Research

Adaptation of the Shirom−Melamed Burnout Measure in Parents of Turkish Pediatric Oncology Patients

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ABSTRACT

Objectives: This study was conducted to adapt the Shirom−Melamed Burnout Measure (SMBM) in parents of Turkish pediatric oncology patients.
Methods: This methodological and descriptive study was conducted with 184 parents of pediatric oncology patients from December 2023 to July 2024. Data was collected face to face interviews via an information form and the SMBM. Translation processes, expert opinions, and content validity were meticulously addressed. Data analysis was utilized by IBM SPSS Statistics and AMOS 25.
Results: The mean age of parents was 37.02 ± 8.20, and 94.6% of the parents were mothers. The scale demonstrated high validity (content validity index = 0.97) and excellent internal consistency (Cronbach's alpha = 0.91). The Exploratory Factor Analysis revealed a 4-factor structure, explaining 67.60% of the variance. A modified 4−factor 19−item model of the provided excellent model fit (chi-square/df = 1.946, RMSEA = 0.072, GFI = 0.861, CFI = 0.932, IFI = 0.933, RFI = 0.849, NFI = 0.871, TLI = 0.920).
Conclusions: The Turkish scale with 4−factor 19−item is a valid and reliable tool can be used to determine the burnout level of parents of pediatric oncology patients.
Implications for Nursing Practice: Healthcare providers should use the SMBM to assess parental burnout, develop targeted support programs, and evaluate the impact of caregiving on parents' well-being.

Introduction

Pediatric cancers are a major global health problem in the world.[1] The World Health Organization indicates that approximately 400.000 children and adolescents aged 0-19 are diagnosed with cancer annually.[2] Turkish Pediatric Oncology Group and Turkish Pediatric Hematology stated that 46.067 aged 0-19 new cases were registered between 2002-2022.[3] This significant incidence rate underscores the critical need for comprehensive support systems for affected children and their parents.

Pediatric oncology patients and their parents undergo a prolonged and arduous treatment process following a cancer diagnosis.[4,5] Cancer treatment and prognosis rely heavily on parents' support and care.[6,7] Parents dedicate substantial effort to caring for pediatric oncology patients with delicate physical and mental conditions, collaborating with the healthcare team for treatment and care administration, and monitoring treatment complications and cancer recurrence.[6,8,9] Moreover, parenting a child with cancer can result in changes in their everyday routines and shifts in their roles and employment status, leading to adverse psychosocial consequences and exacerbating existing stressors.[6,7] Over time, this situation can lead to parental burnout.[10]

Parental burnout is a syndrome characterized by exhaustion stemming from physical, emotional, and cognitive demands, where parents encounter excessive stress without adequate coping mechanisms.[11,12] Burnout in the context of parents of pediatric oncology patients may result from the constant worry, emotional strain, and care demands associated with their child's diagnosis.[9,13] Previous research has shown that parents of pediatric oncology patients experience significant levels of burnout, which may result in neglect of children's care, potentially exacerbating their prognosis.[14-16] In addition, the health of parents can be adversely impacted, as they may devote the majority of their time and energy to the caregiving process for their child with cancer.[17] A comprehensive literature review examining the psychosocial

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Layperson Summary

What we investigated and why

Parents dedicate significant effort to caring for pediatric oncology patients with delicate physical and mental conditions, which can cause parental burnout. Therefore, it is necessary to use reliable tools to identify the burnout levels of these parents. Accordingly, this study aimed to conduct a psychometric validation of the Shirom−Melamed Burnout Measure (SMBM) to measure burnout levels in parents of pediatric oncology patients in Turkey.

How we did our research

The study was conducted with 184 parents of pediatric oncology patients. The consistency of the data over time, validity, and reliability were analyzed using statistical methods.

What we have found

The study results indicated that the SMBM is a valid and reliable tool for measuring burnout levels in parents of pediatric oncology patients. The reliability of the SMBM was confirmed by the strong consistency in the responses and a good fit in the analysis of its structure.

What it means

The study's findings suggest that the SMBM is a valuable tool for healthcare providers to identify burnout levels in parents of pediatric oncology patients. This tool may allow healthcare providers to provide early detection and timely intervention to alleviate burnout and improve parental health.

well-being of parents of pediatric oncology patients in Turkey highlights that parents frequently contend with psychosocial issues, including the burden of care,[18] however, there is a lack of a valid scale to measure the burnout level of Turkish parents of pediatric oncology patients. Early detection is a crucial prerequisite for timely intervention to alleviate burnout, improve parental health, and ensure the recovery of pediatric oncology patients.[14]

