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ATTITUDES TOWARDS THE COLD: EFFECTS ON PSYCHOLOGICAL MOOD AND SUBJECTIVE REPORTS OF ILLNESS DURING COLD WEATHER TRAINING

U S ARMY RESEARCH INSTITUTE
OF
ENVIRONMENTAL MEDICINE
Natick, Massachusetts

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FEBRUARY 1988

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UNITED STATES ARMY
MEDICAL RESEARCH & DEVELOPMENT COMMAND

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Abstract (continued)

Fifty-nine male soldiers were followed during eight days of winter training on military tactics conducted by the Army National Guard's Mountaineering School in northern Vermont. Prior to training, each soldier was asked to rate (1) the current amount of stress in his life (4-point rating scale from "no stress" to "constant stress"), (2) how he feels when in the cold outdoors (3-point rating scale from "colder than others" to "warmer than others"), and (3) how much he thinks he will like living in the cold weather during the upcoming training (5-point rating scale from "I will like it very much" to "I will dislike it very much"). Data analysis focused on the three days and two nights that the soldiers continuously lived and worked in the cold outdoors. On a daily basis soldiers completed the Profile of Mood States (POMS) rating scale (which measures tension, depression, anger, vigor, fatigue, and confusion) and the Environmental Symptoms Questionnaire (ESQ) (a 68-item questionnaire which measures 14 domains of symptoms, including cold symptoms, muscle aches, gastrointestinal discomfort, visual discomfort, fever, headache, etc.). Dry bulb temperature was recorded daily.

Ordinary least squares multiple regression analyses were used to analyze the data. Predictor variables were (1) daily air temperature, (2) time into the training, (3) self rating of life stress, (4) rating of relative warmth in cold weather, and (5) expectation for liking the cold weather training. Dependent variables were the six scales of the POMS and the 14 domains of the ESQ. The statistical analyses showed that (1) the more stress the soldiers perceived in their everyday lives (outside of training) the more fatigued, confused, and physically uncomfortable they were during training; (2) the more the soldiers expected to dislike the cold weather training (as measured prior to training) the more tense, depressed, angry, fatigued, and physically uncomfortable they were during training; (3) as time into training increased the more fatigued the soldiers became; and (4) due to appropriate training, exercise, and the use of cold weather clothing, ambient temperature (in the 0° to 32° F range) was found to have little influence on the soldiers' moods and physical symptoms.

This study suggests that a subgroup of individuals may be identified in advance of cold weather training who are likely to display symptoms of negative mood (tension, depression, anger, and confusion) and symptoms of poor physical well-being (fatigue, muscle discomfort, and nasal discomfort) when they are undergoing cold weather training. These individuals are likely to have more stress in their everyday lives, are likely to expect that they will dislike living in the cold, or both.

The views, opinions, and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation.

Human subjects participated in these studies after giving their free and informed voluntary consent. Investigators adhered to AR 70-25 and USAMRDC Regulation 70-25 on Use of Volunteers in Research.

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TECHNICAL REPORT

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Richard F. Johnson, Laurence G. Branch, and Donna J. McMenemy

February 1988

Health and Performance Division

US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE
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TABLE OF CONTENTS

	Page
List of Tables	iv
Abstract	v
Introduction	1
Method	2
Subjects	2
Measures	3
Context	10
Analytic Techniques	10
Results	12
Determinants of Mood	12
Determinants of Symptoms	12
Relative Role of Predictor Variables	17
Discussion	18
Ambient Temperature	18
Days Into Training	18
Soldier Attitudes and Expectations	19
Generalizing the Findings	19
Conclusion	20
References	21

LIST OF TABLES

		Page
Table 1.	Comparison of participants with complete information and participants with incomplete information	4
Table 2.	Self-reported subjective judgments of study sample (n=59)	5
Table 3.	Profile of Mood States (POMS) rating scale	6
Table 4.	Profile of Mood States (POMS) rating scale (continued)	7
Table 5.	USARIEM Environmental Symptoms Questionnaire (ESQ)	8
Table 6.	USARIEM Environmental Symptoms Questionnaire (ESQ) (continued)	9
Table 7.	The 14 Environmental Symptoms Questionnaire (ESQ) domains	11
Table 8.	Ordinary least squares regression analysis of six psychological moods (n=177)	13
Table 9.	Ordinary least squares regression analysis of environmental discomfort symptoms (n=177)	14
Table 10.	Ordinary least squares regression analysis of environmental discomfort symptoms (n=177) (continued)	15
Table 11.	Ordinary least squares regression analysis of environmental discomfort symptoms (n=177) (continued)	16

Abstract

The present study examined the influence of soldiers' attitudes toward the cold, expectations concerning living and working in the cold, and subjective reports of psychological stress on subsequent symptoms of physical illness and psychological mood during military training in the cold.

Fifty-nine male soldiers were followed during eight days of winter training on military tactics conducted by the Army National Guard's Mountaineering School in northern Vermont. Prior to training, each soldier was asked to rate (1) the current amount of stress in his life (4-point rating scale from "no stress" to "constant stress"), (2) how he feels when in the cold outdoors (3-point rating scale from "colder than others" to "warmer than others"), and (3) how much he thinks he will like living in the cold weather during the upcoming training (5-point rating scale from "I will like it very much" to "I will dislike it very much"). Data analysis focused on the three days and two nights that the soldiers continuously lived and worked in the cold outdoors. On a daily basis soldiers completed the Profile of Mood States (POMS) rating scale (which measures tension, depression, anger, vigor, fatigue, and confusion) and the Environmental Symptoms Questionnaire (ESQ) (a 68-item questionnaire which measures 14 domains of symptoms, including cold symptoms, muscle aches, gastrointestinal discomfort, visual discomfort, fever, headache, etc.). Dry bulb temperature was recorded daily.

