

Soldiers' Perception of Combat Ration Use During Arctic Training: A Qualitative Study

Florence V. Lavergne, RD, MSc^{*}; Denis Prud'homme, MD, MSc^{†,‡}
Isabelle Giroux, PhD, RD, BEd, PHEC^{‡,§}

ABSTRACT

Introduction:

Soldiers work in various extreme environments, including the High Arctic, where energy requirements are increased compared with temperate climates. Soldiers often do not reach their energy needs with combat rations and face additional challenges to feeding in the Arctic, which can hinder the performance. The purpose of this study is to document soldiers' perception about individual, dietary, and environmental factors influencing intake of combat rations during Arctic field training.

Materials and Methods:

This qualitative phenomenological study included in-depth semi-structured individual interviews with 16 soldiers of the Canadian Armed Forces participating in the Arctic Operations Advisor training in Yellowknife (Northwest Territories) and Resolute Bay (Nunavut) from January to March 2019. Interviews were audio-recorded, transcribed verbatim, and then coded using a directed content analysis approach. Data were analyzed with NVivo qualitative data analysis software.

Results:

Five themes related to the individual (personal preferences; mood and morale), the diet (water availability; food variety), or the environment (meal preparation time) were identified. A sixth theme found was related to the diet and the environment (food/water temperature). Soldiers explained food and water were frozen, thus limiting water availability and greatly increasing meal preparation time. Food variety was deemed adequate by some, but others preferred more options. Individual food preferences and soldier mood and team morale could be barriers or facilitators to intake. Overall, the complexity of combat ration intake in the Arctic stemmed from the interaction of factors.

Conclusions:

Various factors related to the individual, diet, and environment were found to influence intake of combat rations by participating soldiers during Arctic training. Reducing barriers to combat ration consumption by enhancing operational suitability of rations for the Arctic environment could promote dietary intake. Bearing in mind many interrelated factors influenced intake of soldiers, the military would benefit from further assessing which challenges related to intake in the field could be addressed.

INTRODUCTION

Feeding soldiers of the Canadian Armed Forces (CAF) worldwide is a complex undertaking considering logistical constraints and unique physiological demands of this population. Energy needs of military in training and deployments are generally above those of the average population by 17% to 38%.¹ Furthermore, CAF members work in the Arctic, which also heightens energy requirements by 8% to 15% to maintain body temperature, in addition to wearing heavy clothing and traveling on snow-/ice-covered terrain.^{2,3}

Whenever fresh-feeding is not possible, CAF members are given combat rations: pre-packed and ready-to-eat food designed to facilitate eating on the move during field training and missions.⁴ Each combat ration provides ~1,600 kcal/meal, for a ~4,800 kcal of daily total. These rations are utilized by Canadian military worldwide, including in the Arctic. However, previous research reported soldiers did not consume sufficient energy to compensate for increased energy expenditure, thus resulting in a negative energy balance since only 47% to 78% of rations were actually being consumed.⁵ Hence, a daily energy deficit can accumulate and eventually impact performance and health, causing impairments like lower concentration in high-stake situations and unintended weight loss.⁶⁻⁸

Multiple factors can influence dietary intake of rations by soldiers. Meiselman⁹ developed the "Three Factor Model" to present categories of factors influencing intake: the individual (age, sex, dietary influences, satiety, moods/emotions, etc.), the food (portion size, food presentation, variety, etc.), and the environment (appropriateness, time of day, weather, price, etc.). Although these factors are known to impact intake in

^{*}Interdisciplinary School of Health Sciences, Faculty of Health Sciences, University of Ottawa, Ottawa, ON, Canada K1N 6N5

[†]University of Moncton, Moncton, NB, Canada E1A 3E6

[‡]Institut du Savoir Montfort, Ottawa, ON, Canada K1K 0T1

[§]School of Nutrition Sciences, Faculty of Health Sciences, University of Ottawa, Ottawa, ON, Canada K1N 6N5

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general, they are not military specific. Little is known about soldiers' perspectives regarding which specific factors influence their intake when working in cold climates and how they may compound in extreme climates like the Arctic. This phenomenological study aimed to document perceptions of CAF soldiers during Arctic training about individual, dietary, and environmental factors influencing intake of combat rations during field training.¹⁰ Study findings can help understand the complexity of factors, their interactions, and how they influence soldiers' dietary intake in the Arctic to help guide the development of specialized rations suitable for extreme environments and identify other possible areas of improvement.