Existing tools, such as The Maslach Burnout Inventory,[19] are essential for understanding individual burnout levels but do not capture the comprehensive burnout status of these parents. It does not have a version specific to parents of pediatric oncology patients. Similarly, The Parental Burnout Assessment is another essential instrument designed to measure burnout levels among parents in the general community.[20] However, it primarily focuses on assessing mothers' burnout levels related to maternal roles arising from childbearing and childrearing in a general context.[21] The Shirom−Melamed Burnout Measure (SMBM), developed by Shirom and Melamed in 1992, assesses burnout levels in individuals facing stressful situations.[22] The scale was utilized to measure burnout levels among parents of pediatric oncology patients in different cultures and demonstrated good internal consistency reliability.[14,23,24] The SMBM assesses the core dimensions of burnout through four subscales—physical fatigue/emotional exhaustion, cognitive weariness, listlessness, and tension—using 22 straightforward items that can be utilized in a few minutes.[22,25] Physical fatigue refers to feeling tired and having less energy for daily tasks. Emotional exhaustion involves feeling drained in interactions with others. Cognitive weariness includes feeling mentally sluggish and having difficulty concentrating. These components, along with physical and emotional exhaustion, comprise burnout's main elements.[22] The aspects of tension and listlessness were included to describe the stages of burnout, with tension being more common in the early stages and listlessness

characterizing the later stages, where burnout is more associated with apathy and depression.[22,26]

Nurses should recognize the substantial physiological, cognitive, and psychological components of burnout that parents endure during the cancer diagnosis and treatment process. It was stated that The SMBM might be the most suitable instrument for burnout level measurement in parents of pediatric oncology patients.[14] We posit that integrating this tool into pediatric oncology care will strengthen the support system for parents, thereby improving their psychosocial well-being and the quality of care they provide to pediatric oncology patients. Therefore, this study aimed to conduct a psychometric validation of the SMBM to measure burnout levels in parents of pediatric oncology patients in Turkey.

Materials and Methods

Design

This study utilized a methodological and descriptive design to adapt the SMBM, initially developed by Melamed et al. (1992),[22] for use with Turkish parents of pediatric oncology patients and to assess its validity and reliability. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[27] The methodology was conducted by formulating a clear title, introduction, and methods section, outlining the study design, setting, participants, data collection tools, procedure, results, and conclusions. Additionally, Koenig and Al Zaben's (2021) recommendations related to psychometric validation and translation of religious and spiritual measures were implemented in this study.[28] These recommendations include forward translation, reconciliation, back translation, back translation review, harmonization, debriefing, confirmation of factor structure, establishment of reliability, and finalization. These steps describe the best "Good Practices" standard for scale translation and validation, which includes translating and culturally adapting a scale into a different language.[28]

Sample and Participants

The study was conducted with parents of pediatric oncology patients aged 0-18 who were treated at the Pediatric Hematology/Oncology Clinics in Istanbul University Faculty of Medicine Hospital from December 2023 to July 2024. The purposive sampling method was used to choose participants. In scale adaptations, selecting a sample size of at least 5-10 times the number of scales is recommended. Determining the sample size for the scale, Tabachnick et al. (2007) suggest that the participant/item ratio should be 10:1.[29] For this study, with a scale of 22 items, the sample size was calculated to be 154 individuals, taking seven times the number of items. The sample size was increased by 20% to account for potential dropouts, targeting 184 participants. During the study, 184 parents of pediatric oncology patients who were treated in the Pediatric Hematology/Oncology Clinics were included.

The inclusion criteria for the sample were as follows: being literate, speaking Turkish, volunteering for the study, and having a child with cancer aged 0-18.

The sample's exclusion criteria were incomplete data filling, visual or auditory problems, and wanting to withdraw from the investigation.

Data Collection Tools

Information Form: The researchers have created a form consisting of 10 questions. These questions include parents' age, gender, education level, number of children, marital and employment status, the getting support for child care, and the child's age, gender, and diagnosis.

Shirom−Melamed Burnout Measure (SMBM): The SMBM consists of 22 items, divided into four subscales: Emotional and Physical

Exhaustion (EPE, 8 items), Cognitive Weariness (CWE, 6 items), Tension (TES, 4 items), and Listlessness (LIS, 4 items).[22,30] Examples of items are "I feel tired" and "My batteries are dead" in the EPE subscale, "I feel I am not thinking clearly" and "I have difficulties thinking about complex things in the CWE subscale," "I feel tensed" and "I feel relaxed" in the TES subscale, and "I feel full of energy" and "I feel alert" (these items are reversed) in the LIS subscale. Each item is rated using a seven−point scale (1 = Almost never to 7 = Almost always), with higher scores reflecting a higher degree of self−rated burnout. Five items have reversed scoring: 1 item in the TES subscale, 3 in the LIS subscale, and 1 in the EPE subscale. For each subdomain and the scale, the total score is averaged by dividing by the number of items in the domain.

