Individual Attributes, Values, and Goals of an All-Military Women Antarctic Expedition

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BACKGROUND: While participation of women in the military has increased, research on performance of female teams engaged in arduous physical activity in isolated, confined, and extreme (ICE) environments remains sparse.

METHODS: A team of six British military women completed the Multidimensional Personality Questionnaire-Brief Form, Triarchic Psychopathy Measure, and Personal Values Questionnaire (PVQ) prior to embarking on an expedition that traversed the Antarctic continent. Questionnaires were completed weekly on the ice; repeat of the PVQ and individual semistructured debriefing interviews were carried out within 9 d post-expedition.

RESULTS: Personality findings indicated a generally well-adjusted group with notable individual differences in personality and personal values. Positive affect and camaraderie among teammates was evident throughout, although pace vs. distance in the strategy of the daily trek was a continuing point of tension. Honesty in communication was viewed as key to team effectiveness. A significant post-expedition decline in the tradition value (Pre M = −0.55, SD = 0.99; Post M = −0.82, SD = 1.12) and an increase in the conformity value (Pre M = −0.26, SD = 0.46; Post M = 0.18, SD = 0.27) was found.

DISCUSSION: Congruence in personal and team goals among group members engaged in highly challenging activities is crucial for optimal team performance. Presence of two highly dominant individuals has a negative effect on team dynamics. Application of study findings to space exploration is considered.

KEYWORDS: women teams, isolated, confined, and extreme environments, personality, personal values.

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The role of women in the military has changed over the past several decades. Issues of equal opportunity, evolving changes in stereotypical attitudes about women and men's behavior and capabilities, a lesser focus on physical strength, and a declining availability of male recruits have led to policy changes in many countries. In the United Kingdom, the Women's Royal Army Corps was disbanded in 1992 and women were integrated into the regular Army, but barred from certain combat roles.[11] In September 2017 the Royal Air Force (RAF) became the first branch of the British Armed Forces to allow women into all its roles, including ground close combat. The Army and the Royal Navy were scheduled to begin accepting female recruits for the Infantry and Royal Marines, respectively, by the end of 2018.

While over time the number of women serving in the military in different countries has increased, research on personal characteristics, attitudes, and team dynamics of women engaged in arduous physical pursuits in isolated, confined, and extreme (ICE) environments remains sparse. The personal values of team members, defined as broad motivational goals that serve as guidelines for action, were a particular area of interest in terms of its influence on team dynamics.[31] Possible changes in values as a result of a significant life event, in this case the expedition experience, were also examined.

Close evaluation of personal characteristics, values, and team performance in a polar ICE environment may provide an analog for performance in other types of challenging environments, including military deployments. In addition to severe cold and other physical challenges, polar expedition teams need to deal with team dynamics related to decisions about the pace of the trek and the distance covered each day.

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A number of studies have assessed military teams performing in ICE environments. Psychological hardiness was found to be a significant factor in the successful completion of a polar ski march by Norwegian border patrol applicants.[14] A study of elite all-male Danish military patrol teams operating for extended periods in Greenland demonstrated a psychologically adapted group, above average on positive personality factors, and average or below on neuroticism.[18] Team members also scored high on a boldness factor, indicating adventurous and fearless characteristics. Assessment of Danish all-male military groups deployed to stations in Greenland for a 26-mo period also found a generally well-adjusted group, particularly high on conscientiousness.[10]

Evaluation of personal and social values indicated that the Danish patrol group scored highest on self-direction, universalism (concern for welfare of people and nature), and stimulation values;[31] highest rated values by their counterparts deployed at a polar station were self-direction, hedonism (enjoyment), and benevolence (concern for the wellbeing of those close to the individual).[10,18] Overall, studies of personal and social values of different types of expedition teams showed consistency across groups in designating high valuation of self-direction, stimulation, universalism, and benevolence.[32]

In addition to individual factors, interpersonal interactions among members of small teams in ICE environments are influenced by group characteristics such as gender composition. All-male expedition teams have exhibited marked competitiveness,[7,19,33] although this behavior has not been consistent in all teams studied.[21] All-female expedition teams have tended to exhibit greater interpersonal sensitivity, demonstrated by supportive relationships, concerns about the welfare of team members, and a cooperative orientation.[1,15,28]

The overall focus of the current study was to address gaps in the literature on the characteristics and performance of military women living and working together in a highly challenging ICE environment for an extended period of time while engaged in intense and prolonged physical activity in the extreme cold. Relationships among personal attributes and values of team members, team dynamics, including decision processes regarding the daily trek, and conflict resolution were examined. Along with the psychological emphasis of the current study, other groups of investigators assessed this expedition team on physiological indices, including thermoregulation, and newly developed sensor technologies in pre-, during, and post-expedition evaluations.

