Navigating ROTC and Corps of Cadets' Nutrition Knowledge and Perspectives on Dietary Intake and Behavior

Original Research

Sheyla Leon[1], Adriana Gil[2], Ryan J. Sowinski[1], Lisa C. Colvin[1,3], Steven E. Martin[1,3], Stella L. Volpe[4], & Drew E. Gonzalez[1,3,5]

[1]*Tactical Athlete Research Unit, Department of Kinesiology and Sport Management, Texas A&M University, College Station, TX*
[2]*College of Medicine, University of Houston, Houston, TX*
[3]*Sydney & JL Huffines Institute for Sports Medicine and Human Performance, Department of Kinesiology and Sport Management, Texas A&M University, College Station, TX*
[4]*Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA*
[5]*Occupational, Performance, and Nutrition Laboratory, Department of Kinesiology, Sam Houston State University, Huntsville, Texas, US*

Open Access

Published: September 29, 2025

Journal of Exercise and Nutrition: *2025, Volume 8 (Issue 1): 19*

ISSN: 2640-2572

Abstract

Introduction: Reserve Officer Training Corps (ROTC) and Corps of Cadets face unique challenges that make them susceptible to poor nutritional habits. We evaluated cadets' dietary beliefs, habits, barriers, and food choices, as well as general and sport nutrition knowledge.

Methods: Cross-sectional data were analyzed from 184 members of the University's ROTC and Corps of Cadets, using validated questionnaires, including the Nutrition Knowledge Questionnaire for Athletes (NKQA), the Food Choice Questionnaire (FCQ), the Rapid Eating Assessment for Participants, Shortened Version (REAP-S), and the Perceived Barriers to Healthy Eating. The categorical data were reported as frequencies (n) and percentages, and Chi-square ($\chi 2$) analyses were used to determine group independence ($p < 0.05$). Continuous data were checked for normality and then analyzed for differences between sexes and commission status using independent samples t-tests or Mann-Whitney U tests. Effects sizes were calculated using Cohen's d and interpreted as follows: <0.2 trivial, <0.5 small, <0.8 moderate, <1.2 large, and >1.2 very large.

Results: Participants exhibited poor overall nutrition knowledge (37.3±14.2%), with low scores for carbohydrates = 31.9±15.6%, protein = 52.6±20.7%, fat = 40.6±24.1%, vitamins = 35.3±23.2%, general nutrition = 29.1±14.6%, fluid = 28.8±20.4%, and sport nutrition = 36.2±17.5%. Further, the participants expressed being very willing (n=79, 42.9%) or willing (n=79, 42.9%) to change their dietary habits to healthier ones. However, a busy lifestyle (n = 164, 89.1%) and limited cooking facilities (n = 104, 56.5%) presented significant challenges to healthy eating.

Conclusions: The participants reported having poor nutrition knowledge but valued healthier eating and expressed a willingness to improve their dietary habits to healthier ones. These findings suggest cadets may benefit from practical, registered dietitian nutritionist (RDN)-supported nutrition educational interventions that build culinary skills and address barriers like limited cooking facilities. Structured programs promoting sustainable eating habits could further enhance nutrition knowledge and dietary behaviors.

Key Words: Military, Food Choice, Nutrition, Diet, Tactical Athlete.

Corresponding author: Drew E. Gonzalez, drewgonzalez@shsu.edu

Introduction

Reserve Officer Training Corps (ROTC) and Corps of Cadets are composed of professional soldiers and college students, making them a unique subset of the military. These cadets have to regularly navigate physically and mentally demanding military-specific training while balancing college academics and extracurriculars [1], which makes it challenging to maintain a healthy diet [1,2], as is the case with most tactical and occupational athletes [3-8]. Furthermore, ROTC and Corps of Cadets are expected to maintain a high level of cardiorespiratory/muscular fitness and a favorable body composition (i.e., more lean mass and less fat mass) [9,10]. Inherently, this necessitates an increased need for adequate energy and macronutrient provisions and nutrient timing. Yet, this population has a paucity of data regarding their general nutrition knowledge, with most reports focusing on selected barriers to healthy eating [1,2].

Healthy eating patterns across all life stages are a cornerstone of the United States (US) Dietary Guidelines for Americans [11]. Yet, dietary habits tend to be less than ideal among young adults [1,12-14]. Previous research has shown that college students tend to consume a poor diet consisting of higher amounts of sugary beverages and fewer servings of fruits and vegetables [13,15,16]. Among cadets, these trends are often more pronounced due to their unique occupational and academic demands, which further increase their risk of poor dietary habits [1,2]. For instance, Garron and Klein [1] assessed cadets' dietary habits and the prevalence of low energy availability (EA) and found that the cadets: 1) had clinically low EA (62%), with none of them meeting the optimal EA threshold, 2) were under the Military Dietary Reference Intakes (MDRI) for energy intake (15%), protein (46%), carbohydrates (23%), fats (23%), and fiber (7%), and 3) low EA was associated with higher body fat percentage and fat mass. Moreover, Daniels and Hanson [2] assessed Army ROTC cadets and showed they had an overall low sport nutrition knowledge alongside negative correlations between perceived barriers and fiber, vegetable, and vitamin consumption. Similarly, Purvis et al. [17] examined nutritional and health behaviors in 13,858 Active Duty, Reserve, and National Guard Soldiers and showed that only 38.7%, 22.2%, 16.8%, and 17.3% of participants met the US Dietary Guidelines for Americans recommended intakes for fruit, vegetable, whole grain, and fish, respectively. Collectively, these findings demonstrate that cadets face barriers to healthy eating, which are largely assumed to stem from the complexities of balancing the collegiate, personal, and military-specific elements of their daily lives.

