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Research Article

Safety education status and needs priorities of Korean military food service personnel using the Borich Needs Assessment and the Locus for Focus model: a cross-sectional study

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Objectives: Since the enactment of the *Serious Accidents Punishment Act* in Korea in 2021, the importance of safety management in food service facilities has increased. This study was conducted to examine the status of safety education and to identify educational needs for safety accident prevention among army food service personnel.
Methods: This study included 157 food service personnel from Army units located in Gyeongsangnam-do. Participants were divided into two groups based on the daily number of meals served. Demographic characteristics, the status of safety education, and priority for safety accident prevention education were evaluated.
Results: A total of 97.5% of participants received safety education, with 60.8% attending at least monthly. "Lecture" (63.4%) was the most commonly used educational method. The preferred educational methods were "Lecture" (23.5%) and "Counselling" (23.5%), showing significant group differences ($P < 0.001$). A total of 79.6% of participants reported applying the educational content in their performance. The mean importance score for safety accident prevention (4.78) was higher than the performance score (4.44), with significant differences between the two groups observed in the importance scores ($P < 0.05$). "Slip & burn" had the highest importance score, while "Electric shock and fire" had the highest performance score. The educational needs analysis revealed that the highest priority item for the < 100 meals group was "When moving heavy items, an assistive device or assistance from colleagues should be utilized", while for the ≥ 100 meals group, it was "When using a vegetable cutter or grinder, use an exclusive stick."
Conclusion: This study can serve as a foundational database for developing customized safety education programs tailored to Korean army food service personnel.

Keywords: safety; education; food service; military personnel

INTRODUCTION

In Korea, military food service is a core element directly related to ensuring soldiers' nutritional intake for health and maintaining combat readiness. It also significantly influences the operational efficiency of the military army organization and the quality of life in barracks [1, 2]. Recently, in Korea the *Basic Act on Military*

Food Service was enacted to reflect this importance [3]. Personnel responsible for military food service include logistics officers, supply officers, food service managers, supply and food service coordinators, dietitians, civilian cooks, and military cooks, each with distinct roles and responsibilities. These personnel are responsible for a wide array of tasks, including meal planning, food procurement, production, hygiene, and safety management within space- and time-constrained environments [4]. These facilities are particularly vulnerable to physical, chemical, and biological hazards, resulting in frequent accidents, such as burns, cuts, slips, and musculoskeletal injuries [5-7]. In response to increasing concerns about workplace safety, the *Serious Accidents Punishment Act* was enacted in Korea in 2021 to emphasize the need for more robust safety management in food service settings [8]. Military cooks, who comprise the majority of food service personnel, receive only three weeks of initial training after enlistment, underscoring the need for continuous and practical safety education [9]. However, current education is mostly top-down and instruction-based, often failing to reflect real-world conditions and the specific needs of food service personnel [10]. Therefore, the need for practical and effective education to prevent safety accidents has become apparent. To design such safety education, a prior analysis of education needs that reflects the job roles and circumstances of the target trainees is essential [7, 11].

The Borich Needs Assessment quantitatively prioritizes educational needs by measuring the weighted gap between perceived importance and current performance. While it provides objective and precise identification of priority areas, its results may be less accessible without visual interpretation [12, 13]. The Locus for Focus model complements this by visually mapping importance and performance into four quadrants, facilitating intuitive recognition of critical educational priorities. However, it offers less quantitative precision compared to Borich. Integrating both models leverage their respective strengths, combining robust numerical analysis with clear visual prioritization to enhance the accuracy and usability of needs assessments [14]. These models have been effectively applied across multiple disciplines, including healthcare, education, and food service [7, 12-14, 15, 16]. Despite the critical importance of military food service safety, research in this field remains limited due to concerns over national security and accessibility [17]. Moreover, few studies have examined how variations in unit size and meal volume affect educational needs. Based on the *Food Sanitation Act*, industrial foodservice facilities serving < 100 meals are classified as small-scale and are not required to employ a dietitian or a cook [18]. However, specific standards for the deployment of nutritionists and cooks within military foodservice facilities have not been established.

This study aimed to analyze the educational needs for safety accident prevention among Korean army food service personnel in Gyeongsangnam-do, using the Borich Needs Assessment and the Locus for Focus model. To reflect differences in the scale of food service facilities, the analysis was conducted by dividing participants into groups based on the daily number of meals served (< 100 and ≥ 100). This study is expected to provide practical foundational data not only for identifying the priorities of educational content but also for developing customized safety education programs tailored to the scale of each military unit.

METHODS

Ethics statement

The informed consent was obtained from all participants for the survey. The survey procedures and protocols were approved by the institutional review board of Changshin University (Approval No. 104271-201501-HR-022). Additionally, the Security Office of the army unit conducted a security review.

1. Study design

This cross-sectional study was described with reference to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting guidelines (https://www.strobe-statement.org/).

2. Participants and data collection

Participants were army food service personnel in Gyeongsangnam-do, Korea who understood the purpose and content of the study and participated voluntarily. A survey was conducted online using Google Forms from October to November 2024. The survey link was distributed to participants via a social networking service. Re-

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sponses were collected anonymously, and no personally identifiable information was recorded. The sample was obtained using a convenience sampling method, and the number of participants was 150, the minimum sample size when using the G*Power 3.1.9.2 (the hhu) with an effect size of 0.3, a significance level of 0.05, and a power of 0.95. Considering the anticipated dropout rate, the survey link was shared with a total of 165 people. A total of 163 copies were returned, with 157 used for data analysis, excluding 6 copies that had inconsistent responses or missing important variables.