METHODS

Subjects

Six women serving in the British Army or Army Reserve participated in this expedition and study. From an initial pool of over 250 Army volunteers, 50 women were selected. Subsequent selection phases based on observation of potential participants over three expedition training periods in the United Kingdom and Arctic areas of Norway culminated in the selection of the six-person team. Subject demographics were as follows: mean age 32 (range 28–36); five officers and one noncommisioned officer. Two team members had multiple deployments in combat areas: Kosovo, Iraq, and Afghanistan.

This investigation was approved by the British Ministry of Defense Research Ethics Committee and the University of Minnesota Institutional Review Board. Subjects provided written informed consent, all forms were identified only by code number, and confidentiality was maintained. Individual data were not shared with the British military or any other group.

Procedure

Subjects were administered the Multidimensional Personality Questionnaire-Brief Form (MPQ-BF), Triarchic Psychopathy Measure (TriPM), and the Portrait Values Questionnaire (PVQ) following the selection of the final team. They also were instructed in the logistics of completing and saving the Weekly Rating Form (WRF), structured as an application on their cell phones, and filling out this form on a designated evening each week during the expedition. Following the completion of the trek and while awaiting their return to England, subjects repeated the PVQ. Each subject participated in a semistructured debriefing interview 9 d after their return administered by one of the investigators who had no prior association with the British military. The debriefing interview transcripts were subjected to Thematic Analysis (TA) applying Braun and Clarke's method.[8]

Expedition Preparation and Details

Following final team selection, subjects met as a group and individually with Ministry of Defense psychologists to examine their typical coping strategies in stressful situations, and explored, as needed, more adaptive ways of handling difficult situations. Group sessions dealt with issues of teamwork and exploration of methods of functioning more effectively as a team. In addition, the group continued intensive training to enhance physical fitness and become highly proficient in skiing and winter survival skills. These activities included crevasse survival training in Switzerland and further training on the ice in Chile.

Team members were encouraged to gain approximately 20 kg before the start of the expedition based on the rationale that they would lose approximately that amount of weight over the course of the expedition. Rations for the trek were set at 5000–5500 kcal per day to maintain strength and fitness. Team members carried cell phones and wore clothing containing physiological sensor technologies.

The team was transported from Chile to Union Glacier in Antarctica to await a flight to Leverett Glacier, the starting point of the expedition. Because of weather conditions, the team was delayed at Union Glacier for 14 d before being flown to the Ross Ice Shelf. The ski trek across Antarctica to Hercules Inlet covered 1700 km and was successfully completed in 61 d. The team pulled sledges with all of their gear and had two resupply points along the route. Team members skied for 10 h/d, each team member leading a 75-min leg, with an 8-min rest stop in between, followed by two 45-min legs at the end of the day. The team reached the South Pole in 26 d, covering 577 km.

Subsequently, the group switched to skiing at night to take advantage of shadows to aid in navigation. The number of kilometers covered each day ranged from 12 to 40 km, reaching 46 km/d in the last portion of the trek. Temperatures ranged from −14°C to −56°C across the expedition.

Initial planning was conducted by coleaders; prior to the expedition one leader was chosen based on team and support team decision. Nightly team meetings on the ice were held in the leader's tent, discussing progress that day and dealing with any concerns. While a democratic process of discussion ensued, ultimate decision authority was in the hands of the leader. The team switched tent mates at several points over the course of the trek, enabling them to share a tent with more than one other team member.

Measures

The test battery used in the current research was developed specifically to assess the functioning of team members engaged in different types of challenging environments. The use of a standardized battery, albeit with some modifications as new findings emerge, enable a direct comparison of diverse groups on the same personality, behavioral, and team dynamic measures.

