Original Investigation

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Development of Tactical Medicine Knowledge and Awareness Scale: Validity and Reliability Study

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ABSTRACT

Objective: Tactical medicine training is not considered as a part of the curriculum of medical schools or emergency medicine (EM) residency programs. Shifting paradigms of war and conflict natures may require any physician to take a role as a provider in tactical settings. No standardized test or questionnaire study was found in the literature to evaluate physicians' knowledge and awareness levels in tactical emergency medical support. The objective of this study was to develop a scale that can be used to determine the level of awareness and knowledge of EM physicians on tactical medicine.

Methods: This was a cross-sectional study analyzing the validity and reliability of a new scale. An item pool was prepared consisting of 55 questions. Eleven experts evaluated the content validity and the scale was finalized with 28 items.

Results: The study found that the tactical medicine knowledge and awareness scale tool is a valid and reliable measurement for assessing the knowledge and awareness of EM physicians in tactical medicine. The internal consistency of the scale was high, with a Cronbach's α coefficient of 0.808. Confirmatory factor analysis indicated acceptable model fit, and all sub-dimensions positively influenced the total knowledge and awareness score. The results suggest the need for tactical medicine education to be integrated into medical school and EM residency curricula to improve competency in this critical field.

Conclusion: We can conclude that this new scale proved to be a reliable measurement tool to determine the level of knowledge and awareness of EM physicians in tactical medicine.

Keywords: Medical education, military science, questionnaire design, tactical medicine

INTRODUCTION

Tactical medicine provides close medical support to law enforcement officers during their operations and activities, minimizing the potential for additional injury and disease, as well as continuing the care of the sick and wounded until their transfer to a center where they can receive comprehensive care (1,2). Medical support has always been a part of the organizational structure in modern armies. However, the fundamental importance of tactical medicine was understood in the middle of the 20th century due to the experiences gained from the World Wars and civil unrest, and it was observed that the survival rate increased thanks to the rapid care of injured military personnel at the scene and rapid transport to an advanced center (3). In the following years, the concept of tactical emergency medical support (TEMS) became an essential part of tactical medicine due to the increase in multiple injury incidents, including terrorist acts in residential areas where law enforcement officers and the civilian population were harmed (2,4).

TEMS can be considered a natural part of emergency medicine (EM), including prehospital and emergency health care. Today, EM associations emphasize the importance of EM specialization in TEMS and accept it as a sub-specialty of EM (5). However, since the healthcare service to be provided in the conflict area involves several aspects fundamentally distinct from civilian prehospital trauma, it would not be appropriate to use trauma and prehospital care guidelines directly in TEMS or to automatically consider EM physicians as competent in TEMS (4,6).

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The tactical combat casualty care project, first developed in the USA in the mid-1990s, aimed to prevent morbidity and mortality by standardizing trauma care on the battlefield. The data from this project were realized when a section on Military Medicine was added to the Prehospital Trauma Life Support (PHTLS) Guidelines published in 1999. Studies show that employing EM specialists in tactical medicine improves outcomes (7).

tactical medicine training is not a part of the curriculum of medical schools in the USA, Türkiye, or the Turkish EM Core Education Programme (6,8-10). Physicians who lack training in this area may experience deficiencies in TEMS care (6). Therefore, it is important to increase the level of knowledge of EM physicians about tactical medicine. No standardized test or questionnaire study was found in the literature to evaluate physicians' knowledge and awareness levels in TEMS.

This study aimed to develop a scale that can be used to determine the level of awareness and knowledge of EM physicians involved in tactical medicine. Results may provide data that could enable the inclusion of tactical medicine in the local EM residency education curricula.

METHODS

Study Design

This cross-sectional study was conducted between January 1, 2024 and April 1, 2024, after approval from the İzmir Katip Çelebi University Social Research Ethics Committee (decision no: 2023/21-07, date: 20.12.2023). A validity and reliability study was conducted for a scale that measures tactical medicine knowledge and awareness.

Study protocol

An item pool was prepared for the study by reviewing the relevant literature. Then the item pool (Table 1) was administered to the sample size determined within the scope of content validity. Eleven EM physicians who are experts in their field were asked to choose one of the options of "appropriate", "should be improved", or "not appropriate" for each question. As a result of content validity evaluation, items with item response statistics below 0.5 were eliminated, and the form was finalized. The study started with a question pool of 55 items and was finalized with 28 items.