METHODS

Study Participants

A purposive sample of soldiers participating in the Arctic Operations Advisor (AOA) training was recruited. This 8-week training (January-March 2019) prepared soldiers for planning and conducting cold-weather operations. This field training started in Yellowknife (Northwest Territories) and continued in the High Arctic: Resolute Bay (Nunavut) and surrounding communities. Soldiers consumed combat rations for 14 days and periodically ate at military dining facilities. The training was finished in Trenton (Ontario), where data collection took place. All soldiers who partook in the Arctic training were invited by the main author (F.V.L.) to participate in the study after providing informed written consent. The 2019 AOA training cohort had 24 attendees. All participants initially accepted to participate in this study. However, eight participants dropped out since they had to stay in the Arctic after the training and could not participate in the interviews in Trenton. Ethics approval was obtained from the Research Ethics Board of the University of Ottawa.

Data Collection

Semi-structured individual interviews were conducted in the preferred language of participants (French or English). A bilingual interview guide was created, modified from previous interview guides,^{11,12} and piloted with two active CAF members. It was then refined based on feedback and finalized. Before their interview, participants completed a demographic questionnaire. Sixteen in-depth interviews were conducted by two dietitians (including F.V.L.) during two consecutive days in Trenton, within 72 hours after participants returned from the 8-week Arctic training. Interviewers did not know participants. Each dietitian interviewed eight participants. Interviews were 30 to 66 minutes. They were audio-recorded and conducted in private closed rooms. Field notes were taken.¹³

The interview covered the following topics: food and nutrition knowledge, healthy eating, combat rations, mood and morale, influence of others, physical impact and activity, and snacks. Interview questions are provided in Table I.

After completing the interview, participants received a nutrition education booklet developed by CAF Strat J4 Food

Services. The research team's contact information was given in case participants had questions or wanted to see their interview transcript.

Data Analysis

Audio-recordings were transcribed verbatim and then verified for accuracy. No participant names or identifiers were included. A directed content analysis approach was used for coding, where initial codes and their definition originated from previous theory and research findings on military nutrition.¹⁴ Two researchers independently coded 25% of interviews using the initial code book, while also identifying potential new codes.^{15,16} After comparing and discussing analyses, the initial coding scheme was revised to include new codes. Initial interviews were re-analyzed to capture new codes, followed by content analysis of remaining transcripts. A third party was involved when discrepancies in coding and differences in interpretation occurred.¹⁷ Intra-coder reliability was evaluated by re-coding four randomly selected transcripts and comparing with original coding results.¹⁸ A 90% reliability threshold was used.¹⁸ Content analysis was done using NVivo qualitative data analysis software.¹⁹ Supporting quotes from participants are included in results and were translated from French to English as needed, to illustrate emerging themes. Data saturation was reached. Demographic data are presented with mean \pm standard deviation, calculated with Microsoft Excel.²⁰

RESULTS

Sixteen male CAF members participated; ages ranged from 24 to 43 years (32 ± 5 years). Eleven interviews were in English and five in French. Participants were based out of six provinces and had been in CAF for 11 ± 3 years. All participants had previously used combat rations. Half of participants had been in the Arctic before the AOA training.

Six main themes emerged from interviews with regard to participants' perception of factors influencing their dietary intake of rations while in Arctic training. Those themes consistently emerged from interviews, regardless of participants' language, base location, or years of experience. Five themes related to the individual (personal preferences; mood and morale), the diet (water availability; food variety), or the environment (meal preparation time) were found. The sixth theme identified was related to the diet and the environment (food/water temperature). Supporting quotes from participants (P) are provided in Table II.

Theme 1: Food/Water Temperature

A common theme throughout interviews was that Arctic field training meant food in rations would be completely frozen. Therefore, food needed to be thawed and warmed up in order to be consumed (Quote 1.1).

