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PREDICTORS OF COLD WEATHER HEALTH BEHAVIORS[†]

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SUMMARY

Military personnel frequently fail to follow cold weather health guidelines. For example, typical liquid consumption in the cold averages half the recommended amount. Failure to comply with guidelines contributes to health problems in the cold, so it would be desirable to improve the pattern of behaviors. This report presents the results of an initial study to identify predictors of liquid consumption, food intake, and foot care in the cold. Identifying these predictors can point to leverage points for programs to modify these behaviors when appropriate.

Male Marine Corps volunteers (n = 161) were studied during cold weather training. Prior to a field exercise, participants completed questionnaires describing (a) personal characteristics known to be related to the occurrence of cold injuries, (b) beliefs about the severity of illnesses when they occur, personal susceptibility to illness, and the efficacy of prescribed behaviors for preventing illness, (c) beliefs about control of health outcomes by personal actions, by the actions of health professionals, and by chance factors, and (d) personal health habits. Following the exercise, participants completed a questionnaire describing their liquid intake, food intake, and foot care. This questionnaire also included descriptions of mood during the exercise, the mental and physical workload, and the perceived quality of leadership, climatic conditions, and general evaluations of the quality of the training program and personal and unit performance during the exercise. These last 3 items were combined to provide a measure of morale during the exercise.

Pearson product moment correlations, multiple regression, and subgroup moderator analyses identified significant correlates of the the 3 health behaviors. Findings were:

(a) Lower liquid consumption was predicted by poorer preventive health habits, but the association accounted for only 2.3% of the individual differences in water intake.

(b) Food intake was significantly related to 10 of 27 predictors. Stepwise regression produced a 5-predictor equation which explained 22.1% of the variance in food intake. Low intake was associated with being older, depressed mood, higher ratings of illness severity and illness susceptibility and lower ratings of the efficacy of behavior in avoiding illness.

(c) Foot care was significantly related to 6 of 27 predictors. Stepwise regression produced a 3-predictor equation accounting for 15.1% of the variance. Poor foot care was associated with lower ratings of illness severity and effectiveness of potential preventive behaviors, and lack of a prior cold injury.

The findings demonstrated psychological and behavioral factors can predict cold weather health behaviors. General health habits and beliefs about susceptibility to illness, severity of illness, and the efficacy of specific behaviors as means of avoiding illness provide a core of predictors which can be expanded in future studies to improve the prediction of cold weather health behaviors. Successful extension of this initial study holds promise for developing predictive models of cold weather health behavior that identify individuals at high risk in the cold and specify bases for programs to reduce that risk.

INTRODUCTION

Behavior patterns which adversely affect health are commonplace in cold weather training (1-3). Programs to modify these patterns will be ineffective if they are not focused on critical determinants of the target behaviors. This report presents an initial study of predictors of 3 behavioral determinants of well-being in the cold, liquid consumption, food intake, and foot care (4-8). Identifying predictors of these behaviors can point to potential leverage points for programs to modify these behaviors.

Health beliefs which may adversely affect cold weather health behaviors were a major study focus because these beliefs can be modified by educational programs if appropriate. The Health Belief Model (9,10) and a multidimensional health locus of control model (11,12) specified the beliefs to be studied. The Health Belief Model predicts that appropriate health behaviors will be more common among people who believe they are susceptible to illness which will have significant consequences if it occurs but which can be avoided by proper preventive action. The health locus of control model predicts that appropriate health behaviors will be more common among people who believe in personal control of health outcomes, high effectiveness of health professionals, and limited impact of chance events on health outcomes.

Health habits, situational reactions, and demographic characteristics were also studied to test hypotheses linking them to maladaptive behavior patterns. The inclusion of health habits permitted a test of the hypothesis that cold weather health behavior is an extension of old habits to a new setting. Situational reactions, including depressed mood, low morale, and physical fatigue, were studied because prior research and observational reports have suggested that maladaptive behavior is caused by these acute reactions to the demands of working in a cold environment (1,4-8). Finally, demographic attributes were among the potential predictors of cold weather health behaviors because age, education, rank, and race are related to the risk of cold injuries (13-15). Cold injuries are preventable if health protection guidelines are followed (1,6), so these relationships suggest a connection between demographics and failure to follow preventive guidelines.