Ordinary least squares multiple regression analyses were used to analyze the data. Predictor variables were (1) daily air temperature, (2) time into the training, (3) self rating of life stress, (4) rating of relative warmth in cold weather, and (5) expectation for liking the cold weather training. Dependent variables were the six scales of the POMS and the 14 domains of the ESQ. The statistical analyses showed that (1) the more stress the soldiers perceived in their everyday lives (outside of training) the more fatigued, confused, and physically uncomfortable they were during training; (2) the more the soldiers expected to dislike the cold weather training (as measured prior to training) the more tense, depressed, angry, fatigued, and physically uncomfortable they were during training; (3) as time into training increased the more fatigued the soldiers became; and (4) due to appropriate training, exercise, and the use of cold weather clothing, ambient temperature (in the 0° to 32°F range) was found to have little influence on the soldiers' moods and physical symptoms.

This study suggests that a subgroup of individuals may be identified in advance of cold weather training who are likely to display symptoms of negative mood (tension, depression, anger, and confusion) and symptoms of poor physical well-being (fatigue, muscle discomfort, and nasal discomfort) when they are undergoing cold weather training. These individuals are likely to have more stress in their everyday lives, are likely to expect that they will dislike living in the cold, or both.

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Introduction

The incidence of cold injury during actual combat in cold weather is quite high (Hanson & Goldman, 1969). However, the incidence of cold injury in military populations during cold weather training has been shown to be quite low, especially when compared to the frequency of most other injuries (e.g., orthopedic injury and acute trauma) (McCarroll, Jackson, Traver, Langevin, Phair, Murray, and Farese, 1979; Sampson, Stokes, Barr, & Jobe, 1983). This low incidence during training may be due to the fact that past research has focused almost exclusively on reports to sick call at medical treatment facilities and has failed to describe symptomatology which goes unreported. Symptomatology may go unreported either because the disorder is treated by a field medic or the soldier fails to report the symptoms to anyone. Failure to record these "unreported" illnesses and injuries is also likely due to the fact that past research has focused on large populations (thousands of soldiers) in which it is difficult for the research team to canvas individual participants. Recently, the US Army Research Institute of Environmental Medicine has begun to follow smaller groups of soldiers through military training cycles during cold weather. The objective has been to measure systematically the nature and frequency of injuries and illnesses which occur during training (whether reported to the regular medical treatment facility or not) and, concurrently, to assess the psychological moods of the participants. The goal is to determine if illness, psychological mood, or both are systematically related to cold weather conditions, preexisting subjective factors, or to both.

Cold-related injury may be defined as tissue trauma produced by exposure to cold temperature. Tissue trauma typically includes the freezing type (frostbite - superficial or deep) and the non-freezing types (chilblains, trench foot, immersion foot, and hypothermia) (Department of the Army, 1976). Among the factors that increase susceptibility of an individual to cold-related injuries are: age (the very young and the very old are more vulnerable), fatigue, inadequate nutrition, inexperience with cold temperatures, previous cold injuries, activity level (both excessive and too little activity predispose one to injury), substances and medications which influence circulation and/or have vascular effects, improper clothing, weather conditions, and psychosocial factors. Race is a factor which historically has been reported to influence susceptibility, specifically Blacks being more vulnerable than Caucasians, but this issue remains unsettled (Hamlet, 1987).

The above factors have been the subject of extensive study in the scientific literature, and all have been incorporated into official US

Departments of the Army, Navy, and Air Force guidance for prevention and management of cold injury (Department of the Army, 1976; Department of the Navy, 1976; Department of the Air Force, 1976). The majority of these factors, such as the soldier's age or whether or not the soldier is receiving medication, are easy to define operationally. However, the psychosocial factor remains elusive with respect to its operational definition and the nature of its actual influence upon the soldier's susceptibility to the cold. Psychosocial factors include mental attitudes, motivations, and expectatations about performance on the battle field, all of which are more difficult to define operationally and to measure.

Psychosocial factors are also less obvious to the military commander, and consequently are more difficult to assess in terms of influence on performance. In spite of this, the military recognizes that there is a strong psychosocial influence on battle field behavior, and commanders are taught to be on the lookout for psychosocial signs which may degrade performance in the cold. For example, military training manuals on cold weather operations state that: "Cold injury tends to occur in passive, negativistic individuals" (Department of the Army, 1976, p. 3); the cold can "get you down and you become moody and blue" (Department of the Army, 1974, p. 4); and "Personality and motivation are probably the most significant psychological factors that determine a person's adaptability in severely cold environments. ...Psychological preparation for cold region assignments should include...development of a positive attitude toward the assignment" (Naval Health Sciences and Education Command, 1978, p. 9).

The influence of psychosocial factors on the solder's moods and on the nature and frequency of subjective reports of medical symptomatology during cold weather operations has not been the subject of intense scrutiny. The present study is an attempt to shed light on this issue. The goal is to determine if illness, psychological mood, or both are systematically related to either cold weather conditions, or days into training, or preexisting subjective factors, or all three. Specifically, the present investigation seeks to clarify the relative influences of (a) ambient temperature ($0^{\circ}F$ to $32^{\circ}F$), (b) number of days into outdoor training, and (c) three preexisting subjective judgments (self-perception of usual stress level, self-perception of relative warmth in cold weather, and self-expectations of like or dislike for an upcoming three-day outdoor field training exercise (FTX)) on psychological mood and subjective report of medical symptoms.