With everything being frozen, soldiers were required to set up cooking tents, and place individually-packaged items in

TABLE I. Interview Questions Asked to Soldiers Participating in Individual Interviews About Combat Ration Use While Training in the Arctic

Themes and main questions	Probes and follow-up questions
(Food and nutrition knowledge)	
1. How would you describe your knowledge related to foods and nutrition?	<p>a. What do you use as source of nutrition information?</p> <p>b. How would you describe your food preparation skills (in general/at home)?</p> <p>c. Does this influence your ability to prepare rations? How?</p> <p>d. To what extent were discussions or teachings about food and nutrition incorporated into your training in the army?</p> <p>e. Would you have benefited from more information on food and nutrition in your training? Please explain.</p>
(Healthy eating)	
2. Is eating a healthy balanced diet a concern for you?	<p>a. What do you think would have been ideal for you to eat/drink during the training?</p> <p>b. What do you think is good nutrition for soldiers' performance?</p> <ul style="list-style-type: none"> • What types of food and beverages should be eaten? • How much should a soldier eat/drink? • What makes the diet of a soldier unhealthy? <p>c. Do you think what you ate/drank affected your performance during the training? Explain.</p>
(Combat rations)	
3. What do you think about the combat rations?	<p>a. Tell me more about:</p> <ul style="list-style-type: none"> • Variety of the food available in the rations? • Taste of the rations? • Nutritional value? • Texture? • Ease of preparation? • Weight? • Amount of food? <p>b. How much time did you have for meals (preparation and eating) while training in the Arctic? Was this sufficient time? Please comment.</p> <p>c. While in Arctic, did you have to skip meals? Tell me more about that.</p> <p>d. Can you describe any challenges you had in preparing rations during the daily routine?</p> <p>e. Tell me about your fluid intake and what you drank while on rations.</p> <ul style="list-style-type: none"> • Were you thirsty? • Were enough fluids available to quench your thirst? <p>f. If thawing the food is an issue in the Arctic, what would you suggest to better thaw the rations?</p> <p>g. Did you normally (in operations/deployments) eat all of your rations? If not, why?</p> <ul style="list-style-type: none"> • What about in the Arctic: Did you eat everything in the rations? Explain. <p>h. Did you sometimes discard items from your rations? If so, why?</p> <p>i. Can you describe any changes you would like to see in the current rations and/or suggestions to improve feeding in the Arctic? Why those changes?</p> <p>j. How would you feel about eating dehydrated rations?</p>

TABLE I. (Continued)

Themes and main questions	Probes and follow-up questions
(Mood and morale)	a. How did you feel if you did not have enough food during the day?
4. Do you think that eating rations on Arctic training impacted your mood? Team morale?	b. Were there days when you did not have enough to eat? <ul style="list-style-type: none"> • How did this affect you? • How did this affect your performance?
(Influence of others)	a. What was the effect on your food intake?
5. Based on your experience training in the Arctic, was your food intake influenced by others (instructors and/or peers) participating in the training? How so?	b. What was the effect on your mood/psychologically/the way you felt?
(Physical impact/activity)	a. Describe your digestion of rations. Are they easily digestible? <ul style="list-style-type: none"> • Is this usually the case?
6. How did rations physically affect you, i.e., weight, digestion, satiety, hunger, appetite?	b. After eating a ration, did you feel full and satisfied (i.e., enough food)?
	c. Have you experienced a weight gain, weight loss or no weight change eating the rations during the AOA training? <ul style="list-style-type: none"> • What may have caused this? Please explain. • Did you expect this?
	d. How would you describe your usual exercise level? <ul style="list-style-type: none"> • What about during the AOA training?
	e. Was your appetite affected by the cold of other factors? Please describe.
(Snacks)	a. Were the snacks between meals in the field giving you sufficient energy?
7. Were you satisfied with the snacks available to you between meals?	b. What types of snacks did you normally have? <ul style="list-style-type: none"> • What do you prefer to eat as a snack on the go?
	c. How often did you eat them?
(Conclusion)	
8. Are there any final comments you would like to talk about regarding rations that we have not already discussed and that you think we should know about? If so, please explain.	