This study also explored the possible influence of habits and situational reactions on health belief-health behavior associations. Recent research indi-

cates that attitude-behavior associations are enhanced when a person monitors his or her behavior (16) and diminished when there is extensive analysis of the reasons for behavior (17). Strong habits imply relatively automatized behavior which would involve reduced monitoring and analysis. Situational factors would have similar implications if ongoing tasks or emotional reactions absorb cognitive resources, rendering them unavailable for monitoring and/or analysis. Situational factors also might serve as cues that proper preventive care was required, thus leading the individual to act on his or her beliefs with the result that belief-behavior associations increase (9,10).

The foregoing arguments imply that habits and situational reactions potentially can enhance belief-behavior associations, diminish them, or have no net effect even if the hypothesized influences were correct. If habits and situational factors affect monitoring more than analysis, belief-behavior associations would be weaker among those with strong habits or strong situational reactions. If the reverse were true, the associations would be enhanced. If the two effects were equal, no net influence on the belief-behavior associations would be noted. Because there was no basis for determining in advance which effect would predominate or even whether the hypothesized effects on monitoring and analysis occur in the cold, no specific predictions were made concerning the outcome of the analyses undertaken to explore these possibilities.

METHOD

Sample

Marine Corps volunteers (n = 190) from 3 rifle companies participated in the study after giving informed consent. Subsequently, 161 men completed the Field Behavior Questionnaire (FBQ) which provided the behavioral data for this report. Of the remaining 29 men, 26 could not return for their testing session because a change in plans required them to leave prior to the scheduled data collection. Thus, the dropout rate after the consent session was 2.1%. The demographic characteristics of the sample are shown in Table 1.

Study Setting and Research Design

The study took place during cold weather training at the Marine Corps Mountain Warfare Training Center (MWTC), Bridgeport, CA. The MWTC facilities are approximately 6500 feet above sea level with training activities carried out up to altitudes of approximately 8000 feet. Precise meteorological data were not avail-

TABLE 1

DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS

CHARACTERISTIC	CATEGORY	PERCENT OF SAMPLE
AGE (in years)	18	5.2%
	19	29.4%
	20	22.2%
	21	15.7%
	22	11.1%
	23 or more	16.5%
RACE	White	65.8%
	Black	19.5%
	Hispanic	9.6%
	Other	4.9%
SCHOOLING	Less than 12 years	15.8%
	12 years	79.6%
	More than 12 years	4.6%
RANK	E-1	5.9%
	E-2	16.3%
	E-3	57.5%
	E-4	15.7%
	E-5/E-6	4.6%
LENGTH OF SERVICE	Less than 1 year	10.0%
	1 - 2 years	26.0%
	2 - 3 years	38.8%
	3 - 4 years	15.3%
	4 or more years	10.0%

NOTES: Percentages were based on responses of individuals completing the question. Missing data ranged from 8 (5.0% of total sample) to 15 (9.3% of total sample). Tabled percentages may not sum to 100% in all cases due to rounding.

able for the period of study, but the temperature generally was above freezing during the daylight hours with occasional wind and snow squalls.

The training program consisted of two phases. Phase I, which lasted 10 days, taught basic cold weather survival skills. Phase II applied the skills and knowledge acquired in Phase I to tactical maneuvers. Four field training exercises during Phase II provided experience in planning and executing tactical maneuvers in the cold. Each field exercise lasted 3 to 4 days with a 16- to 44-hour rest and recovery period between exercises.

Data were collected during Phase II after the first, second, and fourth field exercises. Three platoons were sampled from 2 of the 3 rifle companies. In each of these companies, a different platoon provided data after each exercise. Two platoons from the third rifle company provided data, one after the first field exercise and one after the second. The third company departed almost immediately after the last field exercise, so the planned data collection for that company could not be completed.