Table 1. Item pool of the scale

No	Item	Not appropriate	Must be revised	Appropriate	CVR
1	The meaning and scope of tactical medicine can be defined as follows.	0	3	8	0.455
2	I am knowledgeable about the types of equipment used in tactical medicine.	1	2	8	0.455
3	I have received theoretical training in tactical medicine both before and after graduation.	3	2	6	0.091
4	I have received practical training in tactical medicine before or after graduation.	3	3	5	-0.091
5	Being trained in tactical medicine is important for a physician.	0	2	9	0.636
6	I am familiar with the three phases of casualty care in tactical medicine.	4	2	5	-0.091
7	I am knowledgeable about the key points in casualty care in tactical medicine.	4	1	6	0.091
8	I can correctly identify life-threatening bleeding in a battlefield setting.	1	2	8	0.455
9	I can correctly identify tension pneumothorax in a battlefield setting.	1	1	9	0.636
10	I trust my knowledge of applying a tourniquet.	1	2	8	0.455
11	I can effectively intervene in life-threatening bleeding in a battlefield setting.	0	2	9	0.636
12	I can intervene correctly in tension pneumothorax in a battlefield setting.	0	1	10	0.818
13	I can correctly apply a tourniquet in a battlefield setting.	0	1	10	0.818
14	I know the meanings of the MARCH and PAWS treatment acronyms used in tactical medicine.	5	1	5	-0.091
15	I can effectively manage hypothermia in a battlefield setting.	2	2	7	0.273
16	I can perform tactical medicine procedures under low light and high noise conditions.	4	2	5	-0.091
17	I have received theoretical training in tactical medicine procedures under low light and high noise conditions.	6	1	4	-0.273

Table 1. Continued

No	Item	Not appropriate	Must be revised	Appropriate	CVR
18	I have received practical training in tactical medicine procedures under low light and high noise conditions.	6	1	4	-0.273
19	I trust my knowledge in emergency trauma resuscitation.	1	0	10	0.818
20	I trust my knowledge of triage.	0	1	10	0.818
21	I am proficient in supraglottic airway placement.	1	1	9	0.636
22	I am proficient in nasopharyngeal airway placement.	3	0	8	0.455
23	I am proficient in endotracheal airway placement.	1	0	10	0.818
24	I am proficient in surgical cricothyroidotomy procedures.	3	2	6	0.091
25	I am proficient in needle decompression procedures.	3	1	7	0.273
26	I am proficient in chest tube procedures.	1	1	9	0.636
27	I am proficient in intraosseous vascular access.	0	1	10	0.818
28	I am proficient in pelvic binder procedures.	0	0	11	1,000
29	I am knowledgeable about emergency burn care.	2	1	8	0.455
30	I am knowledgeable about tranexamic acid administration.	2	0	9	0.636
31	I am knowledgeable about hemostatic wound dressings.	3	2	6	0.091
32	I am competent in using airway suction devices in the field.	3	0	8	0.455
33	I am knowledgeable about sanitation practices.	3	4	4	-0.273
34	I feel confident in providing immediate intervention and splinting for fractures.	3	2	6	0.091
35	I trust my knowledge of medications that can be used in a battlefield setting.	1	1	9	0.636
36	I trust my knowledge in pain management, in a battlefield setting.	2	1	8	0.455
37	I have knowledge of "care under fire" (CUF) procedures.	3	2	6	0.091
38	I feel competent in implementing CUF.	7	1	3	-0.455
39	I am knowledgeable about tactical field care (TFC) procedures.	4	1	6	0.091
40	I feel competent in implementing TFC.	7	1	3	-0.455
41	I feel competent in implementing tactical evacuation care.	6	2	3	-0.455
42	I am proficient in the 10 competencies of NATO's prolonged field care (PFC).	5	0	6	0.091
43	I feel sufficiently capable of working under pressure.	4	1	6	0.091
44	Theoretical training in tactical medicine should receive before graduating from medical school.	0	1	10	0.818
45	The emergency medicine residency program should include theoretical training in tactical medicine.	0	0	11	1,000
46	Medical students should receive practical training in tactical medicine before graduating from medical school.	1	1	9	0.636
47	The emergency medicine residency program should include practical training in tactical medicine.	0	0	11	1,000
48	The presence of specialists trained in tactical medicine in the field during disasters or battles will enhance the success of medical management.	2	0	9	0.636
49	Tactical medicine emphasizes not only on-field intervention but also medical coordination.	1	1	9	0.636
50	Any physician may need knowledge of tactical medicine at any time.	0	1	10	0.818
51	Tactical medicine training should only be provided to emergency medicine specialists.	4	1	6	0.091
52	I understand that I may not use a light source while providing medical intervention in a battlefield setting.	1	1	9	0.636