Validity and Reliability Stages

Translation Process

In the process of adapting the scale to a different language, a five-stage translation and back-translation method was used to minimize conceptual and linguistic differences, adhering to the guidelines of the World Health Organization (WHO) (2007).[31,32] First, the scale was translated into Turkish by three people who were fluent in both Turkish and English (forward translation). It is crucial that the translation of such scales from English to Turkish is undertaken by health professionals with expertise in the relevant terminology and experience in data collection/interviewing. In this study, three language experts with a good understanding of the cultural, psychological, and grammatical nuances between the two languages completed the Turkish translation. The translations were then reviewed by these experts and independently assessed by two language editors who were proficient in both languages but had not been exposed to the original English version of the questionnaire. The language editors then performed a back-translation of the Turkish version into English. A thorough review of the Turkish translation was carried out by comparing the translated phrases with the original English terms, and adjustments were made to ensure accuracy and faithfulness to the source material.

Content Validity

The Content Validity Index (CVI) is the most frequently employed metric in quantitative assessments of content validity.[33-35] There are two primary types of CVIs: the Item Content Validity Index (I-CVI) and the Scale Content Validity Index (S-CVI). In line with the World Health Organization's guidelines, this process is highly recommended for scale adaptation studies. In this study, following the back-translation process, experts assessed both I-CVI and S-CVI as recommended by Polit and Beck. A 4-point likert scale was employed (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant).[36,37] The I-CVI for each item was calculated by dividing the number of experts who rated the item as 3 or 4 by the total number of experts. Similarly, the S-CVI was calculated based on the proportion of experts who rated each item as 3 or 4. According to the guidelines suggested by Polit et al.[36,37] It is recommended to obtain input from at least 3 experts to evaluate both the I-CVI and S-CVI.[37] Ten experts in this study were selected based on their expertise in pediatric nursing and physicians either a Master's or PhD degree and at least five years of experience, particularly in oncology settings. All experts had a deep understanding of the burnout of the caregivers. They evaluated the instrument based on three criteria: comprehension, clarity, and accuracy. They suggested adapting "I feel active" to "I feel energetic" to better align with Turkish cultural expressions. The results were interpreted according to the recommendations of Landis and Koch (1977), who consider values ranging between 0.61 and 0.80 as indicating substantial agreement.[33] Items with an I-CVI and S-CVI value of 0.80 or higher, as evaluated by experts, are considered indicators of good content validity.[36]

Pilot Study

An initial evaluation was also conducted to assess the readability, comprehensibility, and clarity of the draft inventory based on expert feedback. The pilot study included patients receiving treatment at the same hospital where the study was conducted. For the pilot application, it is recommended to apply the scale to a group of 20-30 individuals who have characteristics similar to those of the study participants but are not included in the primary study sample.[38] In line with this guideline, the scale was piloted with the parents of 30 pediatric oncology patients treated at the Pediatric Oncology Unit. A face validation form was developed following content validation, which included items for parents to assess the clarity and comprehension of each question. Participants rated each item on a 4-point Likert scale, ranging from 1 (not clear/comprehensible) to 4 (very clear/comprehensible). Upon completion of the face validation process, the items were assessed for clarity and comprehension. The proportion of respondents who rated each question as clear and comprehensible (scores of 3 or 4) was calculated to determine the Item Face Validity Index (I-FVI) for each question. The I-FVI was computed by dividing the number of respondents who rated the question as clear and comprehensible by the total number of respondents. These rates ranged from 0.83 to 1.00. These rates ranged from 0.83 to 1.00. Items with an FVI ≥ 0.83 are considered clear and comprehensible.[39]

The data collected during the pilot study were not included in the analysis of the main sample to ensure that the validation process remained independent. The feedback from this pilot study was crucial in refining the inventory and allowed necessary adjustments to be made before it was applied more broadly in the main study.

Data Collection

Data were gathered by conducting face-to-face interviews with parents of pediatric oncology patients aged 0-18 who were being treated at the Pediatric Hematology/Oncology Clinics. The researcher visited the unit every weekday between 09:00 and 17:00, explained the purpose and scope of the study to eligible parents, and obtained data from willing participants. On average, each data collection session lasted 10-15 minutes.

Ethical Consideration

In the first phase of the study, permission was obtained from the scale developers to verify the validity and reliability of the SMBM. Ethics committee permission to conduct the study was obtained from the Başkent University's Non-Invasive Clinical Trials Ethics Committee (Date: 15.11.2023 and No: KA23/383), while institutional permission was obtained from the Department of Pediatrics Oncology at Istanbul University Faculty of Medicine Hospital. They received a detailed explanation about the purpose of the study, possible risks and benefits, and their rights, including the right to withdraw at any stage without repercussions. Personal health information and all sensitive data were anonymized and securely stored in password-protected documents. This study complied with the ethical rules outlined in the Declaration of Helsinki.