Some questions were adapted from interview guides used in previous studies.^{1,12}

pots with water over a heat source (i.e., portable gas stoves). However, no liquid water was readily available. Thus, soldiers brought ice blocks and chipped off ice to melt in pots before adding food. While main entrées were cooking, soldiers would eat snacks and small items (e.g., trail mix) that did not require thawing. Once meals were cooked and distributed, desserts were placed in cooking pots to thaw.

Many soldiers tried to address this challenge by putting small items (e.g., condiments) in their parka to help their thawing. However, it was not feasible for bigger items (Quote 1.2).

Several participants compared their Arctic experience with working in temperate regions, where they would not bother

warming rations (Quote 1.3). Moreover, since food needed thawing, many participants mentioned that everything they consumed was hot. In some cases, this deterred them from eating certain items (Quote 1.4), whereas it could also be a positive aspect for others (Quote 1.5).

Theme 2: Meal Preparation Time

Because of logistical challenges regarding meal preparation, allotted time for food preparation was critical. Most participants expressed concern about large amounts of time required to prepare meals in the Arctic (Quote 2.1, 2.2). Consequently, adequate time-planning was essential to find time to eat (Quote 2.3).

TABLE II. Quotes From Participating Soldiers Illustrating Main Themes and Theme Interactions Emerging from Individual Interviews About Combat Ration Use While Training in the Arctic (N = 16)

Themes	Quotes
	Main themes
1. Food/water temperature	<p>1.1 "I'm going to the field, the rations are going to be frozen, and I'm not going to eat very much. So eat more now, and then starve during the field ex[ercise], and then eat again." (P6)</p> <p>1.2 "In doctrine it says that you can put a ration inside of your coat. The thing is, would you want to put an ice block against your skin for a long time? Chances are no." (P10)</p> <p>1.3 "You can eat the rations cold usually. But in these temperatures, you couldn't 'cause they're blocks of ice. So it takes quite a long time to prepare them and thaw them out." (P2)</p> <p>1.4 "The main entrée and the dessert, when they aren't frozen in temperate climates, they are eaten. But since the dessert is an ice block, eating hot peaches or pears in syrup... it's so-so. You eat them as popsicles or you don't eat them." (P13)</p> <p>1.5 "I would say whenever you're cold though it's nice to eat a warm meal." (P3)</p>
2. Meal preparation time	<p>2.1 "Usually at least an hour. The very minimal, if we were really busy, would be 45 minutes." (P8)</p> <p>2.2 "So there could be good stuff in the ration, but you don't have time to really prepare it all, especially when it's all frozen." (P2)</p> <p>2.3 "It's really a time and preparation thing. If you're not thinking ahead, it's hard to do." (P10)</p> <p>2.4 "I know what we're supposed to eat and drink is nowhere near what we have time to eat and drink." (P4)</p> <p>2.5 "I don't recall actually skipping meals. Not required to, anyway. There was always enough time." (P8)</p>
3. Water availability	<p>3.1 "It's more labour-intensive to make the water and melt it. So as a result, you don't have a lot." (P2)</p> <p>3.2 "I would drink about half a litre of water with the meal, because that was the only time to resupply it. You had to boil it or melt the ice, or keep it hot so it wouldn't freeze in your thermos." (P16)</p> <p>3.3 "I would be curious to know how much more water you need to bring if it [ration] was dehydrated versus our rations – water is already in it." (P9)</p> <p>3.4 "It hit everyone after lunch. All the guys had a headache. Access to water was a very very influential factor." (P12)</p>
4. Personal preferences	<p>4.1 "I would always eat the main entrées. A couple times I didn't but that was just because I just didn't like the entrée I got." (P14)</p>
5. Food variety	<p>5.1 "I get it, you can only put so many things in there. So I think the variety is fine." (P14)</p> <p>5.2 "The problem we're having now is that that's the only variety we have, so people get sick of them, they don't want to eat them." (P2)</p> <p>5.3 "It would be fine if there is more variety for meals, however I would maybe prefer to have less but that are all good, than 25 varieties but 15 that are not edible." (P9)</p>