Table 1. Continued

No	Item	Not appropriate	Must be revised	Appropriate	CVR
53	I understand that there may be a highly noisy environment while providing medical intervention in a battlefield setting.	2	0	9	0.636
54	Even if an emergency physician has not received tactical medicine training, they are competent to perform any necessary interventions in the field.	2	1	8	0.455
55	It is suggested that tactical medicine should be a separate medical specialty.	2	0	9	0.636

CVR: content validity ratio, MARCH: massive bleeding, airway, respiration, circulation, head and hypothermia, PAWS: pain, antibiotics, wounds, and splinting, NATO: North Atlantic Treaty Organization

Then, the survey was administered to all EM physicians working in the Emergency Department of İzmir Katip Çelebi University Ataturk Training and Research Hospital at the time of the study. Written informed consent was obtained from all participants before participation in the study. There were 131 participants involved. Validity and reliability analyses were performed following the application of the survey.

Statistical Analysis

Exploratory factor analysis is used to create measurement instruments (questionnaires, tests, etc.), while confirmatory factor analysis (CFA) tests whether these models are confirmed on the sample studied. The purpose of CFA is to find a small number of latent factors to explain the observed covariance among p observed variables. This analysis enables the model to be tested with all observed and unobserved variables and to reveal the extent to which the result is compatible with the available data. It provides clear results in error calculations. While other traditional methods deal with measurement errors separately, this analysis explicitly takes measurement errors into account in all analyses. A measurement error is associated with each observed variable, and a residual error term is associated with the latent variables. The analysis is also known as structural equation modelling (SEM). SEM can be defined as linear regression models, factor analysis, CFA, path analysis, and structural equation models.

If there is no criterion reference for comparing a test in the analyses, construct validity should be tested. SEM, also known as CFA, is a set of statistical methods used by many branches of science, especially social sciences, behavioral sciences, educational sciences, economics, marketing, and health sciences. It is based on the identification of observable and unobservable variables in a causal and relational model guided by a specific theory, bringing a hypothesis testing approach to the multivariate analysis of the structural theory related to the subject.

SEM is a multivariate analysis method that combines factor analysis and multivariate regression analysis. SEM analysis enables the model to be tested with all observed and unobservable variables and to reveal the extent to which the result is compatible with the available data. Suppose the fit indices obtained by testing the model indicate a good fit between the model and the data. If the fit indices reveal that such a fit does not exist, the hypotheses are rejected; In that case, the structurally generated hypotheses are accepted. Firstly, SEM adopts a confirmatory approach instead of an explanatory approach. While various statistical methods other than SEM try to discover the relationships in the data set, SEM verifies the fit of the theoretically established relationships with the data. SEM reveals clear results in error calculations.

Cronbach's alpha (α) coefficient was used in the reliability analyses to support construct validity. Exploratory and confirmatory factor analyses were applied for validity. Bartlett's test of sphericity assessed the suitability for factor analysis, and Kaiser-Meyer-Olkin (KMO) sampling adequacy statistics assessed the adequacy of the sample size. "Tactical medicine knowledge and awareness scale" (TAMKA) items were determined to have a five-factor structure according to the Varimax rotation method. The summability of the scales was evaluated with the Tukey summability test (11-14), and Statistical Package for the Social Sciences (SPSS) 27 and analysis of moment structures 25 were used using inclusion body myositis (IBM) Corp's statistical package programs (IBM SPSS Statistics for Windows, version 27.0. armonk, NY: IBM Corp). The ($p<0.05$) and ($p<0.01$) levels were considered statistically significant (15,16).

Results

In Table 2, the scale form was prepared using the Lawshe technique, and expert opinions were obtained. Content validity ratios (CVRs) and the content validity index (CVI) were calculated. Whether each item should be included in the scale was decided according to the CVR and CVI criteria.