Data Analysis

The statistical analyses were performed using SPSS version 25.0 and the AMOS version 25.0 program. Descriptive statistics were used to summarize the demographic characteristics of the sample. The mean age of parents and children and the proportions of mothers,

educational levels, employment status, family income levels, and family structure were calculated. Content validity was evaluated by consulting ten experts in the field. The CVI was calculated for each item I and the entire scale. The internal consistency of the SMBM was assessed using Cronbach's alpha. This analysis was performed for three versions of the SMBM. Cronbach's alpha values for each subscale and the overall scale were calculated. Using Principal Component Analysis with Oblimin rotation, EFA was performed to explore potential factor solutions within the sample. The Kaiser−Meyer−Olkin (KMO) measure and Bartlett's test of sphericity were used to assess the appropriateness of the data for factor analysis. The total explained variance and factor loadings for each model were calculated. CFA was conducted to confirm the factor structure identified in the EFA. Fit indices such as the Chi-square (CMIN), Root Mean Square Residual (RMR), Goodness of Fit Index (GFI), Adjusted GFI (AGFI), Normed Fit Index (NFI), Relative Fit Index (RFI), Incremental Fit Index (IFI), Tucker−Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) were used to evaluate the model fit.

Results

Sample Characteristics

The sample characteristics were shown in Table 1.

Content Validity

Before the pilot application of the scale, the content analysis of the items and the scale was carried out by taking the opinions of 10 experts. The item-level Content Validity Index (I-CVI) was 0.97, indicating a high level of agreement between the experts. The scale's overall Scope Validity Index (S-CVI) was 0.98, indicating consistent evaluation consistency. With 10 experts evaluating the items, the item-level Content Validity Index (I-CVI) was 0.97. After calculating

the probability of chance agreement (Pc), the modified kappa was determined to be 0.97, indicating an excellent level of agreement even after adjusting for random agreement. This additional analysis further strengthens the reliability of the scale's content validity.

Adaptation of the SMBM

Minor modifications were made to the SMBM to ensure that it better-captured burnout among parents in Turkey. For example, "I feel like my 'batteries' are 'dead'" was adapted to "I feel like my body is 'out of battery'" to better align with Turkish cultural expressions. The adapted SMBM was then reviewed by 30 mothers who participated in a pilot study. These mothers provided critical feedback on the scale. During the pilot study, each mother completed the questionnaire while we observed their reactions to the items, noting any signs of confusion or discomfort. After completing each item, they were asked whether the statement was clear and easy to respond to.

Reliability Analysis

The analysis of the 4-factor SMBM across different item exclusions reveals significant findings (Table 2). Initially, the internal consistency of the factors was assessed using Cronbach's alpha. For the 4-factor SMBM with 22 items, the Cronbach's alpha values were as follows: Emotional and Physical Exhaustion (EPE) 0.842, Listlessness (LIS) 0.589, Tension (TES) 0.651, and Cognitive Weariness (CWE) 0.908. The overall scale of Cronbach's alpha was 0.914. The 4-factor

TABLE 1

The Sociodemografic Features of the Parents and Children (*n* = 184)

Variables	Mean ± SD	
Age	37.02 ± 8.20	
Child's age	5.23 ± 1.29	
Child's diagnosis time (months)	12.29 ± 1.28	
Number of the children	2.3 ± 1.19	
Caring parent	*n*	**%**
Mother	174	94.6
Father	10	5.4
Gender		
Female	133	72.3
Male	51	27.2
Education		
High School	125	67.9
University	59	32.1
Marital status		
Married	162	66.3
Single	22	33.7
Employment status		
Employed	62	33.7
Unemployed	122	66.3
Getting support for child care		
Yes	146	79.3
No	38	20.7
Type of the child's diagnosis		
Leukemia	85	46.2
Sarcoma	23	12.5
Central nervous system tumors	40	21.7
Lymphoma	19	10.3
Others	13	9.3

SD, standard deviation.

TABLE 2

Results of the Reliability Analyses of the Scale and Correlations of the Item Total Score (*n* = 184)

Items	4−Factor SMBM−22	4−Factor SMBM−20	4−Factor SMBM−19
1. I feel tired.	0.688	0.700	0.896
2. I feel refreshed.	0.307	-	-
3. I feel physically exhausted.	0.626	0.643	0.649
4. I feel "fed up."	0.612	0.613	0.618
5. I feel full of vitality.	0.187	0.182	0.157
6. My batteries are dead.	0.671	0.689	0.702
7. I feel alert.	0.105	0.101	0.088
8. I feel burned out.	0.796	0.806	0.814
9. I feel mentally fatigued.	0.720	0.731	0.738
10. I feel no energy for going to work in the morning.	0.599	0.597	0.587
11. I feel active.	0.299	0.284	0.261
12. I feel sleepy.	0.608	-	-
13. I am tense.	0.683	0.680	0.687
14. I feel relaxed.	0.214	0.207	-
15. I feel restless.	0.715	0.717	0.719
16. I feel intense inner tension.	0.763	0.765	0.768
17. I feel too tired to think.	0.731	0.741	0.743
18. I have difficulty concentrating.	0.802	0.798	0.806
19. My thinking process is slow.	0.771	0.770	0.782
20. I feel I am not thinking clearly.	0.701	0.701	0.717
21. I have difficulty thinking about complex things.	0.739	0.740	0.744
22. I feel I am not focused on my thinking.	0.723	0.727	0.733
Total Cronbach Alpha (α) Value for total score	0.914	0.914	0.919
Total Cronbach Alpha (α) Value for TES	0.651	0.651	0.778
Total Cronbach Alpha (α) Value for CWE	0.908	0.908	0.908
Total Cronbach Alpha (α) Value for LIS	0.589	0.816	0.816
Total Cronbach Alpha (α) Value for EPE	0.842	0.861	0.861