TABLE II. (Continued)

Themes	Quotes
	Main themes
6. Mood and morale	<p>6.1 “If there’s a chocolate bar I’ll throw it in there, ‘cause that’s always a morale booster.” (P7)</p> <p>6.2 “So definitely morale. [...] When you’re out in the field all the time, usually the only time you get a break or something to look forward to is mealtime. So it’s kind of like your whole day revolves around breakfast, lunch and dinner.” (P14)</p> <p>6.3 “So you’re eating the sugary stuff first. That is actually a benefit in my opinion. Morale is better than nutrition at that point.” (P10)</p> <p>6.4 “I would say it really affects your mood and your morale and your state of mind and just generally how you are feeling, which is going to give you more patience or impatience, from what you’ve eaten.” (P1)</p> <p>6.5 “All the guys I’ve seen and had experience with are a lot happier with fresh rations. And if we can hunt or fish or catch our food as well, that helps morale as well.” (P5)</p>
Theme interactions	
7. Mood and morale + Food variety	7.1 “Eating the same things over and over and over again is morale-killing, but like I said, I get it. You can only have so much variety in a box of food.” (P14)
8. Mood and morale + Food/water temperature	8.1 “Whenever you’re freezing cold, you get to eat a warm ration: I think it brings up morale after that.” (P3)
9. Meal preparation time + Food/water temperature	9.1 “It’s really time. It took time because everything was frozen.” (P11)

P = Participant.

Although meal preparation took lots of time, participants had split views regarding adequate time allotted for meals. This was directly linked to activities scheduled. For example, many skipped meals during field training (Quotes 2.4). To help mitigate lack of time, soldiers would eat snacks, such as chocolate bars, jerky, and fruit bars, instead of main meals. However, during another part of field training, time constraints were reduced and sufficient time was given (Quote 2.5).

Theme 3: Water Availability

A direct consequence of Arctic conditions was hindered water availability. Soldiers brought ice blocks needing melting to provide drinking and cooking water (Quote 3.1, 3.2). A common practice was having one soldier continuously melting ice, whereas others worked. Mobilizing one person for a few hours allowed enough water to be prepared.

When asked if freeze-dried rations would be feasible options to reduce frozen foods, many were concerned with difficulty in obtaining adequate water amounts to rehydrate food since this might be “too logistically heavy” (P12) in the Arctic. They were hesitant, but open to trying this option (Quote 3.3).

Some soldiers reported being dehydrated because of low water availability (Quote 3.4).

Theme 4: Personal Preferences

Personal preferences (taste, texture, etc.) with regard to rations greatly affected whether they were consumed. Foods that were appreciated were more likely to be eaten, and vice versa (Quote 4.1).

Also, some items, like the hot sauce, were well appreciated and made meals more enjoyable since “you can eat anything as long as it has the right condiments” (P10).

Moreover, some soldiers mentioned rations offered were good because of overall food quality.

Many suggested adding soups/broth to rations for the Arctic. Considering water is always warm, adding these options would be viable.

Theme 5: Food Variety

Dietary intake was also influenced by food variety offered. Participants had mixed opinions regarding meal variety: some saying variety was adequate and understood the complexity of developing rations (Quote 5.1), whereas others would prefer wider item variety (Quote 5.2). However, food quality was a priority over quantity (Quote 5.3).

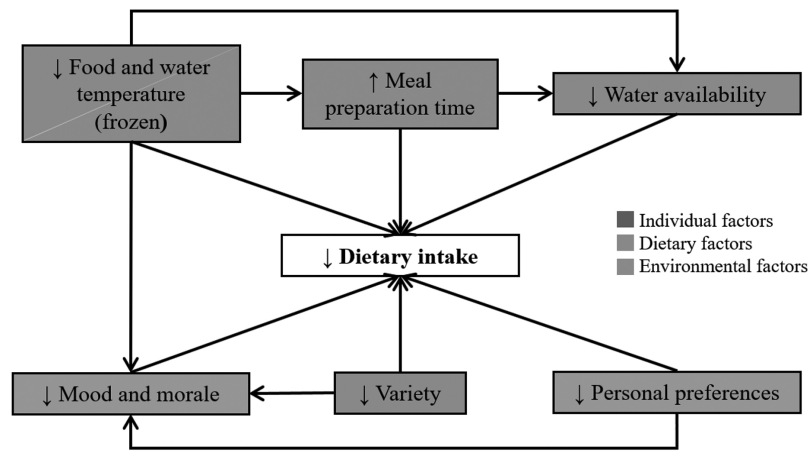


FIGURE 1. Main themes identified by participants and how they interacted to influence dietary intake of combat rations by soldiers training in the Arctic (n = 16).