Multidimensional Personality Questionnaire—Brief Form. The Multidimensional Personality Questionnaire—Brief Form (MPQ-BF)[26] is a 155-item shortened version of the 276 item MPQ.[34] Internal consistency of the 11 primary scales of the MPQ-BF ranged from 0.75 to 0.84; comparison of the MPQ-BF with the MPQ indicated that the higher order factor structure was maintained.[26] Convergent validity between the MPQ and other measures of personality has been demonstrated.[34]

Triarchic Psychopathy Measure. The TriPM is a 58-item inventory assessing three factors of psychopathy: Boldness, Meanness, and Disinhibition.[25] Boldness refers to an interpersonal style of social poise and dominance, adventure-seeking, and relative immunity from fear and stress while remaining calm in stressful and dangerous situations. Disinhibition refers to a tendency toward impulsivity and poor behavioral restraint. The Meanness (callousness) factor designates cruelty and deficient empathy. The TriPM has been shown to be informative in understanding normal range individual differences as related to performance in challenging environments.[24] Items within each scale are summed and then prorated so each scale ranges in value from 0 (low) to 1 (high). The validity of the TriPM as a measure of psychopathy was demonstrated by convergent validity findings in comparison with other measures of the construct.[25]

Portrait Values Questionnaire. The PVQ is a 40-item measure specifically developed to assess the perceived importance of 10 major distinct values that have been consistently identified across different cultural groups.[30,31] Each item presents a gender-matched brief description of a person's goals, aspirations, or wishes that point implicitly to the importance of a value. The value scales are the following: Tradition (respect, acceptance of customs and ideas that traditional culture provides); Universalism (appreciation for the welfare of all people and nature); Self-Direction (independent thought and action); Stimulation (excitement, novelty, challenge); Hedonism (pleasure seeking, enjoyment of life); Achievement (personal success through demonstrating competence to others); Power (social status, dominance over others); Security (safety, harmony, stability of relationships and oneself); Conformity (restraint of actions likely to upset others, violate social expectations); and Benevolence (enhancement of the welfare of those close to one). An example of the Tradition value is: "She thinks it is best to do things in traditional ways. It is important to her to keep up the customs she has learned."; of the Achievement value is: "Being very successful is important to her. She likes to impress other people."; and of the Conformity value is: "She believes that people should do what they're told. She thinks people should follow rules at all times, even when no one is watching." Respondents rate on a 6-point scale how much this person is like the respondent. A correction for individual differences in response style is applied by "centering" the mean of the raw score on each scale by subtracting the mean score of the rankings on all 40 items. Test-retest reliabilities ranged from 0.66 to 0.84 across scales; the discriminant validity of the 10 PVQ values was demonstrated by studies in culturally diverse countries.[31]

Weekly Rating Form. The WRF is a 71-item measure used in previous national and international expedition studies, modified as relevant for the specific questions addressed in this investigation.[10,17,21] The individual sections are: Feelings and Emotions (Positive and Negative Affect Schedule—PANAS);[35] Environmental and Physical Factors; Positive and Negative Event Checklist; Coping Checklist (derived from reported daily coping strategies monitored over a 7-d period by a group of Army recruits undergoing basic training);[5] Strategy/Team Decision Processes; and Other Significant Events. To avoid retrospective contamination, respondents are instructed to rate each item according to their experience on the day they are completing the WRF.

Debriefing interview. The debriefing interview is a semistructured 40-item instrument adapted from previous expedition studies to obtain more comprehensive information on topics surveyed on the WRF, particularly team interactions and other aspects of group processes. Items also covered post-expedition expectations and applications for space missions.

Statistical Analyses

Because of the small number of subjects in this study, the overall approach was necessarily descriptive (mean, SD). Paired samples *t*-tests were used as appropriate (SPSS version 22); significant findings were evaluated for effect size using Cohen's *d*, calculated as the difference in mean group change divided by the pooled standard deviations.[9] The Events and Coping items on the WRF were analyzed as the percentage of time a particular item rating [either 1 (yes) or 2 (no)] was made over the nine weekly rating intervals.

The verbatim debriefing transcripts were coded and combined into categories and then themes.[8] Relevant themes were discussed and verified with a second reader.

RESULTS

The MPQ-BF findings indicated a group relatively high on personality traits of Achievement (T = 56, SD = 8.02), Social Closeness (T = 55, SD = 8.43), and Absorption (imagination, emotionally responsive to sensory stimuli; T = 55, SD = 7.37), and the higher order factor of Positive Emotionality (T = 56, SD = 7.74). The lowest scale scores were on traits of Harm Avoidance (T = 40, SD = 1.64), Traditionalism (conventionality; T = 41, SD = 5.14), and Constraint (T = 39, SD = 4.46), a higher order factor reflecting lack of active engagement in activities. However, inspection of the standard deviations on each of the scale and factor scores indicates a group with notable individual differences in personality, particularly on traits of Stress Reaction, Control, Social Closeness, and Achievement (**Table I**).