Our research team has previously utilized an evidence-based, comprehensive battery of questionnaires to assess 1) self-reported barriers to optimizing dietary habits, 2) perceptions of factors that influence food choices, and 3) diet quality and willingness to change dietary habits among first responders [3]. Previous research on ROTC cadets has typically examined nutrition knowledge or dietary behaviors in isolation [1,2,8,14], which limits the ability to contextualize *why* certain barriers exist or *why* knowledge gaps persist (e.g., some influential factors may stem from limited access to nutrition education or structural barriers within training environments, such as limited cooking facilities). By integrating multiple validated questionnaires into a single assessment, our study aimed to build upon and expand prior ROTC-focused research, providing a more comprehensive understanding of cadets' nutrition-related challenges. Just as with other tactical personnel, evaluating the cadets' perceived barriers, beliefs, and habits, in addition to their general and sport-specific nutrition knowledge, can aid future pragmatic interventions (i.e., ones that teach the skill of cooking to the individual) to augment their knowledge base and improve health and performance-related outcomes. Additionally, it is essential to understand the common challenges and barriers that cadets face regarding healthy eating before implementing strategies to enhance nutrition, health, or performance-based outcomes. Therefore, the purpose of this study was to assess 1) perceived barriers to healthy eating and improving dietary habits, 2) perceptions of external/internal factors that influence food choices, 3) diet quality, 4) willingness to change current dietary habits, and 5) general and sport nutrition knowledge in cadets. We employed several evidence-based, comprehensive questionnaires to identify potential obstacles in optimizing diet and the current nutrition knowledge of cadets.

Methods

Participants and Experimental Design

Participants were sampled from the Texas A&M University ROTC and Corps of Cadets. Inclusion criteria were as follows: 1) must have been between 18 and 35 years of age at the time of response, 2) were currently part of Texas A&M University ROTC and/or Corps of Cadets (commissioned or non-commissioned), and 3) were willing to provide informed consent to participate. Potential participants who failed to meet these inclusion criteria were excluded from the study. This study was conducted in full accordance with the declaration of Helsinki. All experimental procedures subsequently described were approved by the Institutional Review Board of Texas A&M University (IRB2021-1189M).

This cross-sectional study was conducted during Spring 2022 (January to May) and evaluated data from the Texas A&M University ROTC and/or Corps of Cadets. Potential participants were identified through communication with

the Texas A&M University ROTC or Corps of Cadets training staff and were given access to the online survey link, where the informed consent process of the online survey was provided. Upon informed consent, the participants were prompted to click 'next' to start responding to the online series of questionnaires, which included the Nutrition Knowledge Questionnaire for Athletes (NKQA), the Rapid Eating Assessment for Participants - Shortened Version (REAP-S), the Food Choice Questionnaire (FCQ), and the Perceived Barriers to Healthy Eating. These questionnaires assessed general and sport nutrition knowledge, dietary eating patterns, attitudes, beliefs about factors influencing dietary intake, dietary quality, willingness to change current habits, and perceived barriers to eating a healthy diet. These questionnaires have been used previously by other tactical and occupational personnel [3]. Participants were instructed to complete the survey at their convenience, and there was no control over the time of day or day of the week during which the survey was completed. On average, completing the full set of questionnaires required approximately 3 hours and 54 minutes, and several participants completed the survey across multiple sittings due to time constraints (See limitation section).

Dietary Questionnaires

Continuous and categorical data were collected from validated surveys administered through an online Qualtrics link, including the NKQA, REAP-S, the FCQ, and the Perceived Barriers to Healthy Eating questionnaires. Reported internal consistency coefficient (ICC) data across several populations for these previously published questionnaires [3,18-24] are: 1) the NKQA: 0.85 [23]; 2) the REAP-S: 0.71 [25]; 3) the FCQ: 0.781–0.918 [26]; and 4) the Perceived Barriers to Health Eating: 0.73–0.77 [18]. The Nutrition Knowledge Questionnaire for Athletes (NKQA), based on the ACSM position stand [27], includes 145 questions across six domains: carbohydrates, protein, fat, vitamins/minerals, fluids, general nutrition, and sport nutrition [23]. Participants answered multiple-choice questions (e.g., identifying whether specific foods are high or low in carbohydrates). Responses were scored as correct or incorrect, and percentage scores were calculated for each subsection and overall nutrition knowledge. The 13-item REAP-S questionnaire [28,29] targeted how often the participants consumed various foods or dietary patterns during an average week and were categorized as 'usually/often,' 'sometimes,' or 'rarely/never.' The 36-item FCQ questionnaire [28,30-32] measured multidimensional factors regarding individual food choices and factor analysis of health, mood, sensory appeal, price, weight control, convenience, familiarity, and ethical concern [20] on a five-point Likert Scale ranging from 'not important' (score of 1) to 'very important'(score of 5). Finally, the 22-item Perceived Barriers to Healthy Eating questionnaire [18] assessed possible barriers to healthier dietary behaviors.

Statistical Analyses

All data analyses were performed through the IBM® Version 29 SPSS® statistical analysis software (IBM Corp., Armonk, NY, USA). The present sample size was a convenience sample based on the total number of respondents to the online questionnaire. Our research team sent several email advertisements to increase the response rate. The demographic data were checked for normality via a Shapiro-Wilk Test, then analyzed for differences between sexes and commission status (i.e., commissioning into the Army postgraduation [Army] vs. non-commissioned member of the Corps of Cadets [Corps]) via independent samples t-tests. Independent sample T-tests or Mann-Whitney U tests (if normality was violated) evaluated differences in NKQA responses between sexes and commission status. The correct responses (as counts and percentages) for the overall NKQA and its subsections are reported as mean and standard deviations. Effects sizes were calculated as Cohen's d (i.e., small effect, d=0.2; medium effect, d=0.5; and large effect, d=0.8) [33]. The categorical survey data were analyzed and reported as frequencies (n) and percentages. Chi-square (χ^2) analysis was used to determine group independence for categorical variables ($p<0.05$). The probability of type I errors (p-level) was <0.05, with statistical tendencies noted when p-values were between 0.05 and 0.10.

Results

Demographics

One hundred and eighty-four ROTC and Corps of Cadets (n=35 women; n=149 men) from Texas A&M University participated in the cross-sectional survey study. **Table 1** presents the demographic data for all participants, categorized by sex and commission status. No differences were found between commission status. However, differences were found between sexes for height, body weight, and body mass index (BMI); women were shorter, lighter, and had lower BMIs than men.

Table 1. Demographic data.