Overall, 15 participants indicated that food variety was a necessary element of rations to accommodate different tastes since there is “no one-size-catches-all solution” (P10).

Theme 6: Mood and Morale

Another common theme was soldier mood and team morale. According to participants, combat rations themselves could positively contribute to morale and would therefore dictate dietary intake (Quote 6.1-6.3), and could impact behavior (Quote 6.4). In contrast, rations could also decrease group morale; less appreciated rations had negative impacts. Furthermore, returning to fresh-feeding after consuming rations was unanimously welcomed (Quote 6.5).

Theme Interactions

Some theme interactions were identified, namely between morale and food variety (Quote 7.1). Another soldier explained morale is closely tied to food temperature (Quote 8.1). Furthermore, when asked about main challenges to prepare rations in the Arctic, participants explained preparation time and food temperature were linked (Quote 9.1).

To summarize interview findings, main themes are presented (Fig. 1) to show interactions between factors that influenced intake of rations by soldiers in the Arctic.

DISCUSSION

This study documented CAF soldiers' perception of individual, dietary, and environmental factors influencing intake of combat rations during Arctic training. Research has shown that many factors are at play in regard to military feeding, but little is known about soldiers' lived-experiences in cold environments.

All participants brought up food/water temperature as a main barrier to consumption. The necessity to thaw food

required having cooking pots with water. Ironically, water was also frozen, making meal preparation a two-step process of melting ice, then thawing food. Water access was twofold: on one hand, there was no shortage of water since this region is covered in ice/snow almost year-round. On the other hand, water was only available in solid form because of extremely low temperatures, hence reducing its actual availability. Similarly, a study with Arctic military training reported frozen combat rations was the main challenge in this harsh environment, contributing to 74% of participants usually skipping lunch.¹¹ Access to drinking/cooking water was therefore directly affected by the environment, although not a limited resource per se. Another consideration about water provision was the amount of fuel needed to melt ice, adding to the operational complexity of food preparation.²¹ Hence, Arctic meal preparation with combat rations is a logistically and resource-heavy undertaking.

Inevitably, having frozen food meant more time was required to prepare meals. Combat rations are designed so that minimal preparation is needed. Indeed, participants unanimously agreed personal cooking skills did not influence their ability to prepare rations given they simply needed warming up. However, the preparation process suddenly became very complex and time-consuming in the Arctic. Fortunately, most participants reported having enough time to prepare meals, unlike other military settings.¹ In another study where focus groups were conducted with soldiers, all groups “talked about their leaders rushing them to eat and finish their meals in a minimum amount of time.”^{22(p85)}

To alleviate challenges regarding necessary time to prepare frozen rations, many countries have developed rations specifically designed for cold environments containing freeze-dried food.^{23,24} Dehydrated rations are more favorable in

terms of weight compared with current combat rations, i.e., ~1.5 kg/day versus ~2.7 kg/day for many countries with dehydrated rations.²³ Soldiers often choose ration items they plan on eating and throw out the rest, which reduces the load to carry and minimizes space.⁴ With adequate available water, freeze-dried rations could be beneficial, especially since heavier equipment/gear often get priority.²⁵ Furthermore, having combat rations for cold-weather operations could allow tailoring them to this environment; rations can be more energy dense to reflect elevated energy needs in cold climates.^{1,26}