Method

Subjects

The subject population consisted of 107 males who volunteered to participate in eight days of winter training at the Vermont Army National Guard Mountaineering School in northern Vermont. The participants were active duty and reserve personnel representing the Army National Guard, the Army, the Navy, and the Marine Corps. Training was conducted during two separate eight-day phases; of the 107 male soldiers, 52 participated during Phase I and 55 participated during Phase II. During the eight days of training in the cold,

the soldiers learned military tactics for operations in mountainous terrain. The subjects were administered questionnaires or rating scales 33 times: a background questionnaire was administered during the first day, and the Profile of Mood States (POMS) (McNair, Lorr, & Droppelman, 1981) rating scale and the Environmental Symptoms Questionnaire (ESQ) (Kobrick & Sampson, 1979; Sampson & Kobrick, 1980) were each administered twice daily (morning and evening, for a total of 16 administrations each). Eight of the 107 soldiers were non-Caucasian, and their responses were excluded from these analyses because of other literature suggesting the possibility of racial differences in susceptibility to cold-related injuries (Hamlet, 1987; Hanson & Goldman, 1969). Fifty-nine (60 percent) of the remaining 99 soldiers had no missing data on any of the 33 administrations. These 59 soldiers are the subject of the data analysis.

A comparison of the 59 participants having no missing information with the 40 participants having some missing information revealed no differences between the two groups (Table 1). The 59 soldiers in the data analysis had a mean age of 30 years, a mean height of 5 foot 10 inches, and a mean weight of 172 pounds. Most (52 percent) were currently married but many (36 percent) had never married, nearly half (48 percent) did not have formal education beyond high school while nearly half (52 percent) did. Some used tobacco products (29 percent current smokers and 14 percent current chewers). The participants were in the service an average of nine years and were predominantly in the ranks of E4-E6 (42 percent); 19 percent were officers.

Measures

As part of a 36-item background questionnaire, each participant was asked to make three subjective self-ratings (Table 2): (a) "Indicate the current amount of stress in your life: 1=no stress, 2=occasional stress, 3=frequent stress, and 4=constant stress"; (b) "Compared to others around you, in a cool or a cold environment, how do you generally feel: 1=colder than others, 2=about the same as others, and 3=warmer than others"; and (c) "Rate how much you think you are going to like living in the field during this upcoming exercise: 1=I will like it very much, 2=I will like it somewhat, 3=I will neither like it nor dislike it, 4=I will dislike it somewhat, and 5=I will dislike it very much".

The POMS and the ESQ were completed twice a day by participants, each time providing subjective ratings of feelings experienced during the previous 12 hours. The POMS is a pencil and paper rating scale of 65 items assessing six mood states: tension, depression, anger, vigor, fatigue, and confusion (McNair, Lorr, & Droppelman, 1981). The 65 items of the POMS are presented in Tables 3 and 4. The ESQ is a pencil and paper rating scale of 68 items developed at the US Army Research Institute of Environmental Medicine which obtains reports of frequency of complaints of medical symptomatology such as feeling chilly, feeling weak, feeling cold hands, etc. (Kobrick & Sampson, 1979; Sampson & Kobrick, 1980). The 68 items of the ESQ are presented in Tables 5 and 6. For this analysis, elements of the ESQ were grouped into an additive scale for each of the 14 domains: cold discomfort, heat discomfort, head discomfort, muscle aches, fatigue, gastrointestinal discomfort, hearing discomfort, vision discomfort, nasal discomfort, cardiopulmonary discomfort,

Table 1. Comparison of participants with complete information and participants with incomplete information

Characteristics	Complete Information	Incomplete Information	Probability of Significance Of Difference
(n)	(59)	(40)	
Age (mean in years)	30.4	29.6	.637[a]
(minimum-maximum)	20-46	20-43	
Height (inches)	70.0	70.2	.766[a]
Weight (pounds)	171.6	172.2	.872[a]
Marital Status			
Never married	36%	30%	.580[b]
Currently married	52%	62%	
Previously married	12%	8%	
Education			
High School Graduate or less	48%	42%	.632[b]
Some College	30%	43%	
College Graduate	15%	10%	
Beyond College	7%	5%	
Smoking Status[c]			
Current Cigarette Smoker	29%	32%	.695[b]
Current Pipe or Cigar Smoker	2%	5%	.347[b]
Current Tobacco Chewer	14%	20%	.393[b]
Length of Time in Military Service (months)	107.9	90.0	.235[a]
Military Ranks			
E2-E3	19%	10%	.057[b]
E4-E6	42%	70%	
E7-E9	20%	12%	
O1-O5	19%	8%	

[a] Derived from the t statistic.
[b] Derived from the X^2 statistic.
[c] Separate chi-square analyses were conducted on each smoking category because of the possibility of the same person being represented in more than one row. In fact, this occurred only three times: one soldier (with complete information) was both a cigarette smoker and a tobacco chewer; one soldier (with incomplete information) smoked cigarettes and cigars and chewed tobacco; and one soldier (with incomplete information) smoked cigarettes and pipes.

Table 2. Self-reported subjective judgments of study sample (n=59)

Subjective Judgment	Percent Subjects Responding			
Current Amount of Stress in Your Life:				
	None	Occasional	Frequent	Constant
	5.1%	57.6%	28.8%	8.5%
Relative Warmth During Cold Weather:				
	Colder than Others	About Same as Others	Warmer than Others	
	15.3%	54.2%	30.5%	
Expectation for liking Outdoor Training (FTX):				
	Like Very Much	Like Somewhat	Neither Like Nor Dislike	Dislike Somewhat	Dislike Very Much
	40.7%	35.6%	13.6%	8.5%	1.7%

Table 3. Profile of Mood States (POMS) rating scale

Below is a list of words that describe feelings people have. Please read each one carefully. Then fill in ONE space under the answer to the right which best describes HOW YOU HAVE BEEN FEELING DURING THE PAST DAY/NIGHT.