The TriPM analyses demonstrated high scores on the Boldness scale and low scores on the Disinhibition and Meanness scales. This configuration reflects a group high in adventure seeking, while not prone to emotional dysregulation and callous behavior toward others.

Inspection of the hierarchy of values on the pre-expedition PVQ indicated a group who self-identified with the following values: Hedonism, Stimulation, and Self-Direction; the lowest value scores were Power, Tradition, and Achievement. The post-expedition value hierarchy was consistent: Stimulation, Hedonism, and Self-Direction were the three highest self-identified values; Power, Tradition, and Security were the lowest rated values (**Table II**).

Table I. Personality Characteristics of Team Members Assessed by Measures Evaluating Different Aspects of Personality.

SCALE	M	SD
MPQ Lower-Order Scales[+]		
Wellbeing	53	4.0
Social Potency	52	6.12
Achievement	56	8.02
Social Closeness	55	8.43
Stress Reaction	48	11.41
Alienation	53	5.05
Aggression	45	5.87
Control	45	9.56
Harm Avoidance	40	1.64
Traditionalism	41	5.14
Absorption	55	7.37
MPQ Higher-Order Factors[+]		
Positive Emotionality	56	7.74
Negative Emotionality	47	5.27
Constraint	39	4.46
TriPM[++]		
Disinhibition	0.26	0.05
Boldness	0.64	0.08
Meanness	0.15	0.03

MPQ: Multidimensional Personality Questionnaire; TriPM: Triarchic Psychopathy Measure.
[+] T-scores; standardized score with mean 50, SD 10.
[++] Scores range from 0 (low) to 1 (high).

Significant differences on the PVQ were found on the Tradition and Conformity scales comparing pre- and post-expedition, with large effect sizes.[9] None of the other scales showed significant differences. The Tradition score decline was as follows: Pre M = −0.55, SD = 0.99; Post M = −0.82, SD = 1.12; d = 1.51, 95% confidence interval of 0.7 to 3.49. The Conformity score increase was as follows: Pre M = −0.26, SD = 0.46; Post M = 0.18, SD = 0.27; d = −0.88, 95% confidence interval of −7.65 to −0.31.

The WRF PANAS ratings were assessed for differences in Positive Affect (PA, M = 3.32, SD = 0.44) vs. Negative Affect (NA, M = 1.38, SD = 0.27) over the course of the expedition. PA was significantly higher than NA throughout [$t(4)$ = 7.84, P = 0.001]; there was little variation among individuals. The findings also assessed a possible "Third Quarter" decline in affect;[3] however, PA and NA changes were minimal.

WRF items assessing several physical, emotional, and attitudinal factors were rated on a 10-point scale from 1 (not at all) to 10 (the most possible) and averaged across the rating periods. The ratings were as follows: Level of exertion, M = 5.5, range = 3.0–8.1; Level of Stress, M = 4.1, range = 2.3–5.1; How restful was your sleep?, M = 5.3, range = 3.0–6.9; Confidence level that the team will successfully complete the expedition, M = 9.0, range = 6.5–10. Estimates of the total number of hours of sleep indicated M = 6.6, range = 5.5–9.1.

The Events ratings, averaged over the nine weekly rating periods of the expedition, showed a number of positive events that were endorsed, although notable individual differences again were evident; "Satisfaction I am able to cope with the challenges" (M = 89%, range = 66.7–100); "Feelings of camaraderie/closeness with teammates" (M = 88%, range = 50–100); "Satisfaction that the equipment is working properly (M = 88%, range = 55.6–100); "Enjoyment of the Antarctic environment" (M = 79.2%, range = 66.7–100); and "Satisfaction in making good progress today" (M = 77.8%, range = 33.3–100). Events with a low frequency of endorsement were as follows: "Frostbite" (M = 1.8, range = 0–11.1); "Worried about family, friends" (M = 5.6%, range = 0–22.2); and "Concerns about the effectiveness of or safety of decisions I made today" (M = 7.41, range = 0–22.2) (**Table III**).