Variable	Occupation	N	Mean		SD	p-value	d
Age (years)	Army	119	18.8	±	1.4	0.597	0.073
	Corps	59	18.7	±	0.7		
	Women	35	18.6	±	0.7	0.521	0.164
	Men	149	18.8	±	1.3		
	Total	184	18.7	±	1.2		
Height (cm)	Army	118	176.2	±	8.6	0.395	0.075
	Corps	59	176.9	±	9.2		
	Women	34	165.5	±	8.7	<0.001	1.789
	Men	149	178.6	±	7.0		
	Total	183	176.2	±	8.9		
Weight (kg)	Army	118	74.5	±	12.6	0.893	0.008
	Corps	59	74.4	±	16.8		
	Women	34	62.8	±	11.2	<0.001	1.061
	Men	149	76.6	±	13.5		
	Total	183	74.0	±	14.1		
Body Mass Index (kg/m^2)	Army	118	23.9	±	3.1	0.995	0.046
	Corps	59	23.7	±	4.7		
	Women	34	22.9	±	3.7	0.028	0.285
	Men	149	24.0	±	3.7		
	Total	183	23.8	±	3.7		

Data represented as means ± standard deviation (SD).
Army: participants in Army Reserve Officer Training Corps (ROTC);
Corps: participants in Corps of Cadets
d: Cohen's d (effect size); cm: centimeters; kg: kilograms; m^2: meters squared
One participant only reported their age, resulting in n=184 for age, but n=183 for all other demographics.

Nutrition Knowledge Questionnaire for Athletes

Participants averaged 37.3±14.2% overall correct responses on the NKQA, wherein percentage scores for each subsection were as follows: carbohydrates = 31.9±15.6%, protein = 52.6±20.7%, fat = 40.6±24.1%, vitamins = 35.3±23.2%, general nutrition = 29.1±14.6%, fluid = 28.8±20.4%, and sport nutrition = 36.2±17.5%. No differences were found between commission status for the NKQA responses; however, there were statistically significant differences noted for the protein ($p=0.002$, $d=0.585$) and sport nutrition ($p=0.042$, $d=0.335$) NKQA sections, as female cadets reported lower nutrition knowledge compared to male cadets within these subsections.

Food Choice Questionnaire Results

Table 2 presents the FCQ results with chi-square analyses for sexes and commission status. Data within the table are presented as frequencies (n) and total percentages with the reported chi square statistic ($\chi 2$) and statistical significance or trends denoted as the following: ‡ = $p > 0.05$ to $p < 0.10$; * = $p < 0.05$; and ** = $p < 0.01$. The majority of cadets placed importance (i.e., reported 'important' or 'very important') on the following FCQ factors: 'keeps me healthy,' 'is nutritious,' 'is easily available,' 'keeps me awake and alert,' 'is high in protein,' 'is easy to prepare,' 'tastes good,' 'makes me feels good,' and 'is not expensive.' The chi-square analysis revealed differences between male and female cadets for the following FCQ factors: 'keeps me healthy,' 'keeps me awake and alert,' ' is high in protein,' 'is easy to prepare,' 'is good for my skin/teeth/hair/nails,' 'is not expensive,' 'is cheap,' 'take no time to prepare,' 'helps me relax,' 'is low in calories,' 'what I usually eat,' 'environmentally friendly packaging,' 'country of origin clearly marked,' 'from countries I approve of politically,' 'is like the food I ate when I was a child,' and 'cheers me up,'. The male cadets placed high importance on all of these FCQ factors as opposed to the female cadets, except for the following FCQ factors: 'is good for my skin/teeth/hair/nails,' 'take no time to prepare,' 'helps me relax,' 'is low in calories,' 'what I usually eat,' 'environmentally friendly packaging,' 'country of origin clearly marked,' 'from countries I approve of politically,' and 'is like the food I ate when I was a child.' In addition, the chi-square analysis revealed differences between commission status for the following FCQ factors: 'keeps me healthy,' 'tastes good,' 'helps me cope with my life,' and 'cheers me up'. The commissioned cadets placed high importance on the FCQ factors 'keeps me healthy' and 'tastes good' but placed low importance on 'helps me cope with my life' and 'cheers me up' compared to the non-commissioned cadets.