Cold Weather Health Behaviors

A Field Behavior Questionnaire (FBQ; Appendix A) provided self-reports of liquid consumption, the frequency of consuming each major component of the field ration, i.e., "Meal, Ready-to-eat" (hereafter, MRE), and the frequency of 10 hygiene behaviors, including 5 specific foot care behaviors. These behaviors were selected for study because field manuals describe them as means of ensuring good health in the cold (4-8). The FBQ also contained items concerning personally-purchased food taken to the field, between meal snacks, and vitamin supplements.

A prior report described the field behaviors in detail (3). In the present report, food intake and foot care data were transformed into composites representing overall behavior patterns. This scoring change increases the reliability of the dependent variables, minimizes opportunities to capitalize on chance by reducing the number of analyses performed, and simplifies presentation of the results. The general patterns of food intake and foot care were computed as follows:

(a) Responses to the MRE and foot care items were transformed into estimated frequency per day assuming a 3-day exercise (e.g., 3 times a day = 3; once during the exercise = .33).

(b) The transformed foot care activity scores were summed to indicate the average number of foot care activities per day. Having feet checked by the corpsman was not included because less than 1% of the men reported it.

(c) Because the various MRE components differ widely in nutritional makeup (e.g., an entree versus a candy bar), the frequency of consuming each MRE component was multiplied by the estimated number of calories in that component. The estimated number of calories in a component was the average from nutritional analyses of all similar components. For example, the value used for the entrees was the average for the 12 different entrees that are found in MREs. Data regarding the nutritional content of the MREs were obtained from the organization which designed these meals. These values were summed for all of the MRE components to produce a total calorie intake estimate. Calories were selected as the nutritional criterion because estimated calorie requirements are established for the cold (18-20), and calorie intake recommendations were taught in the training.

Personal History Variables

A Background Questionnaire (BQ) provided self-reports of personal characteristics and previous experiences. Age, length of service, rank, education, race, prior cold weather experience, number of previous cold injuries, and smoking habits were used in the analyses to predict health behaviors. These variables were selected for study on the basis of prior evidence linking them to cold injuries (13-15). General health was rated on a scale from "Much below average" (scored 1) to "Much better than average" (scored 5).

Health Beliefs

Perceived susceptibility to illness was measured by ratings of the probability of experiencing each of 11 health problems during cold weather training. The rating scale ranged from "Never happen" (scored 0) to "Absolutely certain" (scored 100). The health problems were dehydration, frostbite, trenchfoot, heat exhaustion, constipation, common cold, flu, sprain or strain of leg, ankle, or foot, sprain or strain of shoulder or back, skin rash or irritation, and diarrhea. These health problems are common in cold weather and/or represent problems specific to cold exposure.

Perceived severity of illness was measured by ratings of how serious each health problem would be if it occurred. Ratings were made on a scale from "Not serious at all" (scored 1) to "Extremely serious" (scored 9).

The perceived efficacy of health protective behaviors in the cold was assessed by obtaining ratings of the impact of each of 8 behaviors on the probability of becoming ill. Ratings of how much each behavior reduced the risk of illness could range from "Not at all" (scored 1) to "Completely" (scored 5). Ratings were obtained for dressing properly, drinking enough water, eating properly, taking care of the feet, taking extra vitamins, washing/shaving regularly, changing clothes regularly, and getting enough sleep. Except for the vitamin and sleep questions, these behaviors were recommended to the men to maintain health and comfort in the field (4,5). The vitamin and sleep questions were added because marines going through training reported these as concerns regarding their well-being in the cold.

Health locus of control belief measures consisted of Lau and Ware's (11) scales for Personal control, Provider control (i.e., beliefs about the effectiveness of health care professionals' actions for ensuring health or rapid recovery from illness), and Chance control of health outcomes. The scales had reasonable internal consistency estimates in our sample and evidence of validity from prior research (11). A fourth scale, General Health Threat, was unreliable in our sample (alpha = .28). Exploratory analyses with this scale produced nonsignificant results which were not considered further because they may have arisen from low scale reliability.