According to the results of the analyses, the experts generally found the scale content highly appropriate. The determination of the central serous retinopathy critical point as 0.385 and the calculation of the CVI as 0.632 indicate that the scale generally has good content validity. Items with content validity score values above the critical point play an essential role in reflecting the purpose of the scale and indicate that this scale comprehensively addresses the selected subject area.

The KMO test is a measure to determine whether the distribution is suitable for factor analysis. The KMO test is related to the suitability of the sample size, and the value of 0.861 indicates that factor analysis can be used on these data (>0.8 is excellent, 0.7-0.8 is good, 0.5-0.7 is moderate, and at least 0.5 is required). Based on this information, the KMO value in this study is at an excellent level. Bartlett's test result was obtained as 1,973.440

(p<0.001). This result means the applied measurement variable is multivariate with respect to the universe parameter. In this study, factors with an eigenvalue greater than 1.50 and those without a limit on number were included in the scale. Cronbach's alpha=0.888 shows excellent reliability, indicating the scale is a reliable measurement tool (Table 3).

Considering that variance ratios ranging between 60% and 80% are accepted as ideal in factor analysis, this study's variance ratios are appropriate. The factor loads of the questions in the first factor (level of knowledge about general medical practices) ranged between 0.541 and 0.842. In the second factor (level of educational awareness), they ranged between 0.435 and 0.905. The third factor (level of general intervention knowledge in the battlefield) had factor loads ranging between 0.687 to 0.798. For the fourth factor (level of awareness of the importance of tactical medicine), they range between 0.686 and 0.888, and for the fifth factor (level of knowledge of medical intervention specific to the battlefield), they range between 0.636 and 0.705.

Root Mean Square Error of Approximation

This index is a measure of the fit of the model to the data. A lower root mean square error of approximation (RMSEA) value indicates that the model fits the data better. Generally, values between 0 and 0.05 indicate good fit, values between 0.05 and 0.08 indicate acceptable fit, and values greater than 0.08 indicate poor fit. As a result of the study, the RMSEA value shows an excellent fit (Table 4).

Incremental Fit Index

This index measures the improved fit of the model. The closer the value is to 1, the better the model fits the data. The incremental fit index (IFI) value should generally be 0.95 or higher. An IFI value of 1 shows an excellent fit.

Comparative Fit Index

This index measures the fit of the model with respect to alternative models. The closer the value is to 1, the better the model fits compared to alternative models. The comparative fit index (CFI) value should generally be 0.97 or higher. The CFI value shows an excellent fit.

Table 2. Scope validity analysis

Item no	Appropriate	Must be revised	Not appropriate	CVR
Item 1	23	2	1	0.77
Item 2	26	0	0	1.00
Item 3	22	3	1	0.69
Item 4	21	5	0	0.62
Item 5	22	4	0	0.69
Item 6	23	3	0	0.77
Item 7	25	1	0	0.92
Item 8	21	5	0	0.62
Item 9	20	6	0	0.54
Item 10	21	5	0	0.62
Item 11	22	3	1	0.69
Item 12	19	7	0	0.46
Item 13	22	4	0	0.69
Item 14	23	3	0	0.77
Item 15	26	0	0	1.00
Item 16	23	3	0	0.77
Item 17	23	3	0	0.77
Item 18	22	4	0	0.69
Item 19	20	5	1	0.54
Item 20	22	4	0	0.69
Item 21	22	4	0	0.69
Item 22	22	4	0	0.69
Item 23	21	5	0	0.62
Item 24	21	5	0	0.62
Item 25	21	4	1	0.62
Total number of experts=26				
CVR critical point=0.385				
CVI=0.632				

CVR: content validity ratio, CVI: Content validity index

Table 3. TAMKA tool factor loadings and factor variances

Factors	Questions	Factor loadings				
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1: level of knowledge about general medical practices	6	0.752				
	8	0.660				
	9	0.818				
	10	0.842				
	11	0.719				
	12	0.774				
	13	0.812				
	15	0.541				