Table 2. Results from Food Choice Questionnaire

FCQ Factors	Not Important	Low Importance	Neutral	Important	Very Important	Sex	Commission
						χ^2	
Keeps me healthy	0 (0%)	1 (0.5%)	12 (6.5%)	100 (54.3%)	69 (37.5%)	6.696‡	6.798‡
Is nutritious	0 (0%)	1 (0.5%)	24 (13.0%)	92 (50.0%)	65 (35.3%)	3.524	2.579
Is easily available	1 (0.5%)	1 (0.5%)	16 (8.7%)	97 (52.7%)	67 (36.4%)	1.281	5.607
Keeps me awake and alert	0 (0%)	9 (4.9%)	24 (13.0%)	74 (40.2%)	75 (40.8%)	6.893‡	0.888
Is high in vitamins/ minerals	1 (0.5%)	12 (6.5%)	52 (28.3%)	58 (31.5%)	58 (31.5%)	6.274	1.906
Tastes good	0 (0%)	5 (2.7%)	28 (15.2%)	61 (33.2%)	88 (47.8%)	1.564	7.770‡
Is good value for money	0 (0%)	7 (3.8%)	38 (20.7%)	58 (31.5%)	79 (42.9%)	4.165	0.649
Helps control my weight	15 (8.2%)	32 (17.4%)	48 (26.1%)	52 (28.3%)	35 (19.0%)	3.881	1.883
Is high in protein	2 (1.1%)	4 (2.2%)	30 (16.3%)	64 (34.8%)	82 (44.6%)	25.054**	5.760
Is easy to prepare	2 (1.1%)	6 (3.3%)	39 (21.2%)	73 (39.7%)	62 (33.7%)	14.006**	5.705
Can be bought close to home or work	2 (1.1%)	8 (4.3%)	23 (12.5%)	74 (40.2%)	75 (40.8%)	7.094	2.495
Is good for my skin/ teeth/ hair/ nails	16 (8.7%)	39 (21.2%)	48 (26.1%)	46 (25.0%)	33 (17.9%)	8.400‡	7.091
Contains natural ingredients	14 (7.6%)	41 (22.3%)	51 (22.7%)	42 (22.8%)	34 (18.5%)	5.253	7.598
Can be cooked very simply	4 (2.2%)	15 (8.2%)	55 (29.9%)	70 (38.0%)	38 (20.7%)	6.604	2.829
Makes me feel good	2 (1.1%)	9 (4.9%)	30 (16.3%)	84 (45.7%)	54 (29.3%)	1.591	1.591
Is not expensive	0 (0%)	8 (4.3%)	28 (15.2%)	69 (37.5%)	75 (40.8%)	8.017*	1.148
Has no artificial ingredients	25 (13.6%)	45 (24.5%)	57 (31.0%)	32 (17.4%)	23 (12.5%)	4.844	3.767
Is low in fat	17 (9.2%)	44 (23.9%)	82 (44.6%)	23 (12.5%)	15 (8.2%)	5.654	4.076
Is cheap	2 (1.1%)	16 (8.7%)	53 (28.8%)	61 (33.2%)	49 (26.6%)	11.682*	6.855
Takes no time to prepare	9 (4.9%)	31 (16.8%)	52 (28.3%)	49 (26.6%)	39 (21.2%)	10.829*	4.193
Helps me relax	9 (4.9%)	25 (13.6%)	57 (31.0%)	57 (31.0%)	33 (17.9%)	10.922*	5.780
Helps me cope with stress	17 (9.2%)	35 (19.0%)	53 (28.8%)	47 (25.5%)	29 (15.8%)	3.118	2.398
Has a pleasant texture	13 (7.1%)	24 (13.0%)	52 (28.3%)	62 (33.7%)	30 (16.3%)	3.923	2.797
Is low in calories	38 (20.7%)	41 (22.3%)	68 (37.0%)	19 (10.3%)	15 (8.2%)	10.331*	2.900
Is high in fiber	12 (6.5%)	29 (15.8%)	82 (44.6%)	40 (21.7%)	18 (9.8%)	7.633	2.151
Is familiar to me	15 (8.2%)	23 (12.5%)	61 (33.2%)	64 (34.8%)	17 (9.2%)	4.148	2.685
Smells nice	11 (6.0%)	18 (9.8%)	45 (24.5%)	80 (43.5%)	27 (14.7%)	3.567	1.372
Helps me cope with life	34 (18.5%)	27 (14.7%)	54 (29.3%)	41 (22.3%)	25 (13.6%)	1.079	11.039*
What I usually eat	21 (11.4%)	33 (17.9%)	64 (34.8%)	41 (22.3%)	22 (12.0%)	14.396**	5.335
Environmentally friendly packaging	69 (37.5%)	26 (14.1%)	51 (27.7%)	26 (14.1%)	8 (4.3%)	19.638**	5.710
Country of origin clearly marked	62 (33.7%)	41 (22.3%)	52 (28.3%)	18 (9.8%)	8 (4.3%)	12.015*	4.106
From countries I approve of politically	88 (47.8%)	30 (16.3%)	41 (22.3%)	14 (7.6%)	7 (3.8%)	12.204*	4.246
Is like the food I ate when I was a child	42 (22.8%)	40 (21.7%)	58 (31.5%)	25 (13.6%)	16 (8.7%)	8.193‡	2.713
Cheers me up	22 (12.0%)	17 (9.2%)	63 (34.2%)	56 (30.4%)	23 (12.5%)	9.565*	9.112‡

Data are presented as frequencies (n) and total percentages. χ^2 = chi square statistic. ‡ denotes $p>0.05$ to $p<0.10$; * denotes $p<0.05$; ** denotes $p<0.01$

Rapid Eating Assessment for Participants Results

When asked, 'How willing are you to make changes in your eating habits in order to be healthier?', the majority of cadets reported being very willing (79, 42.9%) or willing (79, 42.9%), while only 18 (9.8%) and 5 (2.7%) of the cadets reported being neutral or not very willing, respectively. When asked if the cadet or a family member shops or cooks rather than eats takeout or at a restaurant, 157 (85.3%) responded 'yes' and 24 (13.0%) responded 'no.' Lastly, when asked if they felt well enough to shop for food or cook, 158 (85.9%) responded 'yes' and 21 (11.4%) responded 'no.' The chi-square analysis revealed no differences between sexes or commission status for these three REAP-S questions. The remainder of the REAP-S questions and respective chi-square analyses are presented in **Table 3**. Data within the table are presented as frequencies (n) and total percentages with the reported chi square statistic ($\chi 2$) and statistical significance or trends denoted as the following: ‡ = $p > 0.05$ to $p < 0.10$; * = $p < 0.05$; and ** = $p < 0.01$. More male cadets reported eating less whole grains/fiber, eating/drinking less dairy, and drinking less non-diet/fruity drinks than the female cadets. In addition, the male cadets reported eating more meat sources and using processed meat. Lastly, the commissioned cadets reported eating more meat sources than the non-commissioned cadets.

Table 3. Results from The Rapid Eating Assessment for Participants, Shortened Version Questionnaire