Health Habits

The frequency of 37 health behaviors was measured by asking respondents to indicate those which they "always or nearly always" did. The behaviors were re-

duced to 4 composites based on multivariate analyses and comparisons to prior research (21). Health Hazards Avoidance included actions that avoid either environmental hazards or situations which might overtax the body's adaptive capacities. Risk Taking included actions which increase the risk of accidents, particularly those associated with risky patterns of automobile use. Preventive Habits included the use of the services of health professionals and actions taken to minimize the likelihood of and/or effects of accidents. Health Hygiene consisted of behaviors such as watching one's weight, brushing one's teeth, exercising, and not smoking. These behaviors are presumed to represent attempts to maintain current health and/or achieve even better health. The specific behaviors comprising each category are given in Appendix A.

Situational Perceptions and Reactions

Borg's (22) effort scale measured subjective work load. Separate items were included for physical and mental work load. A 14-item questionnaire was developed to assess perceptions of the physical and social environment and morale (Appendix A). The items were derived from cold weather manuals (4-8), field observations, and interviews. Exploratory factor analysis reduced these items to 3 scales. "Situational Factors" assessed perceptions of the climate and work requirements during the exercise. "Leadership" assessed perceptions of planning, organization, and communication during the exercise. "Evaluation" assessed the perceived utility and interest value of the training and perceived personal and unit performance effectiveness. This last scale provided an approximation to the complex concept of morale. The Mood Questionnaire (23) measured activity level, happiness, fatigue, depression, fear (or anxiety), and anger to evaluate emotional responses to the situation.

Analysis Procedures

Pearson product moment correlations were computed to assess the pairwise associations between each cold weather behavior and each of the potential predictors. A stepwise regression then was carried out for each behavior to reduce the full set of potential predictors to a subset. Each predictor in the subset contributed significantly to the prediction of the dependent variable ($p < .05$, 1-tailed) independently of the other predictors in the subset. The resulting multiple correlation coefficient provided an overall assessment of the predictive power of the set of predictors.

Tests for possible interactions between the health behavior predictors included: (a) A 2x2x2 analysis of variance (ANOVA) based on high-low splits for Susceptibility, Severity, and Efficacy used to test the Health Belief Model prediction that positive field behavior patterns would be more common among those with high scores on two or more of these variables. (b) A 2x2x2 ANOVA based on high-low splits for Personal control, Provider control, and Chance control used to test the hypothesis that positive health behaviors would occur more frequently when high Personal control, high Provider control, and low Chance control occurred in combination than would be expected based on the associations for the individual predictors. (c) Four subgroup moderator analyses (cf., 24) with classifications based on Depression, Fatigue, Evaluation, and Situational Factors explored the possibility that health belief-health behavior associations would be modified by these situation-specific factors. (d) Four subgroup moderator analyses with classifications based on the health habit measures explored the possibility that habit strength would affect health belief-health behavior associations.

For each subgroup moderator analysis, the subgroups were defined by splitting the sample into thirds as nearly as possible based on the score distribution for the potential moderator. The procedure began with a multivariate test of parallelism of regression lines within the subgroups, followed by univariate tests for moderators when the overall effect was significant at the 10% level (25). A lenient criterion for the multivariate test was employed to minimize the likelihood that an important moderator effect limited to a single health belief would be lost by combining the effects for that belief with nonsignificant trends for other beliefs. This approach was appropriate because the hypothesis tests were exploratory.

RESULTS

Liquid Consumption

Only Preventive Habits significantly predicted liquid consumption (Table 2). The total variance explained was 2.2%.

Food Intake

Ten of 27 correlations were significant for food intake (Table 2). Stepwise regression reduced this initial set of significant correlates to a 5-predictor equation which included the Health Belief Model scales for Susceptibility, Sever-