3. Materials and methods

Demographic data included sex, age, meals served per day, work career, army hierarchy, the number of food service workers. Work career categorized into two groups: less than five years and five years or more. Army hierarchy was classified as either army officers (including commissioned officers, non-commissioned officers, government employees, and civilian cooks) or army cooks. The daily number of meals served was categorized as fewer than 100 or 100 or more, and the number of food service personnel was classified as five or fewer, or six or more. The measurement tool for assessing the importance and performance of safety accident prevention consisted of 22 items, which were directly adopted from used items in previous studies [6, 7]. The items were categorized into six types: slip & burn (4 items), cut & winding & stenosis (4 items), collisions & falling off (4 items), electric shock & fire (4 items), musculoskeletal disease (4 items), and contact with chemical substance (2 items). Each item was measured using a five-point Likert scale for importance, responses ranged from 1 (not at all important) to 5 (very important), and for performance, from 1 (not at all performed) to 5 (very well performed). Higher scores indicated higher levels of importance or performance. The Cronbach's α coefficients for the importance and performance scales were 0.987 and 0.983, respectively.

4. Statistical analysis

All data were analysed using IBM SPSS Statistics version 23.0 (IBM Corp.). The daily number of meals served was the independent variable. The chi-square test and independent samples t-test were used to analyse the differences in proportions and means between groups. The reliability of the measurement tool was examined for internal consistency using Cronbach's α coefficient. The priority of educational content for preventing safety accidents was analysed using the following three steps. In the first step, the difference in means between the importance and performance of safety accident prevention management was tested using a paired sample t-test. The second step was to calculate the Borich Needs in order to prioritize the safety accident prevention education content. The Borich Needs were calculated for each item using the formula '(importance mean – performance mean) × importance mean) / Total item number'. For example, if an item has an average importance of 4.5, an average performance of 3.0, and the total number of items is 22, the calculation would be ((4.5 – 3.0) × 4.5) / 22. In the third step, the Locus for Focus model was employed to visualize the priorities of educational content, with the X-axis representing importance and the Y-axis representing the discrepancy level (i.e., the difference between importance and performance). Quadrants were delineated using the mean values of each axis as the cut-off points. The first quadrant indicates high importance and high discrepancy levels; the second quadrant indicates low importance but high discrepancy levels; the third quadrant indicates low importance and low discrepancy levels; and the fourth quadrant indicates high importance but low discrepancy levels. Items located in the first quadrant represent the highest educational needs and should therefore be prioritized for implementation. The significance level was set at $P < 0.05$.

RESULTS

1. Demographic characteristics

The demographic characteristics of the participants are presented in Table 1. Among the participants, 73.2% were male, with a mean age of 29.5 ± 12.9 years. The majority of participants (80.3%) had less than five years of work career. The proportion of participants with less than five years of work career was higher in the group serving ≥ 100 meals group, although the difference was not statistically significant. The proportion of army cooks (63.7%) was relatively higher than that of army officers (36.3%). Regarding the number of food service

Table 1. Demographic characteristics by the daily number of meals served

Variables	Items	Total (n = 157)	< 100 meals group (n = 87)	≥ 100 meals group (n = 70)	χ^2 or t-value
Sex	Male	115 (73.2)	64 (73.6)	51 (72.9)	0.010
	Female	42 (26.8)	23 (26.4)	19 (27.1)	
Age (year)	-	29.5 ± 12.9	29.7 ± 13.0	29.2 ± 12.8	0.239
Work career (year)	< 5	126 (80.3)	66 (75.9)	60 (85.7)	2.376
	≥ 5	31 (19.7)	21 (24.1)	10 (14.3)	
Army hierarchy	Army officers	57 (36.3)	31 (35.6)	26 (37.1)	0.038
	Army cooks	100 (63.7)	56 (64.4)	44 (62.9)	
Number of food service personnel	≤ 5	105 (66.9)	87 (100)	18 (25.7)	96.635***
	≥ 6	52 (33.1)	0 (0.0)	52 (74.3)	

n (%) or Mean ± SD.
Differences between groups were analyzed using the chi-square test or t-test.
***$P < 0.001$.

personnel, 66.9% of participants reported having 5 or fewer personnel in their unit, nearly twice the proportion of those with six or more (33.1%). By the daily number of meals served, 82.9% of the < 100 meals group had 5 or fewer personnel, whereas 74.3% of the ≥100 meals group had 6 or more personnel ($P < 0.001$).

2. Status of safety education

As shown in Table 2, 97.5% of the participants had received safety education. The most frequently reported frequency of safety education was once a month or more (60.8%), while 9.1% received education only once a year. "Lecture" was the most frequently used method of safety education (63.4%), followed by "Counselling" (15.7%) and "Discussions" (9.8%). In the < 100 meals group, the proportion of "Counselling" was relatively higher, at 26.2%, whereas in the ≥ 100 meals group, "Discussions" and "Practice" were more prevalent, at 14.5% and 13.0%, respectively, showing a significant difference ($P < 0.001$). The preferred education methods indicated equal proportions for "Lecture" and "Counselling", each at 23.5%, followed by "Practice" (15.0%), "Video-based education" (13.7%), "Discussions" (12.4%), and "Social media" (11.8%). In the < 100 meals group, "Counselling" (36.9%), "Video-based education" (15.5%), and "Social media" (14.3%) were the preferred education methods. In contrast, the ≥ 100 meals group showed greater preference for "Lecture" (34.8%) and "Practice" (23.2%) ($P < 0.001$). A total of 79.6% of participants reported implementing the received educational content in their actual performance.