In an average week, how often do you? n (%)	Usually/Often	Sometimes	Rarely/Never	Sex	Commission
				χ^2	
Skip breakfast? (*n* = 182)	87 (47.3%)	73 (39.7%)	22 (12.0%)	5.448	0.555
Eat 4 or more meals from sit-down or take out restaurants? (*n* = 181)	76 (41.3%)	80 (43.5%)	25 (13.6%)	1.761	1.913
Eat less than 2 servings of whole grain products or high fiber starchy carbohydrates a day? (*n* = 181)	69 (37.5%)	86 (46.7%)	26 (14.1%)	6.763*	0.697
Eat less than 2 servings of fruit a day? (*n* = 182)	44 (23.9%)	88 (47.8%)	50 (27.2%)	0.092	0.671
Eat less than 2 servings of vegetables a day? (*n* = 182)	56 (30.4%)	90 (48.9%)	36 (19.6%)	1.031	1.311
Eat or drink less than 2 servings of milk, yoghurt, or cheese a day? (*n* = 181)	55 (29.9%)	89 (48.4%)	37 (20.1%)	19.758**	0.888
Eat more than 7.5 oz of meat, chicken, turkey or fish per day? (*n* = 182)	36 (19.6%)	66 (35.9%)	80 (43.5%)	16.036**	7.743*
Use regular processed meats? (*n* = 182)	45 (24.5%)	103 (56.0%)	34 (18.5%)	5.114‡	0.367
Eat fried foods such as fried chicken, fried fish, fries/ chips? (*n* = 181)	31 (16.8%)	99 (53.8%)	51 (27.7%)	4.080	0.169
Eat regular potato chips, nacho chips, corn chips, crackers, regular popcorn, nuts instead of pretzels, low-fat chips or low- fat crackers, air-popped popcorn? (n = 181)	57 (31.0%)	85 (46.2%)	39 (21.2%)	1.570	1.097
Add butter, margarine or oil to bread, potatoes, rice or vegetables? (n = 182)	86 (46.7%)	73 (39.7%)	23 (12.5%)	4.297	0.207
Eat sweets like cake, cookies, pastries, donuts, muffins, chocolate and candies more than 2 times per day? (n = 182)	64 (34.8%)	84 (45.7%)	34 (18.5%)	0.052	3.424
Drink 16 oz or more of non-diet soda, fruit drink? (*n* = 182)	99 (53.8%)	57 (31.0%)	26 (14.1%)	5.667‡	0.476

Data are presented as frequencies (n) and total percentages. χ^2 = chi square statistic. ‡ denotes $p>0.05$ to $p<0.10$; * denotes $p<0.05$; ** denotes $p<0.01$. Note: each question lists the total number of participants who responded within the first column: (*n* = "total number of responses").

Perceived Barriers to Healthy Eating Results

The perceived barriers to healthy eating results are presented in **Table 4**. Data within the table are presented as frequencies (n) and total percentages with the reported chi square statistic ($\chi 2$) and statistical significance or trends denoted as the following: ‡ = $p > 0.05$ to $p < 0.10$; * = $p < 0.05$; and ** = $p < 0.01$. The main barriers reported included a busy lifestyle, limited cooking facilities, irregular working hours, the price of healthy foods, limited choices when eating out, and insufficient food to satisfy hunger. The chi-square analysis revealed differences between the sexes for the barriers 'unappealing food,' and 'experts keep changing their minds,' with a tendency toward statistical significance for 'healthy food is more awkward to carry from shops.'. The male cadets reported these three as perceived barriers more than the female cadets. There was also a tendency toward statistical significance between commission statuses for the barrier 'feeling conspicuous amongst others' ($\chi^2=3.448$, $p=0.063$), wherein the commissioned cadets reported this barrier less than the non-commissioned cadets.

Discussion

The primary study findings demonstrate that cadets 1) expressed a willingness to change their current dietary habits, 2) have poor general and sport nutrition knowledge, and 3) are influenced by several factors and perceived barriers, such as protein content or busy lifestyle, irregular working hours, and limited cooking facilities. These findings corroborate previous reports by Garron and Klein [1] and Daniels and Hanson [2], who reported 1) low nutritional knowledge and 2) lack of time due to busy schedules and cadet time commitments as key barriers to healthy eating among small cohorts of ROTC cadets. Identifying barriers and influences on healthy eating is a key step in finding pragmatic solutions for cadets to leverage in their busy lives, and these findings help to build upon the knowledge base related to cadet nutrition. Thus, future interventions could be tailored to overcome potential obstacles and improve adherence to a healthier diet by understanding cadet nutritional knowledge, the perceived barriers to healthy eating, and the various factors influencing food choices.

Table 4. Results from The Perceived Barriers to Healthy Eating Questionnaire.

What barriers to healthy eating can you identify with? n (%)	Overall	Sex	Commission
		χ^2	
Busy lifestyle	164 (89.1%)	0.014	0.000
Irregular working hours	88 (47.8%)	0.225	0.003
Lengthy preparation	66 (35.8%)	0.371	2.259
Price of healthy foods	79 (42.9%)	0.000	0.634
Cooking skills	55 (29.8%)	1.020	0.530
Not knowing enough about healthy eating	66 (35.8%)	0.030	1.880
Not enough food to satisfy hunger	71 (38.5%)	1.830	0.031
Limited choices when I eat out	78 (42.3%)	0.676	0.497
Giving up foods I like	33 (17.9%)	0.018	0.444
Willpower	57 (30.9%)	0.004	2.316
Unappealing food	59 (32.1%)	4.418*	0.069
Taste preferences of family and friends	29 (15.7%)	1.683	0.070
Healthy food is more perishable	48 (26.1%)	0.640	0.325
Strange or unusual foods	31 (16.8%)	2.113	0.765
Experts keep changing their minds	27 (14.6%)	7.433*	1.833
Storage facilities	54 (29.3%)	0.275	1.824
Limited cooking facilities	104 (56.5%)	2.554	0.004
Healthy options not available canteen/home	61 (33.1%)	0.915	1.166
I don't want to change my eating habits	25 (13.5%)	0.171	0.237
Healthy food is more awkward to carry from shops	13 (7.1%)	3.286‡	0.179
Too great a change from my current diet	18 (9.7%)	0.072	2.567
Feeling conspicuous amongst others	11 (5.9%)	0.749	3.448‡

Data are presented as frequencies (n) and total percentages. χ^2 = chi square statistic. ‡ denotes $p>0.05$ to $p<0.10$; * denotes $p<0.05$; ** denotes $p<0.01$. Note: The response rate is the reported frequency.