CWE, cognitive weariness; EPE, emotional exhaustion and physiological fatigue; LIS, listlessness; SMBM, Shirom−Melamed Burnout Measure; TES, tension.

SMBM with 20 items (excluding items 2 and 12) showed promising results. However, further refinement led to the 4-factor SMBM with 19 items (excluding items 2, 12, and 14), which was the most effective version. For the 4-factor SMBM with 20 items, Cronbach's alpha values improved for several factors: EPE 0.861, LIS 0.816, TES 0.651, and CWE 0.908. The overall scale of Cronbach's alpha was also 0.914. Finally, the 4-factor SMBM with 19 items showed the best internal consistency with the following Cronbach's alpha values: EPE 0.861, LIS 0.816, TES 0.778, and CWE 0.908. The overall scale of Cronbach's alpha increased to 0.919. This version, excluding items 2, 12, and 14, demonstrated the highest reliability and is considered the best configuration among the tested models (Table 2).

In the internal consistency and time stability assessment, the Hotelling T-square value was 12.473, and the F test was 31.582. There was no significant evidence of response bias in the scale ($P < .01$). Furthermore, the analysis of summability produced a *P*-value of .763 and an F-statistic of 0.631, confirming the scale's reliability.

Exploratory Factor Analysis of SMBM

The results of the EFA for the SMBM are detailed in Table 3. KMO measure of sampling adequacy was high, with values of 0.920, 0.916, and 0.918 for the 22-item, 20-item, and 19-item models, respectively, indicating the suitability of the sample for factor analysis. Bartlett's test of sphericity was significant for all models ($\chi2 = 2310.646$, $\chi2 = 2176.542$, $\chi2 = 2116.685$; $P < .001$), confirming that the correlation matrices were appropriate for factor analysis (Table 3).

The EFA results revealed distinct factor structures across the different models. For the 22-item SMBM, the total variance explained was 63.33%, while for the 20-item SMBM, the total variance explained increased to 66.21%. The refined 19-item SMBM model, which excluded items 2, 12, and 14, accounted for the highest total variance at 67.60%. This indicates that the 19-item model provides a more straightforward and efficient factor structure (Table 2).

The factor loadings for the SMBM subscales were consistent across the different models. The EPE subscale, for instance, showed strong loadings for items such as "I feel tired" and "I feel physically exhausted," with values generally above 0.7. The LIS subscale also displayed high loadings, particularly for items like "I feel full of vitality" (reversed) and "I feel alert" (reversed), with values ranging from 0.797 to 0.893. The TES subscale had moderate to high loadings, and the CWE subscale consistently showed very high loadings, underscoring the reliability of these subscales (Table 3).

CFA Results

CFA results provide significant insights into the structure and reliability of the model (Table 4). In CFA, the chi-square statistics indicate the model fit. The default model has a chi-square value of 284 with 146 degrees of freedom (DF), yielding a *P*-value of .000. The CMIN/DF ratio is 1.946, suggesting an acceptable model fit with four factors (Fig. 1).

The Goodness of Fit Index (GFI) was 0.861, the Normed Fit Index (NFI) was 0.871, the Relative Fit Index (RFI) was 0.849, the Incremental Fit Index (IFI) was 0.933, the Tucker−Lewis Index (TLI) was 0.920, and Comparative Fit Index (CFI) was 0.932. The default model's Root Mean Square Error of Approximation (RMSEA) is 0.072. These values indicate a good model fit (Table 4).