Table 3. Continued

Factors	Questions	Factor loadings				
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 2: level of educational awareness	1		0.585			
	16		0.896			
	17		0.903			
	18		0.902			
	19		0.905			
	20		0.435			
	21		0.563			
Factor 3: level of knowledge about general interventions on the battlefield	2			0.695		
	3			0.701		
	4			0.687		
	5			0.798		
Factor 4: level of awareness about the importance of Tactical Medicine	22				0.703	
	24				0.686	
	25				0.888	
Factor 5: level of knowledge about medical interventions specific to the battlefield.	7					0.636
	14					0.705
	23					0.666
Total explained variance ratio=64.543						
Kaiser Meier Olkin=0.861						
Bartlett test result=1,973.440; p<0.001						
Croncbach's alpha (α)=0.808						

TAMKA: Tactical medicine knowledge and awareness scale

Table 4. Statistical values regarding the fit of structural equation model

Measurement	Good fit	Acceptable fit	Fit index values of the model
(x^2/ standard deviation)	≤3	≤4-5	1,194**
RMSEA	≤0.05	0.06-0.08	0.039**
IFI	≥0.95	0.94-0.90	0.974**
CFI	≥0.97	≥0.95	0.973**
GFI	≥0.90	0.89-0.85	0.858*
TLI	≥0.95	0.94-0.90	0.968**

*Acceptable fit, **Good fit
RMSEA: root mean square error of approximation, IFI: incremental fit index, CFI: comparative fit index, GFI: goodness-of-fit index, TLI: Tucker-Lewis index

Goodness-of-Fit Index

This index measures the model's overall fit. A higher goodness-of-fit index (GFI) value indicates that the model fits the data better. The GFI value should generally be 0.90 or higher. A GFI value of 0.90 or higher shows an acceptable fit.

Tucker-Lewis Index

This index measures the fit of the model and is adjusted for sample size. The closer the value is to 1, the better the model fits the data. The Tucker-Lewis index (TLI) value should generally be 0.95 or higher. A TLI value indicates an excellent fit.

DISCUSSION

Validity and Reliability

Before a measurement tool can be approved for use, it is essential to assess its validity and reliability. Validity refers to the tool's ability to accurately measure the specific subject or field it is designed for, without overlapping with other areas. To ensure construct validity, the factor analysis method should be applied. Construct validity indicates the extent to which the symptoms are measured accurately. For a sample size to be considered adequate, the KMO value prior to factor analysis must exceed 0.50. Values in the range of 0.60-0.69 are deemed acceptable. Furthermore, Bartlett's test of sphericity must yield statistically significant results to confirm sample adequacy (17-19). In this study, the KMO test result was 0.861, and Bartlett's test of sphericity yielded a value of 1,973.440. The results were statistically significant ($p<0.05$), indicating that the sample was sufficient for conducting factor analysis.

The literature suggests that items with factor loadings below 0.30 should be excluded from the scale (20). Since all items in this study had factor loadings greater than 0.20, no items were removed. Reliability, which is closely linked to validity, evaluates whether the measurement tool provides consistent results (21). To determine the relationship between the measurement tool and the whole, a reliability coefficient is calculated (22-27). Higher item-total score correlations indicate that the items measure similar characteristics, enhancing internal consistency (27). Consequently, items with strong correlations are considered effective for the intended measurement (20). Typically, items with an item-total score correlation of 0.30 or higher are regarded as having good discriminatory power (28).

For scale validity and reliability, item-total score analysis is a key method (27). One of the reliability measures, the split-half reliability test, assesses the consistency of test scores by splitting the items into two groups (odd-even, first-half-second-half, or neutral) and calculating a reliability coefficient using the Spearman-Brown formula (24-26). This method evaluates the consistency between the scores of the two halves. Adequate reliability coefficients, such as Spearman-Brown, Guttman split-half, and Cronbach's α, are utilized for these calculations. Cronbach's α is specifically recommended for Likert-type scales, as it measures the internal consistency of the items (27). For a tool to be deemed reliable, its reliability coefficient should approach one. A Cronbach's α below 0.40 indicates unreliability, values between 0.40-0.59 indicate low reliability, 0.60-0.79 indicate high reliability, and 0.80-1.00 indicate very high reliability (21). In this study, Cronbach's α was calculated to evaluate internal consistency, and found to be 0.808, demonstrating that the scale's internal consistency was highly reliable.

The research findings reveal that the TAMKA tool met the requirements for validity and reliability. The explanatory factor analysis results indicated adequate sample distribution based on the KMO test. The factor loadings for the scale items, organized into five sub-dimensions, ranged from 0.435 to 0.905. While the variance ratios were satisfactory, Cronbach's α was above 0.70. These results confirm that TAMKA is a reliable measurement tool.