College presents unique challenges to cadets, as these individuals must balance numerous physical training and collegiate/academic obligations [1,2] while finding stability in lifestyle choices with their new found responsibilities as young adults [34,35]. Given the time constraints of cadets' schedules, convenience could be a key factor in healthy eating. As demonstrated by the results of the REAP-S questionnaire, revealing that 85.8% of cadets expressed a willingness to change their dietary habits, with 42.9% being 'very willing' and 42.9% being 'willing', while also reporting eating takeout or at restaurants, fried foods, highly processed foods (e.g., potato chips), and sweets (e.g., cakes, cookies, etc.); adding butter, margarine, or oil to their foods, usually/often or sometimes. Further, most cadets reported eating more than 7.5 oz of protein sources 'rarely/never.' These findings suggest that the cadets may gravitate toward the more convenient food options rather than ones requiring more preparation time (i.e., protein sources). It is important to note that the males and commissioned cadets reported eating more meat sources ($\chi^2=16.036$, $p<0.001$ and $\chi^2=7.743$, $p=0.021$, respectively) than their female and non-commissioned counterparts. These differences may reflect varying dietary priorities or access to food sources, though further research is needed to explore the underlying reason for this finding. In addition, with convenience as a consideration, it is reasonable to think that at least some of the cadets of the present study skipped breakfast due to having early morning physical training and/or classes. However, as shown by Garron and Klein [1], cadets who skip breakfast do not consume the necessary energy or macronutrient to support the high physical demands of training. Thus, there is a need to identify nutrition strategies to help cadets consume a reasonable amount of energy and key nutrients before and after physical training. One potential strategy to improve cadet nutrition may be to host educational classes/sessions. For instance, Boyum and colleagues [14] assessed Army ROTC cadets' general and sport nutritional knowledge using the Abridged Nutrition for Sport Knowledge Questionnaire (ANSKQ) pre-post nutrition education sessions with a registered dietitian nutritionist (RDN) and found that their overall general and sport nutrition knowledge improved by ≈12.3% and ≈7.8% post-intervention. This underscores the need for nutrition education among cadets, and it is likely that through educational sessions with an RDN, cadets can better identify healthy, convenient food options to overcome the perceived barrier of lack of time or access to/pricing of healthy food options (subsequently discussed). While only speculative, this finding may suggest that 1) female cadets may need to emphasize dietary protein sources and 2) the commissioned cadets may consume more dietary protein sources to augment training and performance outcomes as they advance toward a career in the military while the non-commissioned cadets do not have the same incentives or motivators. Future work is warranted to explore the potential sex and commission status differences in nutritional habits and patterns.

Cadets reported a busy lifestyle (89.1%), limited cooking facilities (56.5%), irregular working hours (47.8%), the price of healthy foods (42.9%), limited choices when eating out (42.3%), and insufficient food to satisfy hunger (38.5%) as perceived barriers to healthy eating. In addition, regarding the FCQ questionnaire results, the cadets appear to consider whether the foods are healthy, have protein, are easy to prepare, nutritious, easily available, keep them awake and alert, taste good, and are not expensive when making decisions on what foods to include in their diet. These barriers and food choice factors further emphasize that time and convenience are important to healthy eating among cadets. Furthermore, considering it is the most commonly reported, there seems to be a critical need to identify pragmatic strategies to overcome having a busy lifestyle as a barrier to healthy eating. Possible interventions could include RDN-supported nutrition education sessions/classes, especially if the focus incorporates how these individuals can prepare healthier meals at home or order healthy takeout options. In addition, planning nutrition around physical training, academic classes, and extracurricular activities can help ensure optimal energy, macronutrient, and micronutrient provisions. It is important to note that the pragmatic nutrition strategies for healthy eating need to meet each cadet's current situation concerning their eating habits, patterns, and barriers (i.e., meet them where they are). For instance, considering the limited access to cooking facilities, it may be helpful to educate cadets in their respective cafeteria settings so that they can navigate healthy eating in communal dining halls until they gain access to cooking facilities later in their collegiate journey. Regarding the barrier of 'insufficient food to satisfy hunger,' identifying nutrient and healthy, calorically dense food options (i.e., protein shakes and bars, meal replacements, healthy grab-and-go snacks, etc.) that can be consumed in between various ROTC/academic-specific events may help satisfy hunger. Given that the cadets reported consuming lower meat protein sources, it is plausible that increasing protein snacks and food options can help satisfy hunger and ensure optimal protein intake. College is a critical time to emphasize nutrition for cadets, especially among the commissioned cadets who plan to assume key roles within the military post-graduation. Future research should consider these identified barriers and aim to educate cadets about healthy food options and how to implement healthy eating strategies.

Improving the nutritional knowledge base of cadets is paramount to successfully implementing and adhering to healthy eating strategies. The present study's findings demonstrate that the cadets exhibit poor general and sport nutrition knowledge and subsection knowledge regarding carbohydrate, protein, fat, vitamin, and fluid intakes. Previously, Boyum et al. [14] demonstrated that 33 Army ROTC cadets exhibited poor nutritional knowledge before undergoing a nine-week RDN-supported educational nutrition course, whereby post-intervention, the cadets expressed adequate general and sport nutrition knowledge. Riviere and colleagues [36] also critically reviewed the current literature regarding the impact of sports dietitians among collegiate-level athletes and concluded that student-athletes do not have the nutritional knowledge necessary to support the physical demands of their sport best. Therefore, it is plausible that cadets, like student-athletes, could benefit from incorporating RDN and sports dietitians, who have the expertise to ensure proper nutrient provisions and timing before, during, and after physical training and throughout the day. It is worth noting that the tactical and occupational athlete would likely benefit from having a performance team (similar to a sports performance team) comprising RDN and strength coaches. There has been an increased focus on health and fitness programs among military personnel to improve overall health, physical performance, and occupational readiness [37,38]. Commissioned cadets could benefit from these programs, especially ones that prioritize nutrition or include education from an RDN. Future intervention studies are warranted to build upon what Boyum et al. [14] reported, and monitor nutritional knowledge and dietary habits across the entire collegiate career or cadets.