	not at all 0	a little 1	moder-ately 2	quite a bit 3	extremely 4
1. Friendly . . .	[]	[]	[]	[]	[]
2. Tense . . .	[]	[]	[]	[]	[]
3. Angry . . .	[]	[]	[]	[]	[]
4. Worn out . . .	[]	[]	[]	[]	[]
5. Unhappy . . .	[]	[]	[]	[]	[]
6. Clear-headed . .	[]	[]	[]	[]	[]
7. Lively . . .	[]	[]	[]	[]	[]
8. Confused . . .	[]	[]	[]	[]	[]
9. Sorry for things done	[]	[]	[]	[]	[]
10. Shaky . . .	[]	[]	[]	[]	[]
11. Listless . . .	[]	[]	[]	[]	[]
12. Peeved . . .	[]	[]	[]	[]	[]
13. Considerate . .	[]	[]	[]	[]	[]
14. Sad	[]	[]	[]	[]	[]
15. Active . . .	[]	[]	[]	[]	[]
16. On edge . . .	[]	[]	[]	[]	[]
17. Grouchy . . .	[]	[]	[]	[]	[]
18. Blue . . .	[]	[]	[]	[]	[]
19. Energetic. . .	[]	[]	[]	[]	[]
20. Panicky . . .	[]	[]	[]	[]	[]
21. Hopeless . . .	[]	[]	[]	[]	[]
22. Relaxed . . .	[]	[]	[]	[]	[]
23. Unworthy . . .	[]	[]	[]	[]	[]
24. Spiteful . . .	[]	[]	[]	[]	[]
25. Sympathetic . .	[]	[]	[]	[]	[]
26. Uneasy . . .	[]	[]	[]	[]	[]
27. Restless . . .	[]	[]	[]	[]	[]
28. Unable to concentrate	[]	[]	[]	[]	[]
29. Fatigued . . .	[]	[]	[]	[]	[]
30. Helpful . . .	[]	[]	[]	[]	[]
31. Annoyed . . .	[]	[]	[]	[]	[]
32. Discouraged . .	[]	[]	[]	[]	[]

(POMS scale continued in Table 4.)

Table 4. Profile of Mood States (POMS) rating scale (continued)

Below is a list of words that describe feelings people have. Please read each one carefully. Then fill in ONE space under the answer to the right which best describes HOW YOU HAVE BEEN FEELING DURING THE PAST DAY/NIGHT.

	not at all 0	a little 1	moder-ately 2	quite a bit 3	extremely 4
33. Resentful . .	[]	[]	[]	[]	[]
34. Nervous . . .	[]	[]	[]	[]	[]
35. Lonely . . .	[]	[]	[]	[]	[]
36. Miserable. . .	[]	[]	[]	[]	[]
37. Muddled . . .	[]	[]	[]	[]	[]
38. Cheerful . . .	[]	[]	[]	[]	[]
39. Bitter . . .	[]	[]	[]	[]	[]
40. Exhausted. . .	[]	[]	[]	[]	[]
41. Anxious . . .	[]	[]	[]	[]	[]
42. Ready to fight. .	[]	[]	[]	[]	[]
43. Good natured . .	[]	[]	[]	[]	[]
44. Gloomy . . .	[]	[]	[]	[]	[]
45. Desperate. . .	[]	[]	[]	[]	[]
46. Sluggish . . .	[]	[]	[]	[]	[]
47. Rebellious . .	[]	[]	[]	[]	[]
48. Helpless . . .	[]	[]	[]	[]	[]
49. Weary . . .	[]	[]	[]	[]	[]
50. Bewildered . .	[]	[]	[]	[]	[]
51. Alert . . .	[]	[]	[]	[]	[]
52. Deceived . . .	[]	[]	[]	[]	[]
53. Furious . . .	[]	[]	[]	[]	[]
54. Efficient. . .	[]	[]	[]	[]	[]
55. Trusting . . .	[]	[]	[]	[]	[]
56. Full of pep . .	[]	[]	[]	[]	[]
57. Bad-tempered . .	[]	[]	[]	[]	[]
58. Worthless . .	[]	[]	[]	[]	[]
59. Forgetful. . .	[]	[]	[]	[]	[]
60. Carefree . . .	[]	[]	[]	[]	[]
61. Terrified. . .	[]	[]	[]	[]	[]
62. Guilty . . .	[]	[]	[]	[]	[]
63. Vigorous . . .	[]	[]	[]	[]	[]
64. Uncertain about things	[]	[]	[]	[]	[]
65. Bushed . . .	[]	[]	[]	[]	[]

Table 5. USARIEM Environmental Symptoms Questionnaire (ESQ)

Circle the number of each item to correspond to HOW YOU HAVE BEEN FEELING DURING THE PAST DAY/NIGHT. PLEASE ANSWER EVERY ITEM. If you did not have the symptom, circle zero (NOT AT ALL).

	not at all	slight	some-what	moder-ate	quite a bit	extreme
1. I felt lightheaded	0	1	2	3	4	5
2. I had a headache	0	1	2	3	4	5
3. I felt sinus pressure	0	1	2	3	4	5
4. I felt dizzy	0	1	2	3	4	5
5. I felt faint	0	1	2	3	4	5
6. My vision was dim	0	1	2	3	4	5
7. My coordination was off	0	1	2	3	4	5
8. I was short of breath	0	1	2	3	4	5
9. It was hard to breathe	0	1	2	3	4	5
10. It hurt to breathe	0	1	2	3	4	5
11. My heart was beating fast	0	1	2	3	4	5
12. My heart was pounding	0	1	2	3	4	5
13. I had a chest pain	0	1	2	3	4	5
14. I had chest pressure	0	1	2	3	4	5
15. My hands were shaking or trembling	0	1	2	3	4	5
16. I had a muscle cramp	0	1	2	3	4	5
17. I had stomach cramps	0	1	2	3	4	5
18. My muscles felt tight or stiff	0	1	2	3	4	5
19. I felt weak	0	1	2	3	4	5
20. My legs or feet ached	0	1	2	3	4	5
21. My hands, arms, or shoulders ached	0	1	2	3	4	5
22. My back ached	0	1	2	3	4	5
23. I had a stomach ache	0	1	2	3	4	5
24. I felt sick to my stomach	0	1	2	3	4	5
25. I had gas pressure	0	1	2	3	4	5
26. I had diarrhea	0	1	2	3	4	5
27. I felt constipated	0	1	2	3	4	5
28. I had to urinate <u>more</u> than usual	0	1	2	3	4	5
29. I had to urinate <u>less</u> than usual	0	1	2	3	4	5
30. I felt warm	0	1	2	3	4	5
31. I felt feverish	0	1	2	3	4	5
32. My feet were sweaty	0	1	2	3	4	5

(ESQ scale continued in Table 6.)