TABLE 2

SIGNIFICANT CORRELATES OF FIELD BEHAVIORS

	r	SIGNIFICANCE	b	SIGNIFICANCE
LIQUID CONSUMPTION				
Preventive Habits	.15	.042	0.10	.042
	Multiple R = .15, R^2 = .022, Intercept = 2.64			
FOOD INTAKE				
Chance Locus of Control	−.15	.048		
Susceptibility	−.25*	.002	−11.46	.024
Severity	−.18*	.030	−125.24	.037
Efficacy	.11	.101	338.48	.006
Length of Service	−.17	.024		
Age	−.22	.005	−89.75	.001
Anger	−.14	.040		
Depression	−.22	.004	−271.12	.031
Fatigue	−.16	.029		
Mental Effort	−.14	.047		
	Multiple R = .47, R^2 = .221, Intercept = 4672.55			
FOOT CARE				
Health Hazard Avoidance	.20	.009		
Preventive Habits	.16	.026		
Health Hygiene	.23	.003	.12	.048
Severity	.16	.025		
Efficacy	.30	.001	.72	.001
Prior Cold Injury	.16*	.026	.60	.023
	Multiple R = .39, R^2 = .151, Intercept = −.19			

NOTES: One-tailed significance levels have been reported because these were appropriate for those associations which conformed to the original directional hypotheses. Exceptions are noted in the table (*).

ity, and Efficacy. Higher perceived susceptibility to illness and severity of illness were related to lower food intake. These associations were contrary to Health Belief Model predictions. In contrast, higher perceived efficacy of health behaviors for preventing illness was related to higher reported food intake as predicted by the model. The regression equation also included depressed mood as a predictor of lower food intake as predicted from prior cold weather observations. Finally, the regression equation incorporated age as a predictor with older men eating less. Overall, the regression equation accounted for 22.1% of the variance in food intake.

Foot Care

Six of 27 correlations were significant for foot care. Health habit measures (3 of 4) and Health Belief Model measures (2 of 3) were particularly likely to be significant correlates of foot care. The regression equation reduced the initial set of significant predictors to Health Hygiene, Efficacy, and Prior Cold Injury

(Table 1). As predicted, good health habits and belief in the efficacy of preventive health behaviors were related to better foot care. Having previously had a cold injury also predicted better foot care. The regression equation explained 15.1% of the variance in foot care.

Modifiers of Health Belief-Health Behavior Associations

Two additional sets of analyses tested for possible interactions between predictors which would modify health belief-health behavior associations. The analyses of variance employed to test hypotheses about the effects of combinations of health beliefs produced no evidence of significant interactions between Susceptibility, Severity, and Efficacy as determinants of cold weather health behaviors. Similar results were obtained in the analysis of variance testing for possible interactions between the health locus of control constructs.

The subgroup moderator analyses represented an exploratory test of the possible effects of habits and situational reactions on belief-behavior associations. These tests were exploratory because the hypothesis that these variables modified belief-behavior associations was a speculative extension of recent developments in attitude-behavior theory. These exploratory analyses produced 1 significant ($p < .05$) interaction in 32 tests. This was fewer than the number expected by chance, so there was no convincing evidence that either habits or situational factors substantially modified the belief-behavior associations.

Additional Analyses

Two additional analyses examined the relationship between cold weather health behaviors and health beliefs in greater detail. One concern was that the efficacy rating for the specific behavior might predict that behavior more effectively than the overall Efficacy scale used in the preceding analyses. The second concern was that pre-existing illness could explain some of the associations between health beliefs and behavior. The issues and the analyses employed to explore them are detailed in Appendix B. The results of the analyses did not alter the conclusions derived from the initial analyses.

DISCUSSION

Several preliminary inferences can be drawn from this investigation of predictors of cold weather health behaviors. First, the overall predictive power of the original set of predictors can be maintained in future studies with a subset of the potential predictors included in this study. The original set of health belief measures can be reduced to just those derived from the Health Beliefs Model. Situational factors can be reduced to the measures of mood state and demographic measures to age and past history of a cold injury.

Further simplification can be achieved if subsequent studies replicate trends in the health belief and mood categories. Although perceived susceptibility to illness and perceived severity of illness entered the regression equation for food intake, the direction of association was contrary to Health Belief Model predictions. Therefore, these associations may not replicate, in which case the health beliefs variables would be reduced to just the perceived effectiveness of health behaviors for reducing illness risk. Regarding health habits, there were several indications that cold weather health behaviors were influenced by habits established in other settings, but only Preventive Health Habits entered any of the regression equations. If this finding replicates, the 4 health habit measures can be reduced to this single scale.