Strengths and Limitations

The main strength of our study is that we used validated nutrition questionnaires among a fairly large sample size with the inclusion of sexes and commission status in comparison to similar work [1,2,14]. The questionnaires also provided a more comprehensive insight into the cadets' eating habits, patterns, beliefs, barriers, and nutritional knowledge. Nonetheless, our study is not without limitations. First, we utilized a non-probabilistic convenience sample. Therefore, strict interpretations of these results are not appropriate as these results may not be indicative of other regions and areas throughout the US. Future work should include cadets from multiple institutions and different branches of the military, because these groups may vary in access to resources, daily schedules, or nutritional programs, all of which could influence dietary habits and perceived barriers in different ways. Second, we did not assess the status of underclassmen and upperclassmen. It is plausible that upperclassmen may have more control over their schedules and have moved off campus, giving them greater access to cooking facilities, grocery stores, and autonomy over their diet, which could influence their food choices and eating behaviors. However, this is yet to be elucidated. Third, our study used a cross-sectional design, which limits causal inference and prevents assessment of changes over time or in response to interventions. Fourth, while the questionnaires are validated, it is important to consider that the answers are all self-reported; thus, the continuous data may not be as accurate as we would like and may be influenced by social

desirability bias, where cadets report what they believe is expected rather than their true habits, resulting in under- or over-reporting dietary patterns. Lastly, we did not control for the specific time of day or day of the week when cadets completed the survey, which may have introduced variability due to fluctuations in recall accuracy or recent eating behaviors. On average, completing the full battery of questionnaires took approximately 3 hours and 54 minutes, and not all participants were able to do so in one sitting. While this stop-start completion style may have influenced some responses, it also reflects the demanding and fragmented nature of cadet schedules, as surveys were administered during designated class time under the supervision of instructors. Another likely explanation for the stop-start completion style and long duration may be response fatigue from completing long questionnaire batteries, which is a challenge with comprehensive batteries, such as ours. In the future, researchers should consider standardizing the time of administration and implementing a time limit to reduce variability and improve data consistency.

Conclusions

Perceived barriers, such as a busy lifestyle, limited access to cooking facilities, and food pricing, present challenges to healthy eating among ROTC and Corps of Cadets. While these individuals are willing to change their current dietary habits to healthier ones, future work is needed to identify ways to overcome these barriers. Given the cadets' poor general and sport nutritional knowledge scores, RDN-support educational interventions are warranted to boost their knowledge base. From there, dietary intervention studies (i.e., the Mediterranean diet) may be warranted to help these personnel eat healthier while improving their cardiometabolic health and performance outcomes. Future work should consider a multi-institutional assessment of cadets to gain better insight into eating habits, patterns, beliefs, barriers, and nutritional knowledge and how these may differ depending on region or branch. Ultimately, targeted and accessible nutrition education tailored to cadets' unique barriers and environments may help bridge the gap between their willingness to change and practical dietary action among this population. Specifically, the cadets may benefit from practical, RDN-supported nutrition education in interventions that build upon a culinary skillset (i.e., teaching the individual how to cook, navigate the grocery store, and utilize cooking equipment within a context of limited facilities). This style of educational intervention could help cadets overcome barriers to healthier eating and may promote better, long-term, sustainable eating patterns that support their overall health and performance. As such, future research is warranted to explore the implementation of culinary nutrition intervention programs among cadets, as well as other tactical and occupational personnel.

Acknowledgements

The authors thank the Texas A&M University ROTC and Corps of Cadets who participated in the study survey.

References

1. Garron T, Klein DJ. Male Army ROTC Cadets Fail to Meet Military Dietary Reference Intakes and Exhibit a High Prevalence of Low Energy Availability and Poor Sleep Quality. *J Funct Morphol Kinesiol*. Jul 5 2023;8(3)doi:10.3390/jfmk8030095
2. Daniels E, Hanson J. Energy-Adjusted Dietary Intakes Are Associated with Perceived Barriers to Healthy Eating but Not Food Insecurity or Sports Nutrition Knowledge in a Pilot Study of ROTC Cadets. *Nutrients*. Aug 31 2021;13(9)doi:10.3390/nu13093053
3. Gonzalez D, Gil A, Sowinski R, Mackenzie-Shalders K, Martin S, Orr R. Navigating Occupational Challenges: First Responders' Perspectives on Dietary Intake and Behavior. *Journal of Exercise and Nutrition*. 2024;7(1)
4. MacKenzie-Shalders K, Matthews C, Dulla J, Orr R. Law enforcement personnel are willing to change, but report influencing beliefs and barriers to optimised dietary intake. *BMC Public Health*. 2020/11/02 2020;20(1):1638. doi:10.1186/s12889-020-09716-z
5. MacKenzie-Shalders KL, Lee KW, Wright C, Dulla J, Tsoi A, Orr RM. Dietary Intake in Law Enforcement Personnel: Occupation Is an Additional Challenge for Changing Behavior. *Nutrients*. Mar 23 2022;14(7)doi:10.3390/nu14071336
6. Chukwura CL, Santo TJ, Waters CN, Andrews A. 'Nutrition is out of our control': soldiers' perceptions of their local food environment. *Public Health Nutr*. Oct 2019;22(15):2766-2776. doi:10.1017/s1368980019001381
7. Sheafer KA, Lee DM, George B, Jayne JM, Cole RE. Nutrition Knowledge Is Associated With Diet Quality Among US Army Soldiers. *Journal of Nutrition Education and Behavior*. 2023/10/01/ 2023;55(10):748-754. doi:https://doi.org/10.1016/j.jneb.2023.07.008
8. Troncoso MR, NC, USN, Jayne JM, SP, USA, Robinson DJ, BSC, USAF, Deuster PA, PhD, MPH. Targeting Nutritional Fitness by Creating a Culture of Health in the Military. *Military Medicine*. 2021;186(3-4):83-86. doi:10.1093/milmed/usaa325