Table 6. USARIEM Environmental Symptoms Questionnaire (ESQ) (continued)

Circle the number of each item to correspond to HOW YOU HAVE BEEN FEELING DURING THE PAST DAY/NIGHT. PLEASE ANSWER EVERY ITEM. If you did not have the symptom, circle zero (NOT AT ALL).

	not at all	slight	some-what	moder-ate	quite a bit	extreme
33. I was sweating all over	0	1	2	3	4	5
34. My hands were cold	0	1	2	3	4	5
35. My feet were cold	0	1	2	3	4	5
36. I felt chilly	0	1	2	3	4	5
37. I was shivering	0	1	2	3	4	5
38. Parts of my body felt numb	0	1	2	3	4	5
39. My skin was burning or itchy	0	1	2	3	4	5
40. My eyes felt irritated	0	1	2	3	4	5
41. My vision was blurry	0	1	2	3	4	5
42. My ears felt blocked up	0	1	2	3	4	5
43. My ears ached	0	1	2	3	4	5
44. I couldn't hear well	0	1	2	3	4	5
45. My ears were ringing	0	1	2	3	4	5
46. My nose felt stuffed up	0	1	2	3	4	5
47. I had a runny nose	0	1	2	3	4	5
48. I had a nose bleed	0	1	2	3	4	5
49. My mouth was dry	0	1	2	3	4	5
50. My throat was sore	0	1	2	3	4	5
51. I was coughing.	0	1	2	3	4	5
52. I lost my appetite	0	1	2	3	4	5
53. I felt sick	0	1	2	3	4	5
54. I felt hungover	0	1	2	3	4	5
55. I was thirsty	0	1	2	3	4	5
56. I felt tired	0	1	2	3	4	5
57. I felt sleepy	0	1	2	3	4	5
58. I felt wide awake	0	1	2	3	4	5
59. My concentration was off.	0	1	2	3	4	5
60. I was more forgetful than usual	0	1	2	3	4	5
61. I felt worried or nervous	0	1	2	3	4	5
62. I felt irritable	0	1	2	3	4	5
63. I felt restless	0	1	2	3	4	5
64. I was bored	0	1	2	3	4	5
65. I felt depressed	0	1	2	3	4	5
66. I felt alert	0	1	2	3	4	5
67. I felt good	0	1	2	3	4	5
68. I was hungry	0	1	2	3	4	5

general bodily discomfort, psychologically negative feelings, psychologically positive feelings, and miscellaneous discomfort. These 14 domains are presented in Table 7 along with the numbers of the items in the ESQ which were added together to comprise each domain.

Weather conditions, including dry bulb temperature, were recorded continuously. Mean daytime temperature was used in subsequent analyses.

Context

Instruction took place both in indoor classrooms and outdoor settings. Near the end of the eight-day training, three days and two nights were devoted to an outdoor field training exercise (FTX). During the days prior to the FTX, the participants received lectures on strategies for preventing cold-related injuries and discomfort. In addition, appropriate cold weather clothing and equipment were supplied to each participant. Individual clothing included arctic boots, mittens, parka, cold weather trousers, and layers of shirts and undergarments.

The average daytime temperature during the three days of outdoor training was always above 0°F and below 32°F. The actual average daytime temperatures during the two Phases of training were: 2.7°, 4.9°, 7.0°, 8.8°, 28.8°, and 30.3°F. The three subjective judgments made prior to the FTX, the average daily temperature during the FTX, the number of days into the FTX, the self-reported moods (POMS) during the FTX, and the self-reported symptoms (ESQ) during the FTX are the focus of the present analysis. Only the soldiers' POMS and ESQ scores at the end of each day were used in the analysis. Concern with the validity of the nighttime scores necessitated their exclusion from the analysis.

Analytic Techniques

Ordinary least squares multiple regression analyses were used to analyze the data. Three self-reports of moods (POMS) and three self-reports of symptoms (ESQ) (both reflecting the three days of outdoor training) comprise the dependent variables used in the 20 regression analyses (one for each of the six domains of the POMS and one for each of the 14 domains of the ESQ). The resulting regression equations are based on 177 recordings: 59 soldiers providing ratings at the end of each of the three FTX days (with repeated measures on the three subjective judgments). Each of the 20 dependent variables is continuous. The five independent variables for each regression analysis are ambient temperature, the number of days into the outdoor training, and the three subjective judgments made prior to the FTX.

Table 7. The 14 Environmental Symptoms Questionnaire (ESQ) domains

ESQ Domain	Items Comprising Domain
1. Cold discomfort	(5 items: Nos. 34, 35, 36, 37, & 38)
2. Heat discomfort	(3 items: Nos. 31, 32 & 33)
3. Head discomfort	(4 items: Nos. 1, 2, 4, & 5)
4. Muscle aches	(5 items: Nos. 16, 18, 20, 21, & 22)
5. Fatigue	(3 items: Nos. 19, 56, & 57)
6. Gastrointestinal discomfort	(6 items: Nos. 17, 23, 24, 25, 26, & 27)
7. Hearing discomfort	(4 items: Nos. 42, 43, 44, & 45)
8. Vision discomfort	(3 items: Nos. 6, 40, & 41)
9. Nasal discomfort	(4 items: Nos. 3, 46, 47, & 48)
10. Cardiopulmonary discomfort	(7 items: Nos. 8, 9, 10, 11, 12, 13, & 14)
11. General bodily discomfort	(11 items: Nos. 15, 28, 29, 39, 49, 50, 51, 52, 53, 55, & 68)
12. Psychologically negative feelings	(5 items: Nos. 61, 62, 63, 64, & 65)
13. Psychologically positive feelings	(3 items: Nos. 58, 66, & 67)
14. Miscellaneous discomfort	(3 items: Nos. 7, 59, & 60)

NOTE: Two items of the ESQ were omitted from the domains (item Nos. 30 & 54).