Discussion

In our study, the I-CVI was found to be 0.97, and the scale's overall S-CVI was 0.98, indicating a very high level of agreement among the experts and strong content validity. These results are consistent with findings from similar studies. For instance, the psychometric validation of the Chinese version of the SMBM/Q among parents of pediatric oncology patients reported CVI values ranging from 0.80 to 1.00 for individual items and a CVI of 0.91 for the total scale, indicating acceptable content validity.[14] Additionally, other studies have considered CVI

TABLE 3
The Items of the SMBM and Their Associated Factor Loadings ($n = 184$)

Items	Subscale	4−Factor SMBM−22	4−Factor SMBM−20	4−Factor SMBM−19
1. I feel tired (*Yorgun hissediyorum*).	EPE	0.774	0.747	0.747
2. I feel refreshed (**reversed**) (*Ferahlamış/iyi hissediyorum*).	EPE	0.235	-	-
3. I feel physically exhausted (*Fiziksel/bedensel olarak yorgun hissediyorum*).	EPE	0.791	0.695	0.850
4. I feel "fed up" (*Bıkkınlık hissediyorum*).	EPE	0.640	0.740	0.848
5. I feel full of vitality (**reversed**) (*Hayat dolu hissediyorum*).	LIS	0.874	0.882	0.893
6. My batteries are dead (*Enerjimin tamamen tükenmiş olduğunu hissediyorum*).	EPE	0.751	0.730	0.649
7. I feel alert (**reversed**) (*Tetikte/diken üstünde hissediyorum*).	LIS	0.849	0.852	0.837
8. I feel burned out (*Tükenmiş hissediyorum*).	EPE	0.841	0.833	0.723
9. I feel mentally fatigued (*Zihinsel olarak yorgun hissediyorum*).	EPE	0.789	0.742	0.536
10. I feel no energy for going to work in the morning (*Sabahları bir iş yapmak için enerjik hissetmiyorum*).	EPE	0.579	0.667	0.724
11. I feel active (**reversed**) (*Enerjik hissediyorum*).	LIS	0.797	0.797	0.830
12. I feel sleepy (*Uykulu hissediyorum*).	LIS	0.189	-	-
13. I am tense (*Gergin hissediyorum*).	TES	0.636	0.554	0.474
14. I feel relaxed (**reversed**) (*Rahatlamış hissediyorum*).	TES	0.817	0.343	-
15. I feel restless (*Huzursuz hissediyorum*).	TES	0.633	0.721	0.686
16. I feel intense inner tension (*Yoğun bir iç gerginlik hissediyorum*).	TES	0.670	0.786	0.727
17. I feel too tired to think (*Düşünemeyecek kadar yorgun hissediyorum*).	CWE	0.710	0.773	0.726
18. I have difficulty concentrating (*Konsantre olmakta zorluk çekiyorum*).	CWE	0.824	0.818	0.816
19. My thinking process is *slow (Düşünce sürecim yavaşladı)*.	CWE	0.846	0.859	0.849
20. I feel I am not thinking clearly (*Sağlıklı düşünemediğimi hissediyorum*).	CWE	0.771	0.743	0.789
21. I have difficulty thinking about complex things (*Karmaşık şeyler hakkında düşünmekte zorluk çekiyorum*).	CWE	0.848	0.858	0.869
22. I feel I am not focussed in my thinking (*Düşüncelerime odaklanamadığımı hissediyorum*).	CWE	0.796	0.821	0.841
Total Explained Variance		63.33	66.21	67.60
KMO Coefficient		0.920	0.916	0.918
Barlett Test		2310.646; < 0.001	2176.542 < 0.001	2116.685 < 0.001

CWE, cognitive weariness; EPE, emotional exhaustion and physiological fatigue; LIS, listlessness; SMBM, Shirom−Melamed Burnout Measure; TES, tension; KMO, Kaiser−Meyer−Olkin coefficient.

TABLE 4
Model Fit Indices of the Scale

	X^2	DF[a]	X^2/DF	RMSEA[b]	GFI[c]	CFI[d]	IFI[e]	RFI[f]	NFI[g]	TLI[h]
Factor 4 SMBM-19 items	284	146	1,946	0.072	0.861	0.932	0.933	0.849	0.871	0.920

[a] Degree of Free.
[b] Root Mean Square Error of Approximation.
[c] Goodness of Fit Index.
[d] Comparative Fit Index.
[e] Incremental Fit Index.
[f] Relative Fit Index.
[g] Normed Fit Index.
[h] TLI (NNFI): Trucker-Lewis Index.

values greater than 0.78 for each item and more significant than 0.9 for the total scale to be acceptable, reinforcing the strong content validity of the instruments used. Similarly, the internal construct validity of the SMBM/Q reported CVI values greater than 0.80 for each item and a CVI of 0.91 for the total scale. These comparisons illustrate that the content validity of our scale is well within the range of what is considered acceptable and robust in the field.