3. The importance and performance of safety accident prevention

Table 3 presents a comparison of the importance and performance of safety accident prevention management between the two groups based on the daily number of meals served. The overall mean score for importance was 4.78 out of 5.0, with the < 100 meals group reporting a significantly higher score than the ≥ 100 meals group (4.86 vs. 4.70) ($P < 0.05$). The overall mean score for performance was 4.44, which was 0.34 points lower than the importance score. Although the < 100 meals group showed a slightly higher performance score than the ≥ 100 meals group (4.51 vs. 4.37), the difference was not statistically significant.

In the analysis of importance by type of safety accident, the "Slip & burn" indicated the highest mean score (4.82), while "Musculoskeletal disease" had the lowest (4.74). However, all six categories scored above 4.5 out of 5, indicating a generally high level of importance across all accident types. The < 100 meals group consistently reported higher importance scores across all accident types. Statistically significant differences were observed in the categories of "Collision & falling off" ($P < 0.01$), "Electric shock & fire" ($P < 0.05$), "Musculoskeletal disease" ($P < 0.01$), and "Contact with chemical substance" ($P < 0.05$), with the < 100 meals group showing a higher importance in each type. The highest level of performance was found in the "Electric shock & fire" (4.55), and the lowest in "Musculoskeletal disease" (4.18). In five out of the six accident types, excluding

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Table 2. Status of safety education by the daily number of meals served

Variables	Items	Total (n = 157)	< 100 meals group (n = 87)	≥ 100 meals group (n = 70)	χ^2 value
Experience of safety education	Yes	153 (97.5)	84 (96.6)	69 (98.6)	0.637
	No	4 (2.5)	3 (3.4)	1 (1.4)	
	Total	157 (100)	87 (55.4)	70 (44.6)	
Frequency of safety education[1)]	Once a year	14 (9.1)	4 (4.8)	10 (14.5)	4.484
	Once every 6 months	17 (11.1)	9 (10.7)	8 (11.6)	
	Once every 3 months	29 (19.0)	17 (20.2)	12 (17.4)	
	≥ Once a month	93 (60.8)	54 (64.3)	39 (56.5)	
	Total	153 (100)	84 (54.9)	69 (45.1)	
Main safety education method[1)]	Lecture	97 (63.4)	51 (60.7)	46 (66.7)	22.458***
	Counselling	24 (15.7)	22 (26.2)	2 (2.9)	
	Discussions	15 (9.8)	5 (6.0)	10 (14.5)	
	Practice	11 (7.2)	2 (2.4)	9 (13.0)	
	Video-based education	6 (3.9)	4 (4.8)	2 (2.9)	
	Total	153 (100)	84 (54.9)	69 (45.1)	
Desired safety education method[1)]	Lecture	36 (23.5)	12 (14.3)	24 (34.8)	28.344***
	Consulting	36 (23.5)	31 (36.9)	5 (7.2)	
	Practice	23 (15.0)	7 (8.3)	16 (23.2)	
	Video-based education	21 (13.7)	13 (15.5)	8 (11.6)	
	Discussions	19 (12.4)	9 (10.7)	10 (14.5)	
	Social media	18 (11.8)	12 (14.3)	6 (8.7)	
	Total	153 (100)	84 (54.9)	69 (45.1)	
Performance of safety education contents	Yes	125 (79.6)	92 (80.0)	33 (78.6)	0.039
	No	32 (20.4)	23 (20.0)	9 (21.4)	
	Total	157 (100)	115 (73.2)	42 (26.8)	

n (%).
Differences between groups were analyzed using the chi-square test.
[1)]Percentages were calculated based on valid responses (n = 153). Total sample size was 157; 4 missing responses.
***$P < 0.001$.

"Musculoskeletal disease", the < 100 meals group reported higher mean performance scores. Statistically significant differences were observed in the types of "Cut & winding & stenosis" ($P < 0.05$), "Collision & falling off" ($P < 0.05$), and "Contact with chemical substance" ($P < 0.05$), with the < 100 meals group demonstrating higher levels of performance.

Among the 22 items, statistically significant differences were observed between the 2 groups in 14 items for importance and in 6 items for performance ($P < 0.05$–$P < 0.01$). For importance, the < 100 meals group reported significantly higher scores in the "When cleaning the gas hood, use the safe ladders and work in pairs" ($P < 0.01$), "When cleaning the trench, install a caution sign and cover it again after cleaning" ($P < 0.01$), "Do stretching exercise before starting and after working" ($P < 0.01$), and "When moving heavy things, use an assistive device or help from colleagues" ($P < 0.01$). In terms of performance, the "When cleaning the trench, install a caution sign and cover it again after cleaning" showed a more pronounced significant difference ($P < 0.01$), with the < 100 meals group demonstrating higher scores.