Results

Tables 8, 9, 10, and 11 summarize the results of the multiple regression analyses on self-reported psychological mood and self-reported symptoms.

Determinants of Mood

Concerning the domains of mood labeled tension, depression, and anger, only one variable achieved statistical significance as a predictor: the individual's expectation of like or dislike of the outdoor training exercise (Table 8). Those whose expectation was dislike of the upcoming exercise reported significantly more tension, significantly more depression, and significantly more anger than those whose predisposition was to like the exercise.

The domains of vigor and confusion also were each predicted by one significant variable, self-reported stress. Those reporting lower levels of usual stress subsequently reported more vigor during the training, while those initially reporting higher levels of usual stress subsequently reported more confusion during the training.

The sixth psychological mood, fatigue, was significantly influenced by three predictors. More fatigue was reported as the training exercise progressed. Those who initially expected to dislike the exercise reported more fatigue. In addition, those who reported more stress in their daily lives reported more fatigue during the training.

Determinants of Symptoms

The regression analyses on the domains of discomfort from the ESQ are presented in Tables 9, 10, and 11. The variables significantly related to the ESQ fatigue domain are identical to those significantly related to POMS fatigue: the number of days into training, the initial expectations of disliking the outdoor training, and the more reported stress in daily life were each significant independent predictors of ESQ fatigue, while the regression model as a whole explained one-fifth of the variance (R^2 = .1960).

The ESQ domain of muscle discomfort (e.g. aches and pains) was significantly predicted by an expectation of disliking the outdoor training and by the number of days into the training. General bodily discomfort (such as lost appetite, thirsty, dry mouth, hands shaking, or a change in urinary frequency) was significantly influenced by days into training (more days, more discomfort) and by the subjective judgment that the individual is usually colder than others in a cold environment.

Both increased levels of self-assessed stress and more days into the outdoor training significantly influenced judgments of negative psychological mood like irritability or depression, while lower levels of self-assessed

Table 8. Ordinary least squares regression analysis of six psychological moods (n=177)

Predictor Variables	Psychological Moods[a]					
	Tension		Depression		Anger	
	Beta	p[b]	Beta	p	Beta	p
Ambient Temperature	0.0601		0.0334		0.0458	
Days into FTX	0.7231		0.7145		1.2119	
Subjective Judgments						
Stress[c]	0.2921		0.7002		0.9768	
Relative warmth[d]	0.7982		1.2653		1.7082	
Expectation for liking FTX[e]	0.9297	.02	1.5945	.00	1.6283	.01
R^2	.0642		.0903		.0838	

Predictor Variables	Psychological Moods[a]					
	Vigor		Fatigue		Confusion	
	Beta	p[b]	Beta	p	Beta	p
Ambient Temperature	0.0431		0.0732		0.0024	
Days into FTX	-0.8737		2.8185	.00	0.0079	
Subjective Judgments						
Stress[c]	-2.2530	.02	1.5451	.02	1.0083	.00
Relative warmth[d]	1.5221		0.9905		0.0964	
Expectation for liking FTX[e]	-0.1281		2.2332	.00	0.3348	
R^2	.0613		.2409		.0986	

[a] Measured by the POMS rating scale; a higher score indicates a stronger mood.
[b] Probability of significance of the association if $p \leq .05$.
[c] Self report of stress in everyday life; a high score indicates more stress.
[d] Self report of of feelings of warmth in a cold environment; a low score indicates colder than others a high score indicates warmer than others.
[e] Self report of expected like for FTX; a low score indicates like for the FTX, a high score indicates dislike.

Table 9. Ordinary least squares regression analysis of environmental discomfort symptoms (n=177)

Predictor Variables	Environmental Discomfort Symptoms[a]					
	Fatigue		Muscle Discomfort		Body Discomfort	
	Beta	p[b]	Beta	p	Beta	p
Ambient Temperature	0.0266		0.0025		-0.0547	
Days into FTX	1.2449	.00	1.7282	.00	1.3558	.01
Subjective Judgments						
Stress[c]	0.9037	.01	0.5217		0.2190	
Relative warmth[d]	-0.1399		-0.6678		-1.3413	.02
Expectation for liking FTX[e]	0.7626	.01	1.4687	.00	0.0798	
R^2	.1960		.1549		.1195	

Predictor Variables	Environmental Discomfort Symptoms[a]					
	Negative Mood		Positive Mood		Cold Discomfort	
	Beta	p[b]	Beta	p	Beta	p
Ambient Temperature	0.0399		0.0289		-0.0315	
Days into FTX	0.6221	.03	-0.2224		0.9677	
Subjective Judgments						
Stress[c]	0.6137	.03	-1.1803	.01	0.6370	
Relative warmth[d]	0.4561		0.4431		-0.2613	
Expectation for liking FTX[e]	0.2303		-0.1499		0.8513	
R^2	.0849		.0536		.0706	

[a] Measured by the ESQ; a higher score indicates more discomfort.
[b] Probability of significance of the association if $p \leq .05$.
[c] Self report of stress in everyday life; a high score indicates more stress.
[d] Self report of of feelings of warmth in a cold environment; a low score indicates colder than others a high score indicates warmer than others.
[e] Self report of expected like for FTX; a low score indicates like for the FTX, a high score indicates dislike.