A second conclusion was that most of the associations represented in the regression equations can be expected to replicate. The associations involving perceived effectiveness of health behaviors confirmed theoretical predictions which also have support in other health behavior research. The preventive health habits findings were consistent with the general rule that past behavior predicts future behavior. Finally, the relationship between prior cold injury and better foot care can be interpreted plausibly as evidence of learning from experience.

The fact that older men ate less replicated findings from national nutrition surveys (26,27) and therefore may be another indication that habits established in other settings carry over into the cold. The relationship between depressed mood and lower food intake was consistent with prior observations that maladaptive cold weather behaviors are related to depressed, withdrawn behavior, low morale and fatigue (1,4,5,7). Each of these statements may represent a single fundamental observation which can be summarized best as depressed mood. Therefore, all of these prior observations suggest that the present finding will replicate. However, because diet can influence mood (28-30), future study must explore the possi-

bility that low food intake is the cause of negative mood rather than an effect of negative mood.

The data did not support the hypothesis that cold weather health behaviors can explain previously reported associations between demographic characteristics and cold injuries. The few significant associations between demographic variables and health behaviors were opposite to what would be predicted based on the associations between demographics and cold injuries. Thus, the previously reported associations between cold injuries and attributes such as rank, age, education, and race may arise from other factors such as extent of exposure to the cold.

Although the initial findings were encouraging, revised methods and theoretical models will be needed to achieve highly accurate prediction of these behaviors. A critical methodological concern will be improved measurement of the dependent variables. Retrospective reports of behavior covering 3 to 4 days undoubtedly are imprecise because of recall errors, incorrect averaging of behavior over time, and so on. Daily diaries could minimize some of these problems and provide greater detail regarding nutrition intake, a particularly important behavior for well-being in the cold (3). However, even daily diaries will have limited utility for measuring behaviors which are inherently difficult to estimate. Field observations suggest that this problem is particularly important for liquid consumption, a fact which may explain why this behavior was so poorly predicted in this study.

The theoretical model guiding the study may be improved by incorporating predictors suggested by recent theoretical developments concerning health behaviors (e.g., 31,32). Another possibility would be the addition of a measure of dietary habits to directly test the hypothesis that food intake in the cold is influenced by habits established in other settings. One theoretical modification that does not look promising at present is the use of moderator variables in the predictive models. The analyses in this study which tested the hypothesis that habits and situational reactions would modify health belief-health behavior associations produced virtually no support for this possibility.

The overall conclusion from this study is that cold weather health behaviors can be predicted by relatively simple regression equations using at most 1 or 2 measures from each of the several predictor categories in this study. Given the range of possible improvements summarized above, this finding provides an encouraging beginning toward development of methods for improving cold weather opera-

tional effectiveness by modifying health behaviors to improve the well-being of personnel operating in this environment. What remains to be determined is whether theoretical and methodological improvements will increase the predictive precision of these models sufficiently to change this potential to a reality.

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Appendix A

FIELD BEHAVIOR QUESTIONNAIRE AND ITEM CONTENT FOR HEALTH HABITS AND SITUATIONAL PERCEPTIONS SCALES

FIELD BEHAVIORS

1. MARK THE POINT ON THE LINE BELOW THAT BEST INDICATES HOW MUCH LIQUID YOU CONSUMED ON THE AVERAGE DURING THE LAST EXERCISE. THE ESTIMATE SHOULD INCLUDE ALL WATER CONSUMED AND ANY ADDITIONAL LIQUIDS SUCH AS MILK OR JUICES THAT MAY HAVE BEEN SERVED WITH HOT MEALS. A CARTON OF MILK IS APPROXIMATELY 1/4 OF A CANTEEN AND A FULL CANTEEN CUP OF JUICE WOULD BE APPROXIMATELY 1/2 OF A CANTEEN.