Based on CFA, the model fit indices revealed that the TAMKA exhibited acceptable goodness of fit according to the first-order CFA structural equation model. All items significantly contributed to the model.

The 1st order CFA structural equation model further demonstrated that TAMKA's sub-dimensions positively influenced the total knowledge and awareness score. Consequently, TAMKA was validated and found reliable for use among young individuals undergoing EM Specialty training. The tool comprises 25 questions grouped into five factors: factor 1 (level of knowledge about general medical practices) includes questions 6, 8, 9, 10, 11, 12, 13, and 15; Factor 2 (level of educational awareness) includes questions 1, 16, 17, 18, 19, 20, and 21; Factor 3 (level of knowledge about general interventions on the battlefield) includes questions 2, 3, 4, and 5; Factor 4 (level of awareness about the importance of tactical medicine) includes questions 22, 24, and 25; And factor 5 (level of knowledge about medical intervention specific to the battlefield) includes questions 7, 14, and 23 (Figure 1).

Despite the promising results regarding the scale's validity and reliability, certain limitations warrant consideration. The single-center design and relatively small sample size may restrict the generalizability of the findings. Future multi-center studies with larger cohorts are essential to validate the scale in diverse

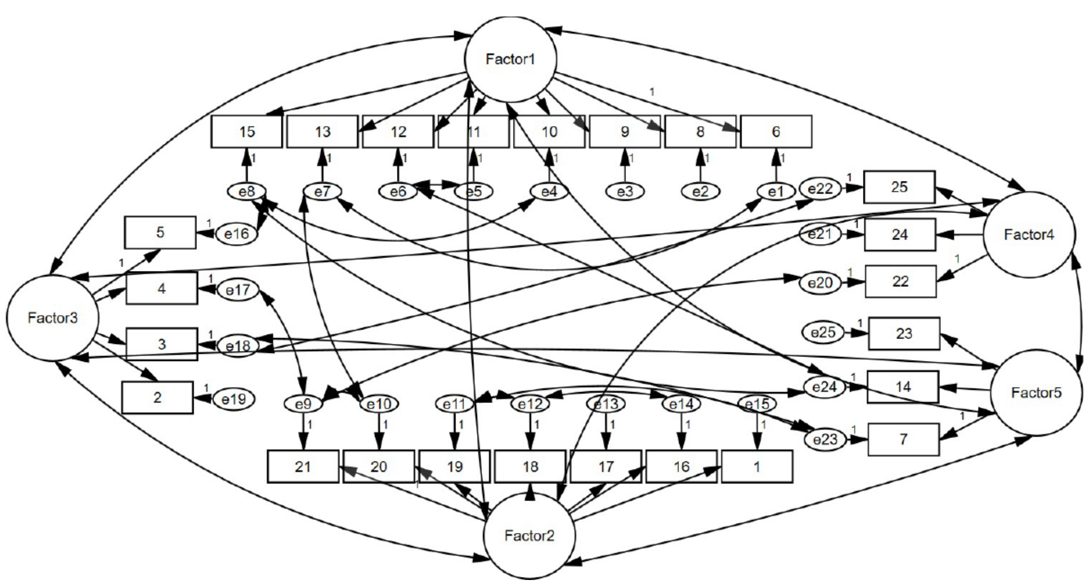

Figure 1. Confirmatory factor analysis scheme

settings. Additionally, while CFA demonstrated a good model fit, comparative evaluations with alternative models could provide further insights into the scale's structure. Some items showed lower factor loadings, highlighting the need for ongoing refinement to enhance construct validity. Furthermore, the absence of discriminant and convergent validity testing represents a limitation that future research should address to solidify the scale's psychometric properties.

Application of the Survey

The "conventional warfare" era, in which the wars typically took place between regular armies and civilian involvement was collateral, was replaced by the "unconventional warfare" era in the 21st century, where the conflicts often involved civilians and non-state actors (29). Battle-related deaths have increased in recent years, with a calculated number of 225,000 people dying in 2022 (30). The current situation has led to a re-evaluation of the traditional view of tactical medicine (6,7,29), and TEMS has become a field of expected demand and growth (4). While EM specialists may be familiar with algorithms and procedures included in tactical EM, there are fundamental differences between emergency care and TEMS (1,6). While it is not a requirement mandated by the Accreditation Council for Graduate Medical Education, Petit et al. (10) showed that EM residencies in the USA, including tactical medicine training in their curriculum, have grown from 18% to 53% between 2005 and 2018. As is true across the globe, there is no formal training on tactical medicine in the curricula of the faculty of medicine and EM residency training in Türkiye (8,9).