Table 10. Ordinary least squares regression analysis of environmental discomfort symptoms (n=177) (continued)

Predictor Variables	Environmental Discomfort Symptoms[a]					
	Heat Discomfort		Nasal Discomfort		Head Discomfor	
	Beta	p[b]	Beta	p	Beta	p
Ambient Temperature	-0.0491	.04	-0.0194		-0.0110	
Days into FTX	-0.1578		0.5149		-0.0735	
Subjective Judgments						
Stress[c]	0.3785		0.2816		0.0795	
Relative warmth[d]	-0.5076		0.9017	.01	-0.1837	
Expectation for liking FTX[e]	0.3703		0.6967	.01	0.0168	
R^2	.0613		.0863		.0127	

Predictor Variables	Environmental Discomfort Symptoms[a]					
	Cardiopulmonary Discomfort		Gastrointestinal Discomfort		Vision Discomfort	
	Beta	p[b]	Beta	p	Beta	p
Ambient Temperature	0.0544		-0.0209		0.0168	.05
Days into FTX	1.2275	.00	-0.0125		0.1801	
Subjective Judgments						
Stress[c]	-0.4116		0.4134	.01	0.0574	
Relative warmth[d]	0.7491		0.0960		-0.1298	
Expectation for liking FTX[e]	0.5588		0.2155		-0.1787	.05
R^2	.0695		.0604		.0490	

[a] Measured by the ESQ; a higher score indicates more discomfort.
[b] Probability of significance of the association if $p \leq .05$.
[c] Self report of stress in everyday life; a high score indicates more stress
[d] Self report of of feelings of warmth in a cold environment; a low score indicates colder than others a high score indicates warmer than others.
[e] Self report of expected like for FTX; a low score indicates like for the FTX, a high score indicates dislike.

Table 11. Ordinary least squares regression analysis of environmental discomfort symptoms (n=177) (continued)

Predictor Variables	Environmental Discomfort Symptoms[a]			
	Hearing Discomfort		Miscellaneous Discomfort	
	Beta	p[b]	Beta	p
Ambient Temperature	-0.0098		-0.0116	
Days into FTX	-0.0233		0.0499	
Subjective Judgments				
Stress[c]	-0.0658		0.5897	.00
Relative warmth[d]	-0.0523		-0.2640	
Expectation for liking FTX[e]	0.1375	.04	-0.1297	
R^2	.0486		.0878	

[a] Measured by the ESQ; a higher score indicates more discomfort.
[b] Probability of significance of the association if $p \leq .05$.
[c] Self report of stress in everyday life; a high score indicates more stress.
[d] Self report of of feelings of warmth in a cold environment; a low score indicates colder than others a high score indicates warmer than others.
[e] Self report of expected like for FTX; a low score indicates like for the FTX, a high score indicates dislike.

stress significantly influenced expressions of positive psychological mood such as feeling good or feeling alert.

Expressions of cold discomfort such as cold hands, cold feet, being chilly, shivering, or feeling numbness were not significantly influenced by any of the five factors in the model, although collectively the predictors accounted for 7 percent of the variance (R^2=.0706).

Heat discomfort, (for example, sweating all over) was inversely influenced by the ambient temperature. Lower temperatures were significantly related to more heat discomfort.

Nasal discomfort, including sinus pressure or runny nose, was independently and significantly predicted by expectations of disliking the outdoor training and by the judgment of usually feeling warmer than other people in cold environments. None of the predictors significantly predicted reports of head discomfort such as headache.

Cardiopulmonary discomforts such as chest pain and breathing hard were influenced only by the number of days into the training: the more days into the FTX the more discomfort experienced.

Gastrointestinal complaints such as stomach aches, gas pressure, and bowel irregularity were influenced only by self-perceived stress: the more stress the more gastrointestinal discomfort.

Increased visual discomforts such as irritated eyes or blurry vision were inversely related to expectations of liking the outdoor training: the more one expected to dislike the outdoor training the less visual discomfort would be reported by the soldier while on the FTX.

The increased frequency of hearing discomforts (ears ringing or feeling blocked) was significantly related to the expectation of disliking the outdoor training. Miscellaneous discomforts, such as problems with coordination or concentration, were significantly associated with reports of more stress in one's everyday life.

The Relative Role of Predictor Variables

Reviewing the regression analyses in Tables 6, 7, 8 and 9 from the perspective of the potential predictor variables, we note that ambient temperature was significantly related to only two of 14 physical symptom domains (lower temperatures with more heat discomfort and higher temperatures with more vision discomfort), and did not achieve statistical significance as a predictor of participants' moods.

The number of days into outdoor training significantly influenced six domains: as the training went on, there were more reports of POMS fatigue, ESQ fatigue, muscle discomfort, general bodily discomfort, negative psychological mood, and cardiopulmonary discomfort.

The soldier's subjective judgments exhibited variable patterns. One's

judgment of the usual level of stress was predictive of eight of the 20 domains. More stress was significantly associated with more confusion, less vigor, more fatigue (POMS and ESQ), more negative psychological mood, less positive psychological mood, more GI discomfort, and more miscellaneous discomfort. One's judgment of whether one is usually warm, the same, or colder than others in a cold environment was significantly related to only two outcomes: usually feeling colder was associated with general bodily discomfort while usually feeling warmer was associated with more nasal discomfort. One's expectation of liking or disliking the outdoor training also was significantly related to nearly half the outcomes (nine of 20). Those expecting to dislike the training reported more tension, more depression, more anger, more fatigue (POMS and ESQ), more muscle discomfort, more nasal discomfort, more hearing discomfort, and less vision discomfort.

Discussion

In the context of a three-day outdoor winter training exercise of moderate activity level, with average daytime ambient temperatures below freezing but above 0°F, with appropriate winter field clothing and instruction on the prevention of cold-related injuries, it was possible to develop multiple regression models to determine the independent influence of five predictor variables. On self-reported domains of psychological mood and environment-related discomforts, these five predictors are: temperature, days into training, and three subjective judgments (usual stress level, rating of warmth relative to others in cold environments, and expectation of liking/disliking the outdoor training).