The assessment of the 4-factor SMBM through various item exclusions revealed significant findings regarding internal consistency, mainly evaluated using Cronbach's alpha. Initially, with 22 items, the Cronbach's alpha values for the EPE factor was 0.842, LIS was 0.589, TES was 0.651, and CWE was 0.908, with an overall scale Cronbach's alpha of 0.914. Subsequent refinement led to a 4-factor SMBM with 20 items (excluding items 2 and 12), showing improved results, and further exclusion of item 14 resulted in the most effective version with 19 items. In this final version, excluding items 2 (I feel refreshed), 12 (I feel sleepy), and 14 (I feel relaxed) the Cronbach's alpha values were EPE 0.861, LIS 0.816, TES 0.778, and CWE 0.908, with an overall scale Cronbach's alpha of 0.919, indicating the highest reliability and the best configuration among the tested models.[40] In many cultures, including Turkish culture, emotional expressions such as feeling refreshed or relaxed might not align with the expected emotional states of parents dealing with a child's serious illness, such as cancer.[18] Parents may feel that expressing feelings of being refreshed or relaxed is inappropriate or even contradictory to the gravity of their child's condition. The role of caregivers in Türkiye often involves significant emotional and physical labor, with a focus on meeting the needs of the sick child before their own.[41] Within this cultural framework, parents may not often reflect on or express personal physical states like feeling sleepy or relaxed. The expectation to remain alert and available for the child's needs may override personal feelings of fatigue or rest. The removal of these items might reflect the understanding that these emotional states are not culturally congruent with the experience of caregiving in this context, where parents may prioritize feelings of vigilance, anxiety over rest or relaxation. Almén and Jansson (2021) performed a Swedish version of the SMBM.[42] Similarly, they calculated different subdimensions of the SMBM with different item numbers. They revealed that the Cronbach's were .96 for the 4-factor-SMBM-19 and the 3-factor-SMBM-16, .94 for the SMBM-11 and the 2-factor-SMBM-12, and .90 for the 2-factor-SMBM-6. The total scores for the different scales correlated between .95 and 1.00 with each other.[43] Liao et al. (2023) performed validation of the Chinese version of the SMBM/Q among parents of pediatric oncology patients.[14] The Cronbach's α coefficients of the Chinese version of the scale were 0.936 for the total scale and 0.911, 0.941, 0.772, 0.758, and 0.793 for the physical fatigue, cognitive weariness, emotional exhaustion, listlessness, and tension factors, respectively.[14] Norberg (2007) first used the SMBM/Q to measure the specific burnout levels among parents of pediatric oncology patients and reported good internal consistency reliability (Cronbach's α coefficients were 0.98 and 0.89-0.97 for the SMBM/Q total scale and subscales, respectively).[14,23,24,43,44] In the internal consistency and time stability assessment, the Hotelling T-square value was 12.473, and

the F test was 31.582, with no significant evidence of response bias in the scale ($P < .01$). These results collectively indicate the robustness and effectiveness of the 4-factor SMBM, especially in its refined version with 19 items, in measuring burnout across different dimensions with high internal consistency and reliability. The improvements observed in Cronbach's alpha values for the different factors of the SMBM following item exclusions suggest a refinement of the scale that enhances its internal consistency and reliability.

The EFA and subsequent assessments reveal that the 19-item version of the SMBM is the most effective and reliable model for measuring burnout. The high KMO values for all models (0.920 for 22 items, 0.916 for 20 items, and 0.918 for 19 items) indicate adequate and suitable sample sizes for factor analysis. Significant results from Bartlett's test of sphericity confirm the appropriateness of the correlation matrices for factor analysis. The 19-item SMBM model, which excludes items 2, 12, and 14, explains the highest total variance at 67.60%, compared to 63.33% for the 22-item model and 66.21% for the 20-item model, indicating a more efficient factor structure. Consistent factor loadings across models further validate the reliability of the subscales, with strong loadings for the EPE subscale, high loadings for the LIS subscale, moderate to high loadings for the TES subscale, and very high loadings for the CWE subscale. The 19-item model demonstrates the highest internal consistency, with a Cronbach's alpha of 0.919, compared to 0.914 for the 22-item and 20-item models. The 19-item SMBM is the most effective and reliable model, providing a comprehensive, efficient, and robust measure of burnout suitable for future research and clinical applications. In the Chinese version of the SMBM/Q, Bartlett's test of sphericity and KMO index values were high (KMO = 0.913, $\chi 2 = 3077.783$, and $P < .001$), and EFA results suggested the 5-factor Model was optimal.[14] This indicates that while both versions of the SMBM are suitable and reliable, the Chinese version may capture additional dimensions of burnout not accounted for in the original or refined 19-item models. The differences in the optimal number of factors between the two versions could be attributed to cultural or contextual differences in the experience and reporting of burnout symptoms. Therefore, the 19-item SMBM is robust and effective in its context, whereas the Chinese version's 5-factor model provides a more nuanced understanding of burnout in the Chinese context.