4. Educational needs and priorities for safety accident prevention

The results of the paired samples t-test conducted to analyze the differences between importance and performance for the 22 safety accident prevention items in the < 100 meals group are presented in Table 4. For all 22 items, the importance scores were higher than the current performance scores, and the differences were statistically significant ($P < 0.001$). To determine the priorities

Table 3. Comparison of the importance and performance of safety accident prevention by the daily number of meals served

Types of safety accidents	Items	Importance[1]					Performance[2]				
		Total (n = 157)	< 100 meals group (n = 87)	≥ 100 meals group (n = 70)	t-value	Rank	Total (n = 157)	< 100 meals group (n = 87)	≥ 100 meals group (n = 70)	t-value	Rank
Slip & burn (4)	1. Clean the floor of the work place	4.80 ± 0.44	4.85 ± 0.39	4.73 ± 0.48	1.721	4	4.55 ± 0.60	4.62 ± 0.58	4.46 ± 0.63	1.697	2
	2. When working, wear the apron and non-slip shoes	4.82 ± 0.40	4.86 ± 0.38	4.77 ± 0.42	1.398	2	4.55 ± 0.60	4.61 ± 0.58	4.47 ± 0.63	1.426	2
	3. Arrange in the work place and in the aisle	4.82 ± 0.40	4.85 ± 0.39	4.77 ± 0.42	1.207	2	4.55 ± 0.61	4.62 ± 0.58	4.46 ± 0.65	1.667	2
	4. Pay attention to the burning when using with hot water, oil, and utensils	4.85 ± 0.37	4.89 ± 0.36	4.81 ± 0.39	1.173	1	4.55 ± 0.60	4.63 ± 0.57	4.46 ± 0.63	1.820	2
	Subtotal	19.29 ± 1.54	19.44 ± 1.45	19.09 ± 1.65	1.444	-	18.20 ± 2.38	18.48 ± 2.27	17.84 ± 2.49	1.683	-
	(mean per item)	(4.82 ± 0.38)	(4.86 ± 0.36)	(4.77 ± 0.41)			(4.54 ± 0.59)	(4.62 ± 0.57)	(4.46 ± 0.62)		
Cut & winding & stenosis (4)	5. Wear protective gloves when using sharp cooking utensils	4.82 ± 0.43	4.89 ± 0.36	4.74 ± 0.50	2.002*	2	4.50 ± 0.65	4.60 ± 0.58	4.37 ± 0.70	2.160*	5
	6. Keep the knife at hidden place or do not leave it in sink with water	4.82 ± 0.40	4.86 ± 0.38	4.77 ± 0.42	1.398	2	4.50 ± 0.67	4.62 ± 0.60	4.36 ± 0.72	2.453*	5
	7. When using a vegetable cutter or grinder, use an exclusive stick	4.78 ± 0.46	4.84 ± 0.40	4.70 ± 0.52	1.841	6	4.39 ± 0.82	4.51 ± 0.71	4.26 ± 0.91	1.917	8
	8. Precaution when using a rotating machine with a risk of stenosis	4.82±0.40	4.86±0.38	4.76±0.43	1.597	2	4.55 ± 0.61	4.60 ± 0.58	4.49 ± 0.65	1.136	2
	Subtotal	19.24 ± 1.62	19.45 ± 1.47	18.97 ± 1.77	1.809	-	17.94 ± 2.49	18.32 ± 2.32	17.47 ± 2.65	2.112*	-
	(mean per item)	(4.80 ± 0.40)	(4.86 ± 0.36)	(4.74 ± 0.44)			(4.48 ± 0.62)	(4.58 ± 0.58)	(4.37 ± 0.66)		
Collision & falling off (4)	9. Check the floor and surroundings without running in the kitchen	4.82 ± 0.40	4.89 ± 0.36	4.74 ± 0.44	2.189*	2	4.54 ± 0.64	4.61 ± 0.60	4.44 ± 0.67	1.638	3
	10. Preventing collisions by securing distance and passage between workers	4.79 ± 0.47	4.87 ± 0.40	4.69 ± 0.53	2.473*	5	4.52 ± 0.65	4.61 ± 0.62	4.41 ± 0.67	1.894	4
	11. When cleaning the gas hood, use the safe ladders, and work in pairs	4.76 ± 0.52	4.89 ± 0.39	4.61 ± 0.62	3.186**	8	4.38 ± 0.85	4.53 ± 0.76	4.20 ± 0.93	2.443*	9
	12. When cleaning the trench, install a caution sign and cover it again after cleaning	4.73 ± 0.60	4.86 ± 0.41	4.56 ± 0.74	3.107**	11	4.44 ± 0.76	4.60 ± 0.64	4.24 ± 0.86	2.878**	6
	Subtotal	19.10 ± 1.85	19.51 ± 1.52	18.60 ± 2.11	3.020**	-	17.88 ± 2.61	18.34 ± 2.48	17.30 ± 2.69	2.526*	-
	(mean per item)	(4.77 ± 0.46)	(4.88 ± 0.38)	(4.65 ± 0.53)			(4.46 ± 0.65)	(4.59 ± 0.62)	(4.32 ± 0.67)		