Ambient Temperature

Ambient temperature was not a significant independent predictor for 18 of the 20 domains. Its only significant influence was with heat discomfort (the lower temperatures were associated with more reports of heat discomfort such as sweating) and vision discomfort (the warmer winter weather was associated with blurred vision or irritated eyes). It is plausible that some of the participants in fact overdressed for the outdoor winter training, particularly on the colder days, and then could not dissipate the extra heat generated from their activities which produced the heat discomfort symptoms. The vision discomfort might have been the result of facial perspiration irritating the eyes and blurring vision.

Days Into Training

The number of days into training was significantly related to each of the domains which assess some aspect of physical tiredness (i.e., POMS fatigue, ESQ fatigue, muscle discomfort, and general bodily discomfort). This pattern of findings suggests that the level of activity required by the outdoor training phase exceeded the participants' level of usual activity, and consequently produced general physical fatigue. In fact, one of the objectives of the outdoor training was to require a level of physical challenge beyond the usual level of the participants. Apparently this objective was met.

Soldier Attitudes and Expectations

The associations of the soldiers' initial attitudes and expectations suggest several interesting interpretations. The individual's judgment of his own level of usual stress was an important predictor of subsequent moods and reactions during outdoor winter training. Those who reported higher stress in their daily lives were found to report more confusion, less vigor, more fatigue (both POMS and ESQ), more negative psychological feelings, and less positive psychological feelings during the subsequent outdoor activities. This pattern of reports during training, all influenced significantly by the level of stress the individual brought to the training, suggests a subgroup of individuals who can be identified in advance as perhaps requiring specialized attention during training exercises such this. In addition, and somewhat expected, those with higher levels of usual stress also reported more gastrointestinal discomforts.

The subjective judgment of whether one is usually colder, about the same, or warmer than others in a cold environment demonstrated very few significant associations with subsequent reports, and a pattern is difficult to discern. Those who judge they are usually colder than others reported more general bodily discomforts, while those who judge they are usually warmer than others reported more nasal discomfort.

The subjective judgment of the degree the individual expected to like or dislike the outdoor training was an important predictor for nine of the 20 subsequent moods and symptoms. Those expecting to dislike the outdoor training subsequently reported more tension, more depression, more anger, more fatigue (both POMS and ESQ), more muscle discomfort, more nasal discomfort, more hearing discomfort, but less vision discomfort. This pattern strongly supports the interpretation that expectations and outcomes are intertwined. These individuals might have had accurate self-knowledge based on prior experience to predict accurately their own negative reactions, or they might have "programmed" themselves to have negative reactions and produced self-fulfilling prophecies. It is clear that the individual's expectancy was demonstrated to be a powerful and independent predictor of subsequent moods and symptoms.

Reports of cold-related discomfort were not significantly related to any of the five potential predictor variables. This suggests that, regardless of the participants' initial attitudes and expectations, the clothing, instruction on cold injury prevention, level of activity, and duration of the exercise were effective and appropriate for this range of ambient temperature.

Generalizing the Findings

There are limits to the generalizability of these findings that merit attention. First, the findings were produced in the context of a mild winter temperature range: below freezing but above zero. Second, the participants had a full supply of appropriate arctic clothing and state-of-the-art instruction on the prevention of cold-related injuries. Third, the length of outdoor training was only three days. Therefore, it is unwarranted to generalize these findings to temperatures below $0^{\circ}F$, to individuals without

appropriate clothing or instruction on the prevention of cold-related injuries, or to longer periods of exposure to the cold outdoors.

Nevertheless, within this ambient temperature range, with this number of days, and for those with adequate instruction and clothing, we find expected associations of days-into-training with reports of physical fatigue. We also find important independent associations between the individual's usual level of stress and outcome on the FTX (more perceived stress in one's everyday life is associated with more fatigue, confusion, and gastrointestinal discomfort on the FTX), and between the individual's expectation of liking or disliking the FTX and outcome on the FTX (expecting to dislike the FTX is associated with tension, depression, anger, fatigue, and bodily discomforts on the FTX).

The relative lack of association of ambient temperature with moods or symptoms was determined to be due to the fact that the micro-environment of the soldier was relatively stable. That is, even though the air temperature of the surrounding environment was below freezing, the soldier was suitably clothed and thus protected from such an environment. Suitable winter clothing, combined with the vigorous exercise required by the FTX, resulted not in symptoms indicative of a cold soldier but rather symptoms of a soldier who actually is relatively warm and adapted to his surroundings. The low incidence of cold-related discomfort suggests that the clothing, instruction in cold-injury prevention, and level of activity during the FTX were appropriate for this range of ambient temperature (0° to 32°F). Further research in colder environments (below 0°F), where it is more difficult for the soldier to remain warm, may show a significant influence of ambient temperature on cold-related discomfort.

Conclusion

During a three-day military training exercise in cold mountainous terrain, it was found that:

(a) the more the soldiers perceived stress in their everyday lives outside of the FTX, the more fatigued, confused, and uncomfortable they were when on the FTX;

(b) the more the soldiers expected to dislike the FTX, as measured prior to the FTX, the more tense, depressed, angry, fatigued, and physically uncomfortable they were when on the FTX;

(c) the longer the soldiers were on the FTX the more fatigued they became; and

(d) due to appropriate training, exercise, and the use of cold weather clothing, ambient temperature (in the 0° to 32°F range) was found to have little influence on the soldiers' moods and physical symptoms.

This study suggests that a subgroup of individuals can be identified in advance of a cold weather FTX who are likely to display symptoms of negative mood (tension, depression, anger, and confusion) and symptoms of poor physical well-being (fatigue, muscle discomfort, and nasal discomfort) when they are on

the FTX. These individuals are likely to have more stress in their everyday lives, are likely to expect that they will dislike being on the particular upcoming FTX, or both.

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