0 1 2 3 4 5 6 7 8

Number of Canteens

(If more than 8, write the estimated number here _____)

2. INDICATE BELOW HOW OFTEN YOU ATE EACH OF THE INDICATED ITEMS IN YOUR MRE DURING YOUR LAST EXERCISE:

	NEVER	ONCE	EVERY OTHER DAY	DAILY	TWICE A DAY	THREE TIMES A DAY
Main course	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Crackers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Jelly/Cheese/Peanut Butter	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cookies/candy	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Coffee	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cocoa	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Extra Salt	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Sugar	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

3. WAS THERE ANYTHING IN THE MREs THAT YOU DID NOT LIKE AND THEREFORE DID NOT EAT?

_____

_____

_____

4. CHECK THOSE THINGS THAT YOU DID DURING THE LAST EXERCISE:

_____ Ate snacks in addition to main meals

_____ Took extra food to the field

_____ Took candy and cookies to the field

5. INDICATE HOW OFTEN YOU DID EACH OF THE FOLLOWING FOR FOOT CARE AND HYGIENE. CHECK THE APPROPRIATE BOX.

	NEVER	ONCE	EVERY OTHER DAY	DAILY	TWICE A DAY	THREE TIMES A DAY
Changed socks	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Washed feet	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Dryed feet	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Used foot powder	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Had feet checked by Corpsman	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Shaved	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Changed underwear	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Brushed teeth	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Took vitamins	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Took a "snow bath"	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Item Content for Health Habits and Situational Perceptions Scales

Health Habits

The instructions for the items in the following scales were "Put a check mark next to those behaviors that you do always or almost always."

Health Hazards Avoidance (11 items): Avoid overworking; Get enough relaxation; Limit foods like sugar, coffee, fats, etc.; Get enough sleep; Do things in moderation; Avoid getting chilled; Avoid parts of the city with high pollution; Fix broken things around the home right away; Avoid over-the-counter drugs; Avoid high crime areas; Use dental floss

Risk Taking (5 items): Take more chances doing things than the average person; Drive after drinking; Speed while driving; Don't drink (*), Carefully obey traffic rules (*)

Preventive Habits (9 items): Get shots to prevent illness; See a dentist for a regular checkup; Check the condition of electrical appliances, the car, etc.; Destroy old or unused medicines; Have a first aid kit in the home; Learn first aid techniques; Keep emergency phone numbers near the phone; See a doctor for regular checkups; Avoid contact with doctors when feeling okay (*)

Health Hygiene (7 items): Watch my weight; Get enough exercise; Discuss health with friends, neighbors, relatives; Pray or live by principles of religion; Don't smoke; Brush teeth regularly; Eat sensibly

Situational Perception Scales

The instructions for responding to the items in the following scales were: "How well does each of the following statements describe your experiences during the last exercise? Check the box that best indicates your agreement with each statement." Response alternatives ranged from "Disagree Strongly" (scored 1) to "Agree Strongly" (scored 5).

Leadership (4 items):

There was a lot of standing around and waiting. (*)

Things proceeded smoothly as scheduled.

Orders and explanations about what had to be done were clear.

I frequently got conflicting orders about what to do or how to do it. (*)

Evaluation (4 items):

What we were doing was boring because I have done things like that so many times before. (*)

The training was interesting and I learned from it.

Overall, I think this training is making a better person of me.

My performance was above average.

Situational Factors (4 items):

It was cold enough to make cold injuries a real threat if you did not watch what you were doing.

I was able to adjust my clothing to stay comfortable all the time. (*)

Weather and the tactical requirements made it hard to take proper care of myself.

I had to try hard just to keep up with the physical requirements.

NOTE: (*) indicates an item that was reverse scored when the overall scale score was computed.

Appendix B

DETAILS OF FOLLOW-UP ANALYSES

The primary analyses reported in this paper did not take health status into account. This limitation was a concern because some men may have been ill prior to their field exercise. If so, acute illness could have affected health beliefs measured prior to the exercise and mood and behavior during the exercise. A spurious correlation between beliefs and behavior could therefore arise because both shared a common cause. A spurious correlation would be indicated if taking health status into account reduced the health belief-health behavior associations to nonsignificance. Confirmation of this possibility would lead to the conclusion that health beliefs should not be interpreted as causing health behavior.