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Table 3. Continued

Types of safety accidents	Items	Importance[1]					Performance[2]				
		Total (n = 157)	< 100 meals group (n = 87)	≥ 100 meals group (n = 70)	t-value	Rank	Total (n = 157)	< 100 meals group (n = 87)	≥ 100 meals group (n = 70)	t-value	Rank
Electric shock & fire (4)	13. Do not touch electric facilities with wet hands	4.81 ± 0.43	4.85 ± 0.42	4.76 ± 0.43	1.366	3	4.57 ± 0.59	4.63 ± 0.59	4.50 ± 0.58	1.398	1
	14. Check the electrical connections and facilities	4.80 ± 0.42	4.86 ± 0.38	4.73 ± 0.45	1.987*	4	4.57 ± 0.60	4.63 ± 0.59	4.49 ± 0.61	1.522	1
	15. When frying, cook do not leave their seats to prevent fire caused by overheated oil	4.80 ± 0.44	4.87 ± 0.37	4.71 ± 0.52	2.180*	4	4.54 ± 0.62	4.63 ± 0.57	4.43 ± 0.65	2.056*	3
	16. Check the operation status of gas breaker frequently	4.80 ± 0.42	4.86 ± 0.38	4.71 ± 0.46	2.177*	4	4.54 ± 0.64	4.60 ± 0.62	4.46 ± 0.65	1.381	3
	Subtotal	19.21 ± 1.64	19.45 ± 1.52	18.91 ± 1.74	2.018*	-	18.22 ± 2.35	18.49 ± 2.32	17.87 ± 2.38	1.655	-
	(mean per item)	(4.80 ± 0.41)	(4.86 ± 0.38)	(4.73 ± 0.44)			(4.55 ± 0.58)	(4.62 ± 0.58)	(4.47 ± 0.59)		
Musculoskeletal disease (4)	17. Do stretching exercise before starting and after working	4.67 ± 0.62	4.80 ± 0.48	4.50 ± 0.74	2.988**	12	3.99 ± 0.95	3.87 ± 0.94	4.13 ± 0.96	−1.674	10
	18. When moving heavy items, an assistive device or assistance from colleagues should be utilized	4.78 ± 0.45	4.87 ± 0.37	4.66 ± 0.51	2.992**	6	4.38 ± 0.80	4.39 ± 0.84	4.37 ± 0.74	0.151	9
	19. When handling heavy objects, the correct posture and proper techniques are observed	4.78 ± 0.49	4.86 ± 0.41	4.67 ± 0.56	2.391*	6	4.41 ± 0.71	4.47 ± 0.71	4.34 ± 0.70	1.131	7
	20. If the workbench height is inadequate, an auxiliary support is used to adjust it	4.74 ± 0.51	4.83 ± 0.44	4.63 ± 0.57	2.410*	10	3.97 ± 1.12	3.83 ± 1.17	4.16 ± 1.02	−1.884	11
	Subtotal	18.96 ± 1.92	19.37 ± 1.61	18.46 ± 2.17	2.923**	-	16.76 ± 3.07	16.56 ± 3.02	17.00 ± 3.15	−0.884	-
	(mean per item)	(4.74 ± 0.48)	(4.84 ± 0.40)	(4.61 ± 0.54)			(4.18 ± 0.76)	(4.14 ± 0.76)	(4.25 ± 0.79)		
Contact with chemical substance (2)	21. Check safety handling method of MSDS applied substance before use	4.75 ± 0.50	4.83 ± 0.44	4.66 ± 0.56	2.082*	9	4.41 ± 0.78	4.53 ± 0.70	4.26 ± 0.86	2.183*	7
	22. Wear protection thing before treating chemical substances	4.77 ± 0.49	4.85 ± 0.42	4.67 ± 0.56	2.230*	7	4.44 ± 0.74	4.54 ± 0.70	4.31 ± 0.79	1.904	6
	Subtotal	9.52 ± 0.98	9.68 ± 0.84	9.33 ± 1.11	2.175*	-	8.84 ± 1.48	9.07 ± 1.39	8.57 ± 1.57	2.102*	-
	(mean per item)	(4.76 ± 0.49)	(4.84 ± 0.42)	(4.66 ± 0.56)			(4.42 ± 0.74)	(4.53 ± 0.69)	(4.29 ± 0.79)		
	Total score	105.32 ± 8.85	106.90 ± 8.04	103.36 ± 9.48	2.486*	-	97.84 ± 13.14	99.28 ± 12.36	96.06 ± 13.93	1.512	-
	(mean per item)	(4.78 ± 0.40)	(4.86 ± 0.36)	(4.70 ± 0.43)			(4.44 ± 0.59)	(4.51 ± 0.56)	(4.37 ± 0.63)		

Mean ± SD.
Differences between groups were analyzed using the chi-square test or t-test.
MSDS, material safety data sheet.
[1]5points Likert scale: 1 (not important at all) to 5 (very important).
[2]5points Likert scale: 1 (not performed at all) to 5 (very performed).
*$P < 0.05$, **$P < 0.01$.

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for educational content, the Borich Needs values were calculated. The item "If the workbench height is inadequate, an auxiliary support is used to adjust it" showed the highest Borich Needs score at 4.740, followed by 'Do stretching exercise before starting and after working' with a score of 4.348. The model visualized using the Locus for Focus model is presented in Fig. 1A. Quadrant I (high importance high discrepancy; HH) represents the highest priority for educational intervention. The items included are "When cleaning the gas hood, use the safe ladders and work in pairs", "When moving heavy items, an assistive device or assistance from colleagues should be utilized", and "When handling heavy objects, the correct posture and proper techniques are observed". Based on the overlap between the Borich Needs and the Locus for Focus model, the item with the highest educational priority was "When moving heavy items, an assistive device or assistance from colleagues should be utilized" (Rank 1). This was followed by "When handling heavy objects, the correct posture and proper techniques are observed" (Rank 2) and "When cleaning the gas hood, use the safe ladders and work in pairs" (Rank 3).