A literature review showed that no standard questionnaire evaluates the level of knowledge and awareness of EM physicians in the tactical medicine field. Our study concluded that 25 of the 55 questions defined by the researchers according to the literature review were appropriate for the TAMKA tool.

It was observed that EM physicians did not feel competent in the essential tactical medicine components such as the meaning and scope of tactical medicine; The necessary equipment and algorithms; Recognition of hemorrhage, tourniquet application, and hypothermia management; Nasopharyngeal airway, surgical cricothyroidotomy, and needle decompression; Burns and wound care; And pain control. Heiskell and Carmona (3) reminded us that EM specialists and surgeons typically see and treat blunt trauma in the civilian setting and may not be experts on managing multiple blast injuries and penetrating trauma. Like any other specialist, an EM physician who did not receive tactical medical education may need to improve their competence. Today, specific guidelines and courses are available for tactical medicine, reminding us that tactical medicine is not equal to "trauma medicine" (31).

In our study, participants did not think the EM residency training should be unique, in including tactical medicine education. Indeed, tactical medicine is a multidisciplinary field and may need the expertise of several specialties including trauma surgery, cardiothoracic surgery, EM, critical care, operational medicine, and medical education (1,6,7).

Including physicians in tactical teams seems to be an increasing trend (1). Gildea and Janssen (32) survey showed that the rate of tactical teams with a physician on the team increased from 9% to 48% in ten years, and 97% of the participants felt physician involvement was beneficial.

It is challenging to conduct studies on tactical medicine due to the inherent difficulties in the tactical field (6). Gerhardt (7) demonstrated a 44% increase in survival rates (odds ratio 0.56; 95% CI, 0.37-0.86; $p<0.01$) by including EM providers in tactical care. EM associations see TEMS as an essential component of tactical teams and encourage TEMS programs to include EM presence (5). Our study observed that EM physicians believe that medical schools and EM residency programs should include theoretical and practical education in the tactical medicine field. Physicians trained in tactical medicine will improve the results in the tactical field.

Since the questionnaire is short, it is likely functional in terms of being usable in emergency departments and situations requiring rapid intervention. The validity and reliability study with EM physicians should be conducted on different groups and tested with different variables.

Study Limitations

This study's main limitations include its single-center design, relatively small sample size, and cross-sectional nature, which may limit generalizability and preclude assessment of changes over time. Additionally, reliance on expert opinions for content validity may introduce subjective bias. Multi-center and longitudinal studies are recommended for further validation to enhance the scale's applicability in different settings.

Although the CFA demonstrated excellent fit indices (RMSEA, CFI, IFI), the model's robustness would benefit from further evaluation by comparing it with alternative models. Such comparative analyses would provide deeper insights into the factor structure and overall validity of the scale.

Conclusion

The changing paradigms of war and conflicts require that all physicians, and especially the EM specialists, gain more knowledge in the tactical medicine field. This new scale, TAMKA, proved to be a reliable measurement tool, for determining the level of knowledge and awareness of EM physicians in tactical medicine. We believe that TEMS should be included in the curricula of medical school and EM residency programs.

Ethics

Ethics Committee Approval: This cross-sectional study was conducted between January 1, 2024 and April 1, 2024, after approval from the İzmir Katip Çelebi University Social Research Ethics Committee (decision no: 2023/21-07, date: 20.12.2023).

Informed Consent: Written informed consent was obtained from all participants before participation in the study.

Footnotes

Author Contributions: Concept - İ.S., M.G.E., M.A.T.; Design - İ.S., E.K., M.G.E., M.A.T.; Z.P; Data Collection and/or Processing - İ.S., E.K., M.G.E., El.K., Z.Ö.; C.K.; Analysis and/or Interpretation - M.G.E., El.K., Z.Ö., M.A.T.; Literature Search - E.K., M.G.E.; C.K.; Writing - İ.S., E.K., M.G.E., M.A.T.

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