The Coping ratings demonstrated that the mean highest percentage of methods endorsed over the course of the expedition reflected both cognitive and problem oriented strategies: "Kept the goal in sight. Thought about finishing the expedition and why I'm here" (M = 92.6%, range = 66.7–100); "Thought of something pleasant such as good times to come" (M = 84%, range = 50–100); and "Discussed task concerns with a teammate" (M = 82.4%, range = 50–100). Low frequency coping methods were as follows: "Yelled, stomped, threw things around" (0%); and "Cried" (M = 14.8%, range = 0–44.44). (**Table IV**).

Debriefing Interviews

The TA indicated a number of themes mentioned by all six subjects: resolving pace vs. distance in the daily ski plan; honesty in communication with teammates; and tensions between the leader and one of the team members. Another consistent theme

Table II. Personal and Social Values Assessed Pre and Post Expedition.

	PRE		POST	
PVQ SCALE[+]	**M**	**SD**	**M**	**SD**
Tradition	−0.55	0.99	−0.82**	1.12
Universalism	0.30	0.56	0.25	0.61
Self-Direction	0.60	0.31	0.66	0.19
Stimulation	0.72	0.64	0.95	0.90
Hedonism	0.83	0.46	0.73	0.62
Achievement	−0.42	1.20	−0.23	1.16
Power	−1.73	0.66	−1.83	0.32
Security	−0.21	0.39	−0.44	0.61
Conformity	−0.26	0.46	0.18*	0.27
Benevolence	0.62	0.56	0.56	0.71

[+] PVQ = Portrait of Values Questionnaire; a correction for individual differences in response style is applied by "centering" the mean of the raw score on each scale by subtracting the mean score of the rankings on all 40 items. Items are rated on a 6-point scale ranging from 1 = Not Like Me At All, to 6 = Very Much Like Me.
* $P < 0.05$; Cohen's $d = 1.51$; ** $P < 0.01$; Cohen's $d = -0.88$.

was the physical challenge, reflected in part by a need to prove oneself, build self-confidence.

The pace vs. distance issue had an overriding influence on team dynamics during the daily trek and also at the evening team meeting when the leader discussed the strategy for the following day. Team members were given the opportunity to state their own opinion, although the final decision rested with the leader. During the first half of the expedition (reaching the South Pole), the discussion centered on "slow but longer" vs. "fast but shorter." Tension within the group increased during the second half of the expedition; two members wanted to ski for longer periods each day ("not to rest on ones' laurels"), while the others agreed with the leader's consistent strategy to maintain a steady pace and avoid the possibility of injuries. These differences of opinion eventually were dealt with by the leader through asking members to explore the issue of personal goals vs. team goals.

"It's important to identify, within the team, what their team goals are and they agree to it… and accepting what each person can bring to the team."

"That bubbled for a long time and was raised in team meetings, but it was never really resolved...until we talked about what we wanted to achieve...and we actually managed to talk it through."

Honesty in communicating with team members and knowing when to speak up and when not to was viewed as essential to the effectiveness of the team.

"Communication...openness and honesty and trust, not necessarily you have to always say what you think because that can be detrimental."

"…. communication is way up there, and self-awareness and awareness of others and a common goal that you all agree to."

Other aspects of team effectiveness were mentioned in relation to personality factors and personal relationships.

"We have a lot of people of the same type….I know we're all quite similar but we do have own little bits and I think those differences make us work better."

"I think you don't need to be friends to make a good team, and actually it's probably better to not be friends."

Tensions between a team member and the leader were evident throughout the expedition, but affected the entire team.

"The main frictions were between two other people and I was more external to it. Yeah, it affected me, I was aware of it, and the mood of the whole team brought me down."

The motivation for volunteering to be on the expedition centered on several types of personal as well as physical challenges.

Table III. Mean Percentage of Significant Events Endorsed Over the Course of the Expedition.