9. Gonzalez DE, McAllister MJ, Waldman HS, et al. International society of sports nutrition position stand: tactical athlete nutrition. *J Int Soc Sports Nutr*. 2022;19(1):267-315. doi:10.1080/15502783.2022.2086017
10. Scofield DE, Kardouni JR. The tactical athlete: a product of 21st century strength and conditioning. *Strength & Conditioning Journal*. 2015;37(4):2-7.
11. Snetselaar LG, de Jesus JM, DeSilva DM, Stoody EE. Dietary guidelines for Americans, 2020–2025: understanding the scientific process, guidelines, and key recommendations. *Nutrition today*. 2021;56(6):287-295.
12. Abbey EL, Wright CJ, Kirkpatrick CM. Nutrition practices and knowledge among NCAA Division III football players. *Journal of the International Society of Sports Nutrition*. 2017;14:1-9.
13. Association ACH. National College Health Assessment II-Undergraduate Student Reference Group Data Report Fall 2016. *Available at: https://www.acha.org/documents/ncha/NCHA-II_FALL_2017_REFERENCE_GROUP_DATA_REPORT_ UNDERGRADS_ONLY pdf Updated March*. 2018;29
14. Boyum L, Franks C, Kostelnik S, Andre T, Valliant M, Joung H-W. The Assessment of Nutrition Knowledge in ROTC Cadets. *Journal of Exercise and Nutrition*. 2024;7(1)
15. Association ACH. National college health assessment II: Undergraduate student reference group data report spring 2019. *Retrieved October*. 2019;31:2020.
16. Association ACH. National College Health Assessment II: Undergraduate students reference group executive summary spring 2014. *ACHA: Hanover, MD, USA*. 2015;
17. Purvis DL, Lentino CV, Jackson TK, Murphy KJ, Deuster PA. Nutrition as a component of the performance triad: how healthy eating behaviors contribute to soldier performance and military readiness. *US Army Med Dep J*. Oct-Dec 2013:66-78.
18. Spence M, Livingstone MBE, Hollywood LE, et al. A qualitative study of psychological, social and behavioral barriers to appropriate food portion size control. *International Journal of Behavioral Nutrition and Physical Activity*. 2013;10:1-10.
19. Kearney M, Gibney MJ, Martinez JA, et al. Perceived need to alter eating habits among representative samples of adults from all member states of the European Union. *Eur J Clin Nutr*. Jun 1997;51 Suppl 2:S30-5.
20. Dellava JE, Hamer RM, Kanodia A, Reyes-Rodríguez ML, Bulik CM. Diet and physical activity in women recovered from anorexia nervosa: a pilot study. *International Journal of Eating Disorders*. 2011;44(4):376-382.
21. Johnston CS, Bliss C, Knurick JR, Scholtz C. Rapid Eating Assessment for Participants [shortened version] scores are associated with Healthy Eating Index-2010 scores and other indices of diet quality in healthy adult omnivores and vegetarians. *Nutr J*. Sep 28 2018;17(1):89. doi:10.1186/s12937-018-0399-x
22. Lam R, Riggs J, Sunseri M, et al. Nutritional assessment of the world trade center-health program fire department of New York cohort. *C43 COPD AND POPULATION HEALTH*. American Thoracic Society; 2019:A4877-A4877.
23. Furber M, Roberts J, Roberts M. A valid and reliable nutrition knowledge questionnaire for track and field athletes. *BMC Nutrition*. 04/12 2017;3doi:10.1186/s40795-017-0156-0
24. Spence M, Livingstone M, Hollywood L, et al. A qualitative study of psychological, social and behavioral barriers to appropriate food portion size control. *The international journal of behavioral nutrition and physical activity*. 08/01 2013;10:92. doi:10.1186/1479-5868-10-92
25. Shankar V, Thompson KH, Wylie-Rosett J, Segal-Isaacson CJ. Validation and reliability for the updated REAP-S dietary screener, (Rapid Eating Assessment of Participants, Short Version, v.2). *BMC Nutr*. Jul 19 2023;9(1):88. doi:10.1186/s40795-023-00747-4
26. Markovina J, Stewart-Knox B, Rankin A, et al. Food4Me study: Validity and reliability of Food Choice Questionnaire in 9 European countries. *Food Quality and Preference*. 05/14 2015;45:26-32. doi:10.1016/j.foodqual.2015.05.002
27. Rodriguez NR, Di Marco NM, Langley S. American College of Sports Medicine position stand. Nutrition and athletic performance. *Medicine and science in sports and exercise*. 2009;41(3):709-731.
28. Segal-Isaacson C, Wylie-Rosett J, Gans KM. Validation of a short dietary assessment questionnaire: the Rapid Eating and Activity Assessment for Participants short version (REAP-S). *The Diabetes Educator*. 2004;30(5):774-781.
29. Gans KM, Ross E, Barner CW, Wylie-Rosett J, McMurray J, Eaton C. REAP and WAVE: new tools to rapidly assess/discuss nutrition with patients. *The Journal of nutrition*. 2003;133(2):556S-562S.
30. Kearney JM, McElhone S. Perceived barriers in trying to eat healthier–results of a pan-EU consumer attitudinal survey. *British Journal of Nutrition*. 1999;81(S1):S133-S137.

31. Dawes JJ, Orr RM, Siekaniec CL, Vanderwoude AA, Pope R. Associations between anthropometric characteristics and physical performance in male law enforcement officers: A retrospective cohort study. *Annals of occupational and environmental medicine*. 2016;28:1-7.
32. Cunha LM, Cabral D, Moura AP, de Almeida MDV. Application of the Food Choice Questionnaire across cultures: Systematic review of cross-cultural and single country studies. *Food quality and preference*. 2018;64:21-36.
33. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Front Psychol*. Nov 26 2013;4:863. doi:10.3389/fpsyg.2013.00863
34. Frech A. Healthy Behavior Trajectories between Adolescence and Young Adulthood. *Adv Life Course Res*. Jun 1 2012;17(2):59-68. doi:10.1016/j.alcr.2012.01.003
35. Escoto KH, Laska MN, Larson N, Neumark-Sztainer D, Hannan PJ. Work hours and perceived time barriers to healthful eating among young adults. *Am J Health Behav*. Nov 2012;36(6):786-96. doi:10.5993/ajhb.36.6.6
36. Riviere AJ, Leach R, Mann H, et al. Nutrition Knowledge of Collegiate Athletes in the United States and the Impact of Sports Dietitians on Related Outcomes: A Narrative Review. *Nutrients*. May 22 2021;13(6)doi:10.3390/nu13061772
37. Parks AG, Murrah WH, Weimar WH, et al. Impact of Two Types of Fitness Programs on Soldier Physical Fitness. *Int J Exerc Sci*. 2022;15(4):1326-1346.
38. Sax van der Weyden M, Toczko M, Fyock-Martin M, Martin J. Relationship between a Maximum Plank Assessment and Fitness, Health Behaviors, and Moods in Tactical Athletes: An Exploratory Study. *Int J Environ Res Public Health*. Oct 7 2022;19(19)doi:10.3390/ijerph191912832