The ≥ 100 meals group also showed statistically significantly higher importance scores than performance scores across all 22 items ($P < 0.001$). The Borich Needs scores were highest for the "If the workbench height is inadequate, an auxiliary support is used to adjust it" (2.235), as in the < 100 meals group (2.235). This was followed by "When using a vegetable cutter or grinder, use an exclusive stick" (2.117). Based on the visualization using the Locus for Focus model in Fig. 1B, the items located in Quadrant I include "Pay attention to the burning when using hot water, oil, and utensils", "Wear protective gloves when using sharp cooking utensils", "Keep the knife in a hidden place or do not leave it in a sink with water", and "When using a vegetable cutter or grinder, use an exclusive stick". The highest educational priority item identified through the integration of the Borich Needs and the Locus for Focus model was "When using a vegetable cutter or grinder, use an exclusive stick" (Rank 1). The next priorities were "Keep the knife in a hidden place or do not leave it in a sink with water" (Rank 2) followed by "Wear protective gloves when using sharp cooking utensils" (Rank 3) and "Pay attention to the burning when

Table 4. Educational priorities for safety accident prevention based on the Borich Needs and the Locus for Focus model by the daily number of meals served

Types of safety accidents	Items	< 100 meals group (n = 87)						≥ 100 meals group (n = 70)					
		Mean difference[1]	Paired t-value	Borich Needs[2]	Borich priorities	The Locus for Focus model's priorities	Top priorities	Mean difference[1]	Paired t-value	Borich Needs[2]	Borich priorities	The Locus for Focus model's priorities	Top priorities
Slip & burn (4)	1. Clean the floor of the work place	0.23 ± 0.54	3.945***	1.103	21			0.27 ± 0.56	4.036***	1.303	18		
	2. When working, wear the apron and non-slip shoes	0.25 ± 0.53	4.425***	1.219	16			0.30 ± 0.57	4.376***	1.446	13		
	3. Arrange in the work place and in the aisle	0.23 ± 0.54	3.945***	1.108	19			0.31 ± 0.58	4.546***	1.515	11		
	4. Pay attention to the burning when using with hot water, oil, and utensils	0.25 ± 0.51	4.618***	1.226	15			0.36 ± 0.54	4.540***	1.732	8	HH	4
Cut & wind-ing & stenosis (4)	5. Wear protective gloves when using sharp cooking utensils	0.29 ± 0.53	4.581***	1.385	9			0.37 ± 0.62	4.432***	1.790	6	HH	3
	6. Keep the knife at hidden place or do not leave it in sink with water	0.24 ± 0.53	4.268***	1.163	17			0.41 ± 0.65	5.348***	1.997	3	HH	2
	7. When using a vegetable cutter or grinder, use an exclusive stick	0.33 ± 0.66	4.719***	1.593	6			0.44 ± 0.86	4.298**	2.117	2	HH	1
	8. Precaution when using a rotating machine with a risk of stenosis	0.26 ± 0.52	4.777***	1.274	11			0.27 ± 0.56	4.036***	1.308	17		

(Continued to the next page)

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Table 4. Continued

Types of safety accidents	Items	< 100 meals group (n = 87)						≥ 100 meals group (n = 70)					
		Mean difference[1)]	Paired t-value	Borich Needs[2)]	Borich priorities	The Locus for Focus model's priorities	Top priorities	Mean difference[1)]	Paired t-value	Borich Needs[2)]	Borich priorities	The Locus for Focus model's priorities	Top priorities
Collision & falling off (4)	9. Check the floor and surroundings without running in the kitchen	0.28 ± 0.50	5.161***	1.330	10			0.28 ± 0.50	4.821***	1.446	13		
	10. Preventing collisions by securing distance and passage between workers	0.26 ± 0.52	4.777***	1.266	13			0.27 ± 0.56	4.036***	1.300	19		
	11. When cleaning the gas hood, use the safe ladders, and work in pairs	0.36 ± 0.65	5.140***	1.696	5	HH	3	0.41 ± 0.94	3.687***	1.972	4	LH	6
	12. When cleaning the trench, install a caution sign and cover it again after cleaning	0.26 ± 0.54	0.409***	1.250	14			0.31 ± 0.79	3.876***	1.487	12		
Electric shock & fire (4)	13. Do not touch electric facilities with wet hands	0.22 ± 0.49	4.137***	1.050	20			0.26 ± 0.50	4.288***	1.237	20		
	14. Check the electrical connections and facilities	0.23 ± 0.50	4.298***	1.103	21			0.24 ± 0.55	3.694***	1.166	22		
	15. When frying, cook do not leave their seats to prevent fire caused by overheated oil	0.24 ± 0.48	4.677***	1.159	18			0.29 ± 0.59	4.029***	1.371	15		
	16. Check the operation status of gas breaker frequently	0.26 ± 0.54	4.581***	1.269	12			0.26 ± 0.65	3.298**	1.234	21		
Musculoskeletal disease (4)	17. Do stretching exercise before starting and after working	0.93 ± 0.95	9.143***	4.348	2	LH	5	0.37 ± 0.90	3.439**	1.735	7	LH	8
	18. When moving heavy items, an assistive device or assistance from colleagues should be utilized	0.48 ± 0.76	5.922***	2.308	3	HH	1	0.29 ± 0.62	3.873***	1.366	16		
	19. When handling heavy objects, the correct posture and proper techniques are observed	0.39 ± 0.60	6.100***	1.868	4	HH	2	0.33 ± 0.58	4.716***	1.571	10	LH	10
	20. If the workbench height is inadequate, an auxiliary support is used to adjust it	1.00 ± 1.17	7.963***	4.740	1	LH	4	0.47 ± 0.93	4.250***	2.235	1	LH	5
Contact with chemical substance (2)	21. Check safety handling method of MSDS applied substance before use	0.30 ± 0.57	4.865***	1.420	8			0.40 ± 0.86	3.900***	1.900	5	LH	7
	22. Wear protection thing before treating chemical substances	0.31 ± 0.60	4.851***	1.480	7			0.36 ± 0.74	4.023***	1.704	9	LH	9
	Mean ± SD	0.35 ± 0.47	6.888***					0.33 ± 0.53	5.236***				

Mean ± SD.
HH, high importance high discrepancy; LH, low importance high discrepancy; MSDS, material safety data sheet.
[1)]Importance – performance.
[2)]((Importance – performance) × mean importance) / total number.
**$P < 0.01$, ***$P < 0.001$.