ITEM	%*	RANGE
Problems with gear and equipment	25.5	0–75
Feeling of camaraderie/closeness with teammates	88.0	50–100
Concern about wellbeing of another teammate	71.3	50–100
Enjoyment of the Antarctic environment	79.2	66.7–100
Concern about how effectively my teammates and I are working together	53.2	22.2–89
Feeing down/low because teammate feeling same way	26.2	0–77.8
Tension or argument with a teammate	40.7	0–88.9
Satisfaction in making good progress today	77.8	33.3–100
Satisfaction that equipment is working properly	88.0	55.6–100
Satisfaction I am able to cope with the challenges	89.0	66.7–100
Concerns about the effectiveness of or safety of decisions I made today	7.4	0–22.2
Fear of being injured	52.1	22.2–83.3
Worried about family, friends	5.6	0–22.2
Loneliness, homesickness	21.3	0–50.0
Personal hygiene (wanting to be cleaner)	50.0	0–100
Lack of privacy, personal time	18.5	0–55.6
Worried about encountering bad weather	35.2	0–77.8
Frostbite	1.8	0–11.1
Muscle or joint pain	63.2	33.3–88.9
Headache	9.3	0–33.3
Injury	15.1	0–44.4

* Mean percentage of rating periods in which a particular item was endorsed.

"I wanted to be one of the select few that were going to go and do something that no one had done before and I think a part of me didn't know whether I would be able to do it.... It was a huge, huge challenge, and that I'd never have that opportunity again."

"It was a challenge and I wanted something that would be the hardest challenge of my life."

"To have the security to know you've done something really well once."

The positive experiences noted varied across team members and included interpersonal aspects such as team bonding, trust and caring among team members, small acts of kindness, enjoyment

Table IV. Mean Percentage of Coping Methods Endorsed Over the Course of the Expedition.

ITEM	%*	RANGE
Kept my feelings to myself	48.2	0–100
Discussed task concerns with a teammate	82.4	50–100
Discussed personal/emotional concerns with a teammate	64.8	33.3–100
Tried harder. Pushed myself to do my best, told myself I can do it	52.6	11.1–87
Prayer	34.3	0–100
Saw the situation in a positive way, what I'm learning and getting out of it	65.3	25–100
Kept a positive attitude. Humor, joking around, having fun.	74.5	50–100
Cried	14.8	0–44.44
Relaxed, meditated, listened to music, daydreamed	75.0	44.4–100
Kept the goal in sight. Thought about finishing the expedition and why I'm here.	92.6	66.7–100
Thought of something pleasant such as good times to come.	84.0	50–100
Tried to figure out how to solve the situation that's bothering me	36.3	12.5–77.8
Yelled, stomped, threw things around	0	0–0

* Mean percentage of rating periods in which a particular item was endorsed.

of the Antarctic environment, and recognition of reaching the goals of the expedition.

> *"I think we had a fantastic, fantastic team bond and on Christmas Day....I should have been feeling homesick and I was like….there's nowhere I'd rather be and no people I'd rather be with."*

> *"…there was a positive energy, they were relying on you, you were relying on them, together you were going through this together."*

> *"Almost a religious, a spiritual thing, a connection with nature."*

> *"Our mission was to get from one side to the other, with a team and in good health and we did that."*

Sensed presence experiences were noted by two team members.

> *"There were a couple of times I would think someone was behind me...put my heart rate up, you know...was between the Pole and when I got to Thiel….right in the middle of the expedition."*

> *"A song came on my headphones and for some reason I suddenly felt, my father died when I was 19, and I was saying thank you to him for some reason...I really felt a connection with him…. a weird moment I'd never experienced before."*

The team had a number of recommendations for selection and training before embarking on an expedition.

> *"Train harder than the expedition, our training, some of it was a lot harder than the actual crossing... train hard, fight easy."*

> *"We should spend more time as a team before going, maybe just some social time...everything that we did was selection and training. We never had the objective of having a relaxed social environment to really get to know each other. "*

DISCUSSION

The team successfully traversed the Antarctic continent in a relatively short, 61-d period. The findings demonstrated that that these highly diverse individuals maintained a positive energy within the group and dealt effectively with whatever tensions emerged in order to focus on the successful completion of the expedition. Positive findings were evident throughout, including high positive and low negative affect with no evidence of a third quarter decline, camaraderie and strong bonding with other teammates, feelings of trust, and ability to share task and personal concerns with team members. The prominence of concerns about the wellbeing of others in the group is consistent with empirical studies and observations of the performance of women in polar environments.[15,27]

Personality assessments indicated that team members were above the norm on positive traits reflective of wellbeing and positive emotionality; individual differences were evident on traits of stress reaction (several well below the norm on this trait), control (spontaneity), and social closeness, suggesting different intra- and interpersonal styles.[34] The high score on the boldness factor in combination with low scores reflective of poor emotional regulation and callousness point to characteristics highly adaptive for positive performance in ICE environments.