A spurious correlation was possible for food intake because this behavior was significantly related to self-reported health symptoms (3). Additional analyses showed that symptom reports during the field exercise also were related to the ratings of illness severity and susceptibility and to mood. However, symptoms were not related to ratings of efficacy or to the other two cold weather health behaviors. Thus, the conditions for a spurious association existed for food intake, but not the other behaviors. The initial analyses therefore were extended to test the effect of controlling for health status on the health belief-food intake associations.

Gastrointestinal problems could be expected to affect food intake and therefore are pertinent to the hypothesis that illness affected food intake and its predictors. Adjusted scores were developed to remove any effect of gastrointestinal symptoms on severity, susceptibility, and depression. The adjusted score was the observed score minus the predicted obtained by regressing each predictor of food intake on gastrointestinal symptoms. The regression equation developed using these adjusted measures was generally similar to that obtained with the unadjusted scores, but was less effective overall for predicting food intake (Table B-1).

Further analyses tested the possibility that the perceived efficacy rating for a specific behavior was a better predictor of that behavior than the generalized efficacy rating used in the prior analyses. Initial analysis showed that foot care was significantly ($p < .05$) related to 6 of the 8 items ($p < .005$ for 5 of these items) while food intake was related only to the rating for eating properly ($r = .20$, $p = .01$). Liquid intake was not related to any of the ratings. The overall efficacy measure appeared appropriate for foot care because this be-

TABLE B-1

ALTERNATIVE PREDICTIVE MODELS FOR FOOD INTAKE

PREDICTOR	b	SIGNIFICANCE[a]
OVERALL EFFICACY, ADJUSTED MOOD AND BELIEF SCORES		
Efficacy	228.91	.036
Age	−85.42	.002
Adjusted Depression[b]	−209.99	.072
Adjusted Susceptibility[b]	−9.55	.042
Adjusted Severity[b]	−73.93	.129
	Multiple R = .32, R^2 = .102, Intercept = 3009.36	
SPECIFIC EFFICACY, UNADJUSTED MOOD AND BELIEF SCORES		
Efficacy of Eating Properly	227.43	.006
Age	−84.23	.001
Depression	−276.21	.022
Susceptibility	−10.29	.026
Severity	−55.40	.183
	Multiple R = .43, R^2 = .187, Intercept = 4349.95	
SPECIFIC EFFICACY, ADJUSTED MOOD AND BELIEF SCORES		
Efficacy of Eating Properly	229.80	.007
Age	−80.41	.002
Adjusted Depression[b]	−246.19	.043
Adjusted Susceptibility[b]	−9.95	.033
Adjusted Severity[b]	−63.56	.154
	Multiple R = .40, R^2 = .163, Intercept = 2893.13	

[a] One-tailed tests for all predictors

[b] The adjusted score is the raw score minus the predicted score based on the association between the predictor and the score on the symptom composite described in the text.

havior was correlated to nearly all of the individual efficacy ratings. Therefore, further analysis was limited to food intake. The additional regression equations developed with the efficacy rating for eating properly replacing the overall efficacy rating did not substantially alter the previous findings (Table B-1).

Another extension of the analyses tested the possibility that specific susceptibility and severity ratings might be better predictors of behavior than the overall ratings. For example, liquid consumption might be related to the perceived severity of or susceptibility to dehydration even if it was not related to the overall measures. There was no evidence that specific ratings were more effective than the overall ratings for susceptibility and severity.

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This study screened potential predictors of maladaptive cold weather behaviors. Male Marine Corps volunteers (n = 161) completed questionnaires providing a battery of predictor measures, including: (a) Personal history variables related to cold injuries, (b) Health beliefs concerning personal susceptibility to and severity of illness, and the efficacy of preventive behaviors, and perceived control of health outcomes by personal actions, professionals' skills, and chance, (c) Health habits, and (d) Situational

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variables including mood, perceived leadership, weather conditions, workload, and morale. Self-reported liquid intake, food intake, and foot care during field exercises in cold weather training were the dependent variables. The combined predictors explained 22.1% of the variance in food intake, 15.1% of the variance in foot care, but only 2.3% of the variance in liquid consumption. The initial findings suggest that refined models can be developed with further work which will have higher predictive accuracy and provide a basis for developing programs to improve cold weather health behaviors.