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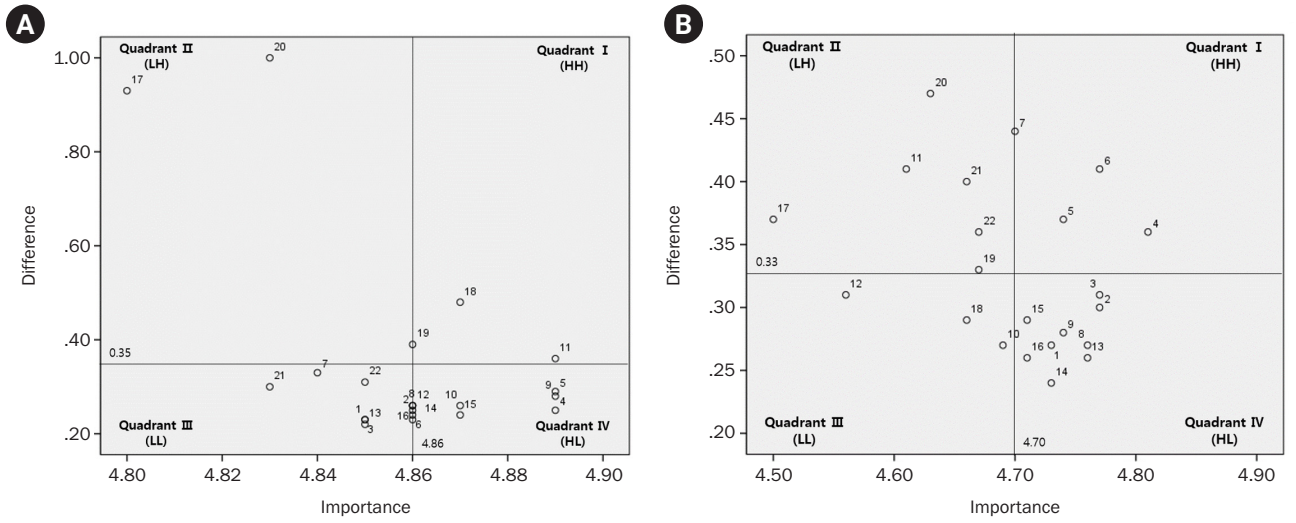

Fig. 1. The Locus for Focus model by daily number of meals served. (A) The result of selecting safety education contents priority using the Locus for Focus model in the < 100 meals group. (B) The result of selecting safety education contents priority using the Locus for Focus model in the ≥ 100 meals group. Difference = Importance – performance. HH, high importance high discrepancy; LH, low importance high discrepancy; LL, low importance low discrepancy; HL, high importance low discrepancy. 1 = clean the floor of the work place; 2 = when working, wear the apron and non-slip shoes; 3 = arrange in the work place and in the aisle; 4 = pay attention to the burning when using with hot water, oil, and utensils; 5 = wear protective gloves when using sharp cooking utensils; 6 = keep the knife at hidden place or do not leave it in sink with water; 7 = when using a vegetable cutter or grinder, use an exclusive stick; 8 = precaution when using a rotating machine with a risk of stenosis; 9 = check the floor and surroundings without running in the kitchen; 10 = preventing collisions by securing distance and passage between workers; 11 = when cleaning the gas hood, use the safe ladders, and work in pairs; 12 = when cleaning the trench, install a caution sign and cover it again after cleaning; 13 = do not touch electric facilities with wet hands; 14 = check the electrical connections and facilities; 15 = when frying, cook do not leave their seats to prevent fire caused by overheated oil; 16 = check the operation status of gas breaker frequently; 17 = do stretching exercise before starting and after working; 18 = when moving heavy items, an assistive device or assistance from colleagues should be utilized; 19 = when handling heavy objects, the correct posture and proper techniques are observed; 20 = if the workbench height is inadequate, an auxiliary support is used to adjust it; 21 = check safety handling method of MSDS applied substance before use; 22 = wear protection thing before treating chemical substances.

using hot water, oil and utensils" (Rank 4).

DISCUSSION

This study examined the current status and perceived needs related to safety education among army food service personnel. Findings revealed that 97.5% of participants had received safety education, a rate comparable to that reported among industrial food service personnel (96.5%) [6], but lower than the 100% observed in school food service settings [9]. In the military, the main providers of safety education are typically food service supervisors or culinary consultants. Whereas the civilian sector benefits from a broader range of instructional agents, including dietitians, the Korea Occupational Safety and Health Agency, and educational institutions, indicating relatively restricted access to diverse and specialized educational resources in the military environment [6, 7]. Only 60.8% of participants reported receiving safety education on a monthly basis, a figure substantially lower than that of their civilian counterparts. Notably, even in the ≥ 100 meals group, where a high proportion of personnel had less than five years of work experience, participation in regular education remained insufficient. These findings underscore the critical need for systematic, continuous safety education programs tailored to less-experienced personnel [19].