The team was similar to other expedition teams in their high valuation of stimulation and self-direction;[18,32] however, individual differences were noted on other personal values, particularly achievement related to social recognition. The assessment of possible changes in values pre- to post-expedition indicated a significant increase in conformity and a decrease in tradition values. The conformity value increase reflects greater importance given to following rules and procedures and avoiding conflict with others, i.e., being a team player; the tradition value decline may reflect the experiences of the team in achieving goals contrary to societal gender stereotypes.[31]

The relatively high score on the MPQ-BF Achievement scale and relatively low score on the PVQ Achievement value are due to the different meanings of these labels on these different measures. The MPQ-BF Achievement personality trait refers to primarily inner-directed characteristics of ambition, such as liking challenging tasks, persistence, and working hard.[26] PVQ Achievement refers to valuing personal success through social recognition, being admired by others, and is therefore an outer-directed characteristic.[31]

Several reviews have focused on individual differences in personality and other factors related to positive team performance in ICE environments, with an emphasis on space applications.[2,13,22] Bell et al.[4] examined team composition variables and made a distinction between surface level (overt characteristics such as age, profession) and deep level variables (underlying psychological characteristics including personality and values). Deep level variables were considered to have a stronger and more enduring influence on team performance over time, as individuals get to know each other better. Bartone et al.[2] concluded that (deep level) emotional stability and personality traits, including

openness, facets of conscientiousness, introversion, self-control, hardiness, and low need for social support, are characteristics optimal for performing in ICE environments.

The debriefing interviews were informative in obtaining a fuller understanding of the context of the weekly ratings and team dynamics and goals. The issue of pace vs. distance was a major topic of the daily discussions and concerns. While all participants were selected based on extensive physical training in extreme environments, these differences may reflect physical differences in body composition, muscle performance, and possible injuries. In addition, personality factors also may have been influential.

The intensification of different preferences of pace vs. distance during the second half of the trek reflected a tension between personal goals and team goals (maintaining comfort and safety for all vs. a record-breaking crossing). This factor was diffused to a great extent by the team leader having members discuss this issue. Clearly, in order to maintain team cohesion to successfully complete the expedition, highly motivated team members who differ to a certain extent on personality traits, values, and physical attributes need to come to an acceptance of an overall strategy about the pace at which the team progresses across the ice.

Other studies have found that congruence among team members on personal goals and perceived team goals significantly impacts team satisfaction and performance.[20] However, specific individual goals may change over time depending on the exigencies of specific tasks or challenges, and may not remain congruent with the goals of others in the group. The challenge for the leader is to use the most effective way to deal with a situation in which prominence of particular goals may change. Laboratory studies have indicated that positive effects on performance were stronger when groups received team rather than individual feedback on goals;[12] thus dealing with these issues in a group setting is important.

A second and related theme that emerged from the interviews was the importance of openness and honesty in communication with others as a key factor in team effectiveness. These comments were focused on interpersonal relationships as well as task strategies. The importance of accurate communication and being able to know when to express an opinion and when to remain silent was also mentioned by subjects in the Danish military studies.[10,17]

The tensions between the leader and a teammate reflected an often noted dynamic when two highly dominant individuals need to work together, and one may hold decision authority.[16,23,33] Conflict resolution is critical in avoiding fault lines in the group if members take sides with one or the other of the individuals involved in a dispute.[6,10,29]

This study has several limitations. As with all small *N* studies, generalizations beyond the current group evaluated need to be made with caution. Moreover, confidentiality concerns limit the findings presented, particularly on psychological assessment measures, to a discussion of group characteristics. The aggregation of data from multiple studies is, therefore, highly important, as is the inclusion of mixed-gender groups to assess commonalities and possible differences in team dynamics compared to single gender groups.

Findings from the current study have applications for long-duration space missions. Considering the success of the team in reaching its expedition objectives irrespective of notable individual differences in personality traits among team members, overall positive psychological adaptation may be a key factor, rather than a specific "right stuff" constellation of personality traits. In addition, examining personal values and training teams in goal congruence and conflict resolution are important in ensuring team effectiveness. This is particularly crucial for a small group who will live and work on Mars or another planet for an extended period, during which teams of two within the group will engage in planetary exploration. Moreover, a focus on the overriding goals of the expedition is a strong incentive in maintaining positive performance and the success of the mission.

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