3.2)	52.6 (2.3)	49.3 (2.1)	51.5 (6.5)	- -	54.0 (1.8)
MSDEP	66.1 (4.4)	57.3 (3.7)	69.1 (5.9)	53.4 (4.3)	95.0 (24.0)	- -	90.0 (6.6)
MSHOS	50.5 (1.6)	47.2 (1.4)	52.2 (2.1)	48.0 (1.8)	58.0 (0.0)	- -	65.2 (2.7)
MSDYS	61.9 (3.1)	54.2 (3.0)	59.7 (3.1)	49.6 (2.7)	68.0 (10.0)	- -	71.8 (3.6)
MSPA	51.9 (1.1)	53.0 (1.1)	51.0 (1.6)	52.9 (1.6)	46.5 (4.5)	- -	48.1 (1.0)
SSANX	46.6 (1.2)	44.9 (1.3)	45.5 (1.9)	42.0 (1.6)	54.5 (3.5)	- -	50.1 (1.3)
SUBJ	38.9 (2.9)	28.9 (3.4)	38.8 (5.7)	24.4 (3.7)	18.5 (9.5)	- -	45.5 (3.4)
SRE	20.8 (2.8)	33.1 (3.3)	37.6 (5.4)	26.7 (4.8)	57.5 (17.5)	- -	34.6 (3.5)
CRE	45.3 (4.4)		48.3 (5.7)			- -	
SEFF	8.26 (0.21)	8.42 (0.23)	8.62 (0.36)	9.08 (0.21)	8.00 (2.00)	- -	5.82 (0.36)
SLEEP	2.21 (0.12)	1.72 (0.13)	3.04 (0.28)	2.40 (0.46)	2.50 (0.50)	- -	2.31 (0.16)

Table B-3

Mean (± SEM) State Response Scores for DROPMED Subgroup over Sessions of the SFAS Course

Scale or subscale	Sessions 1	2	3	4	5	6	7
N	12	10	5	4	1	0	9
MSANX	61.0 (8.8)	49.6 (6.5)	51.2 (6.2)	43.0 (2.0)	37.0 -	- -	48.8 (3.1)
MSDEP	66.1 (10.8)	55.4 (6.6)	89.2 (28.6)	46.5 (0.5)	45.0 0	- -	106.0 (20.2)
MSHOS	47.7 (2.5)	46.7 (2.1)	52.0 (3.5)	44.2 (1.8)	45.0 -	- -	67.0 (8.2)
MSDYS	59.6 (8.4)	49.4 (6.1)	63.0 (13.0)	42.2 (1.8)	40.0 -	- -	75.3 (10.2)
MSPA	51.7 (2.4)	56.2 (2.1)	46.5 (2.1)	56.8 (3.6)	58.0 -	- -	45.9 (1.7)
SSANX	44.9 (3.2)	43.4 (2.3)	47.0 (5.1)	39.0 (3.1)	34.0 -	- -	50.4 (2.4)
SUBJ	33.3 (7.2)	27.0 (7.4)	37.2 (15.5)	18.5 (5.5)	28.0 -	- -	46.3 (9.7)
SRE	15.8 (4.1)	26.3 (6.5)	28.8 (10.1)	20.8 (11.4)	30.0 -	- -	44.0 (12.2)
CRE	38.6 (9.2)		35.2 (6.1)			- -	
SEFF	9.00 (0.30)	9.00 (0.42)	8.40 (0.81)	8.75 (0.75)	10.00 -	- -	7.00 (1.11)
SLEEP	2.00 (0.30)	2.11 (0.42)	3.20 (0.58)	1.50 (0.29)	3.00 -	- -	2.89 (0.54)

Table B-4

Mean (± SEM) State Response Scores for INVWD Subgroup over Sessions of the SFAS Course

Scale or subscale	Sessions 1	2	3	4	5	6	7
N	3	3	1	1	1	0	3
MSANX	42.3 (2.7)	47.0 (3.1)	47.0 -	45.0 -	58.0 -	- -	53.7 (4.3)
MSDEP	44.7 (2.3)	45.0 (1.0)	71.0 -	47.0 -	119.0 -	- -	63.0 (16.0)
MSHOS	44.7 (1.3)	46.7 (2.3)	46.0 -	46.0 -	46.0 -	- -	84.0 (13.0)
MSDYS	41.7 (2.3)	45.0 (2.6)	51.0 -	44.0 -	72.0 -	- -	74.0 (2.0)
MSPA	57.3 (5.7)	58.3 (3.2)	58.0 -	64.0 -	44.0 -	- -	42.7 (0.7)
SSANX	40.0 (1.0)	43.0 (1.5)	47.0 -	41.0 -	58.0 -	- -	55.0 (2.1)
SUBJ	19.3 (10.3	28.5 (11.5)	48.0 -	40.0 -	87.0 -	- -	53.3 (23.1)
SRE	20.7 (5.8)	54.0 (23.0)	32.0 -	32.0 -	40.0 -	- -	57.0 (6.5)
CRE	80.0 (20.0)		32.0 -			- -	
SEFF	8.67 (0.33)	9.00 (0.58)	7.00 -	8.00 -	5.00 -	- -	7.00 (2.1)
SLEEP	2.00 (0.00)	2.67 (0.33)	2.00 -	2.00 -	5.00 -	- -	1.67 (0.67)

APPENDIX C

TRAIT DATA FOR SELECT AND COMBINED OTHER SUBGROUPS IN SFAS COURSE

TRAIT DATA FOR SELECT AND COMBINED OTHER SUBGROUPS IN SFAS COURSE

Table C-1

Mean (± SEM) Trait Scores for SELECT and Combined Other Subgroups of Candidates in SFAS Course

TRAIT	SFAS Subgroup SELECT N 103	ALL OTHERS 157
MAACL-R		
Anxiety	55.4 (1.6)	58.1 (1.2)
Depression	50.7 (1.0)	56.3 (1.4)
Hostility	47.4 (0.8)	50.5 (0.9)
Dysphoria	51.3 (1.1)	55.5 (1.1)
Positive Affect	44.7 (1.1)	44.7 (0.9)
Sensation Seeking	58.2 (1.0)	56.3 (0.8)
STAI		
Anxiety	45.9 (0.8)	48.4 (0.7)
Locus of Control		
External	7.74 (0.36)	8.22 (0.32)
EPQ		
Psychotocism	2.88 (0.24)	3.52 (0.19)
Neuroticism	5.69 (0.44)	7.36 (0.41)
Extroversion	15.14 (0.39)	15.11 (0.33)
RWCCL		
Problem Focused	26.4 (0.4)	26.0 (0.4)
Social Support	22.1 (0.4)	22.0 (0.4)
Blamed Self	21.1 (0.5)	20.1 (0.4)
Wishful Thinking	15.5 (0.6)	16.1 (0.4)
Avoidance	14.9 (0.4)	15.7 (0.3)