As many participants reported, soldiers often do not warm up combat rations because of lack of time or simply not bothering taking time to do so in temperate climates. Keeping this in mind, ready-to-eat rations remain a better option for this environment. It would therefore be unreasonable to change all combat rations, used in various environments around the world, to dehydrated food. When developing rations, it is essential to consider what operationally works for environments military are working in and time availability to prepare meals. Trials with freeze-dried rations will help determine whether or not this is a feasible option in the Arctic, and compare them to current rations. If they are more labor intensive to prepare, it can reduce dietary intake since "increased effort is associated with less consumption."^{9(pK-29)}

As for variety, enhancing it should be pursued to increase overall satisfaction, tolerance and perceived combat ration quality.²⁷ Repetitive meal choices can contribute to menu fatigue.²³ Additionally, it is important to be attentive to food preferences and dislikes of the military, and strive to meet preferences of the target audience.²⁸ Taste-testing, preferably field-testing in the conditions in which rations will be used as opposed to a laboratory setting, can be done to evaluate items and guide future decisions.²⁹ Yet there needs to be a balance between accommodating military, and developing combat rations within the limits of available resources, knowing combat rations are temporary solutions until fresh-feeding is possible.

In this study, soldiers highlighted the importance of morale. Interestingly, morale is closely tied to personal preference: several soldiers greatly appreciated some items (e.g., chocolate bars, coffee) and referred to them as being "morale boosters," thus helping to increase their intake. This occurs regardless if soldiers are working in extreme heat or cold.³⁰ Moreover, low mood and morale "may adversely affect cognitive performance."^{7(p47)} Optimizing soldier performance not only includes physical health, but a psychological component as well.

As demonstrated in this study, the main factors affecting dietary intake were inter-related and cannot be studied in silo. Indeed, in Fig. 1, factors were categorized based on Meiselman's "Three Factor Model" which highlights that eating is influenced by the interaction between individual, dietary and environmental factors.⁹ As seen in our results,

these factors were dependent on one another. An improvement in one area will positively affect other aspects. However, the opposite can also happen. All factors need to be considered when designing combat rations for optimal dietary intake in the Arctic. For example, combat rations could be operationally suitable (e.g., easy to prepare, do not freeze), but if the majority of soldiers dislike them, they will unlikely consume them—or might, but out of pure necessity to provide energy. It is therefore in the military's best interest to develop combat rations better adapted to the environment in which soldiers work to reduce potential health effects of continuous underconsumption.³¹

This study has limits. There could be differences in factors influencing dietary intake in other training contexts where soldiers face different conditions and do different activities, which would affect their experience and perceptions about combat ration use. In addition, data were collected from a sample of soldiers, which limits generalizability to other populations. Although this study was centered on a given Arctic military training, the understanding of the complexity of factors affecting soldiers' intake will inform decision-making about various length and types of trainings in a variety of cold and extreme environments. Since only men participated in the 2019 AOA training, we were unable to obtain women's perspectives.

Underconsumption of food and energy deficits in military has been documented.⁴ However, little has been researched on qualitative levels to explore soldiers' perception and opinions with regard to ration use, even less so in the Arctic. This study is one of few qualitative studies focusing on military nutrition and documenting barriers and facilitators to intake of rations, especially in Canada. It provided an opportunity to revisit combat rations served in the Arctic. Necessary time to prepare and consume rations could be examined to promote intake by soldiers. To promote intake and morale, food appreciated by the majority could be identified in order to remain and be frequently included in rations. Also, varying the ration selection may be beneficial to increase appreciation, while keeping in mind food quality may be more important than variety.

CONCLUSIONS

These study results document that dietary intake of combat rations during Arctic field training is influenced by interactions of multiple factors related to individual, the diet and the environment: food/water temperature, meal preparation time, water availability, personal preferences, food variety, and soldier mood and team morale. This study stresses the need to be attentive to soldiers' perspectives and working conditions. Since the operational suitability of rations greatly depends on working environments, combat rations better adapted for specific extreme environments such as the Arctic could be developed to promote optimal intake, and in the long run, physical and mental health of soldiers. Given that many

interrelated factors influenced intake of participating soldiers, the military could benefit from further nutrition research to evaluate favorable changes within available resources and explore which other challenges related to soldiers' field intake could be addressed to optimize their performance and health.

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CONFLICT OF INTEREST STATEMENT

None declared.

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