The most commonly used method of safety education was "Lecture" (63.4%), albeit less prevalent than in industrial foodservice settings (77.2%) [6]. While the use of

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practical education was relatively higher, accounting for 13.0%. Education methods differed significantly by the scale of food service facilities; individualized "Counselling" was more frequently used in the < 100 meals group, whereas those serving ≥ 100 meals group favored "Discussions" and experiential learning ($P < 0.001$). These results suggest that instructional approaches are being differentiated according to the operational scale of the food service units. Preferences for educational methods were also becoming increasingly diversified. Compared to traditional lectures, which saw a decrease in preference of nearly 40%, other methods, such as "Counselling", "Practice", "Video-based education", "Discussions", and "Social media", were preferred. In particular, participants in the < 100 meals group preferred "Counselling" and "Social media", whereas those in the ≥ 100 meals group favored "Lecture" and "Practice" ($P < 0.001$). This suggests that educational needs vary according to participant characteristics and food service environments [20, 21]. Approximately 79.6% of participants reported that they applied the contents of safety education to their actual work practices, a finding consistent with those among school food service personnel (78.2%) [7]. Nevertheless, previous studies identified dissatisfaction stemming from discrepancies between educational content and the practical work environment (42.3%), and from formalistic or perfunctory delivery modes (19.8%) [7]. The results highlight the necessity of developing contextualized safety education curriculums that reflect both experiential levels and facility characteristics.

Although the perceived importance of accident prevention was high (mean = 4.78), the actual performance was lower (mean = 4.44), reflecting a documented gap between risk perception and behavioral implementation [21-23]. Among the types of safety accidents, "Slip & burn" were perceived as the most important, whereas "Musculoskeletal disease" received the lowest scores in both perceived importance and performance. These findings appear to be related to the most frequently reported types of safety accidents in previous studies, with "burns" (46.4%) being the most common among industrial food service workers [6] and "slips" (66.2%) among school food service employees [7]. It also highlights issues related to risk factors, suggesting that in work environments where repetitive physical tasks are routine, associated hazards may be easily overlooked [24]. Although stretching and the use of assistive devices are critical behaviors for preventing safety accidents, their actual implementation rates were relatively low. Therefore, linking awareness to performance through targeted education on these behaviors may contribute meaningfully to strengthening practical safety outcomes. Comparisons based on the daily number of meals served presented that both overall importance and performance scores were higher in the < 100 meals group compared to the ≥ 100 meals group. Among the 22 items, statistically significant differences were observed between groups in 14 items for importance and 6 items for performance ($P < 0.05$–$P < 0.01$). This difference can be interpreted as reflecting clearer recognition of personnel' roles and responsibilities in smaller-scale units, leading to relatively higher risk awareness. This finding is consistent with previous reports indicating that safety culture and risk perception may vary according to organizational size [25].

The Borich Needs Assessment revealed that, for all 22 items, importance exceeded performance ($P < 0.001$), indicating a widespread demand for educational reinforcement. In both groups, the task "If the workbench height is inadequate, an auxiliary support is used to adjust it" yielded the highest priority score, reflecting the need for ergonomic intervention to mitigate musculoskeletal risk. Previous studies have emphasized the role of repetitive and improper postures as critical risk factors in institutional foodservice settings [26].

The dual analysis model, which combines the Borich Needs Assessment and the Locus for Focus model, is useful for providing practical and strategic intervention directions in educational settings, and its validity has been emphasized in previous studies [11, 12, 14, 15]. The integrated results of the two models in this study indicate that, for the < 100 meals group, the highest educational priorities involve preventing musculoskeletal disorder related to equipment use, which reflect increased physical burdens and heightened accident risks stemming from limited automation and staffing constraints [27]. Conversely, in the ≥ 100 meals group, safety regulations concerning cooking equipment—specifically injuries such as cut & winding & stenosis—emerged as top educational priorities. This finding cor-

responds to the characteristics of the ≥ 100 meals group, where faster cooking speeds and more frequent use of equipment elevate the risks of thermal and mechanical accidents [28]. To effectively address these challenges, comprehensive policy measures at the Ministry of National Defense of the Republic of Korea level are essential. These should include expanding and enhancing training for dedicated safety management personnel, modernizing foodservice facilities through the adoption of advanced safety equipment and automation technologies, developing standardized safety protocols and manuals, and optimizing workforce allocation.

Limitations

This study used a cross-sectional design, analyzing needs at a specific point in time, which limits the ability to reflect changes in safety education needs or long-term effects. Additionally, the use of convenience sampling reduced the representativeness of the study population, and the reliance on self-reported data may have introduced subjective bias from respondents. The samples were limited to army foodservice personnel in Gyeongsangnam-do, Korea, restricting the generalizability of the results to other military branches or civilian industries. Furthermore, external factors, such as the work environment and organizational culture, were not adequately controlled, which may limit the interpretation of the results. Lastly, since this study focused on identifying the priority of educational needs, it did not assess the actual effect of educational programs on accident prevention or the improvement of safety behaviors.

Conclusion

This study is meaningful in that it clearly identifies the priority for safety education among Korean military food service personnel with limited access, by integrating the Borich Needs and the Locus of Control model, and the Locus of Control model, and may provide an empirical basis for establishing detailed provisions to enhance the safety of military foodservice under the recently enacted the *Basic Act on Military Food Service* [3] in Korea. The findings suggest that safety education programs for military foodservice personnel should be tailored and practice-oriented, taking into account factors such as the size of the foodservice facility, working conditions, and types of accidents. The educational content should consistently include topics related to improving the work environment and preventing musculoskeletal disorders. Specifically, for the < 100 meals group, emphasis should be placed on education aimed at fundamental improvements in the work environment and reducing physical burdens, whereas the ≥ 100 meals group should focus more on detailed safety management during food preparation processes and responses to hazardous situations. Furthermore, intervention studies are needed to assess behavioral changes based on the prioritized educational content and to verify whether customized education effectively reduces accidents in Korean military foodservice facilities.

CONFLICT OF INTEREST

There are no financial or other issues that might lead to conflict of interest.

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DATA AVAILABILITY

Research data is available upon request to the corresponding author.

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