The CFA results of the SMBM provide valuable insights into the structure and reliability of the 19-item model. The CFA fit indices indicate a good model fit, with values such as the GFI at 0.861, NFI at 0.871, RFI at 0.849, IFI at 0.933, TLI at 0.920, CFI at 0.932, and RMSEA at 0.072. These values collectively suggest that the 19-item SMBM model captures the burnout construct comprehensively and efficiently. In comparison to the Chinese version of the SMBM/Q, the fit indices for both versions are comparable, indicating the cross-cultural applicability of the SMBM. The Chinese version's high CFI and TLI values and an RMSEA within acceptable limits align with the current study's findings, suggesting robustness in different cultural contexts. However, the Chinese version also proposed an optimal 5-factor model, which diverges from the 4-factor structure used in the 19-item model. This discrepancy raises questions about potential cultural differences in the conceptualization and experience of burnout,
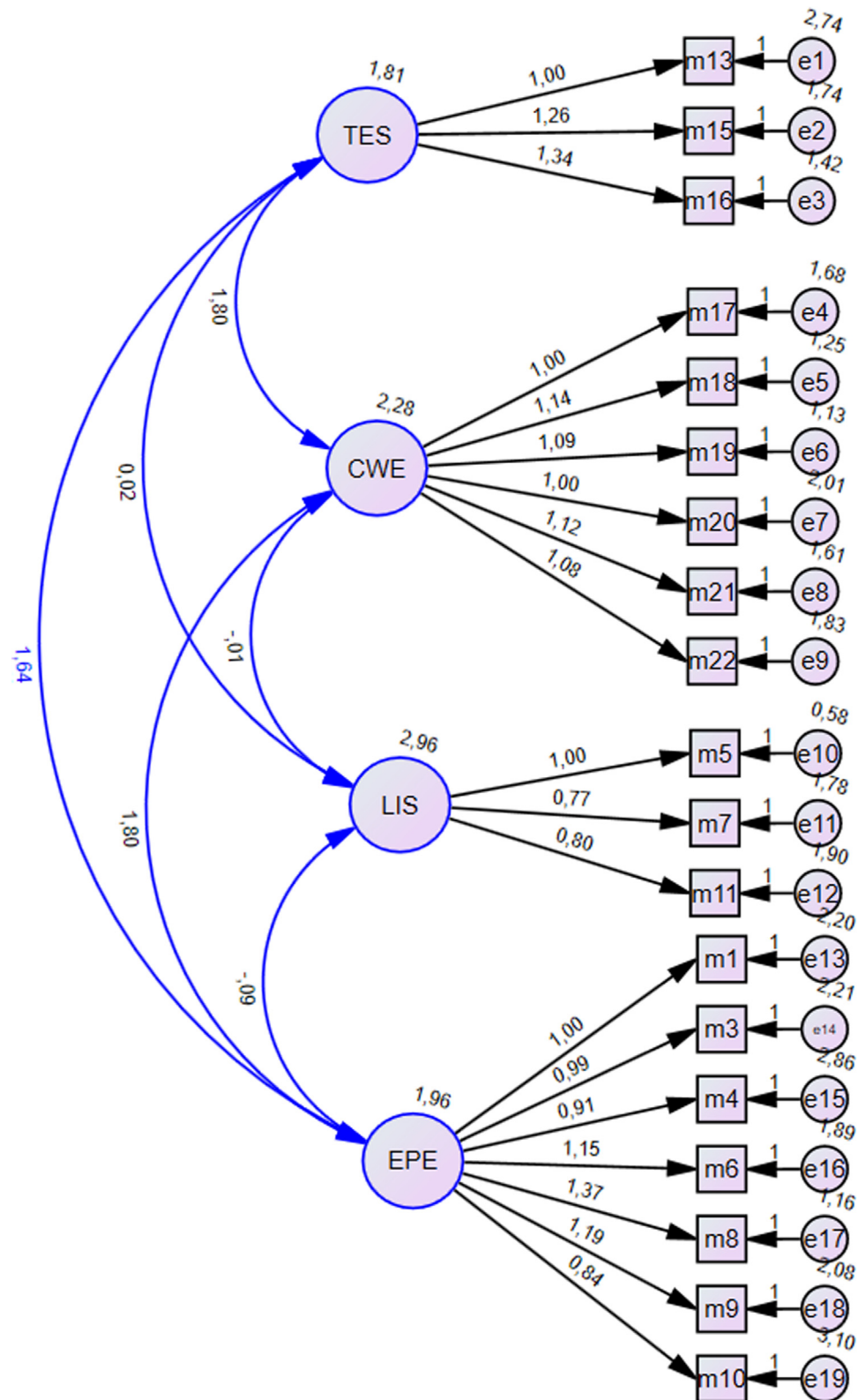
FIG 1. Path diagram and factor loads of the four factor models of the scale.

suggesting that additional factors may be relevant in the Chinese context.[14] The literature presents mixed results regarding the original 4-factor structure of the SMBM. For instance, Lundgren−Nilsson et al. (2012) reported poor fit indices for the original structure (RMSEA 0.133, CFI 0.977, TLI 0.974), highlighting the need for modifications.[45] In contrast, Almén and Jansson (2021) found an adequate fit for the 4-factor 22-item model,[42] while Liao et al. (2023)[14] identified a good model fit for a modified 4-factor 19-item model and an excellent fit for two shorter models (11-item and 6-item). While the 19-item SMBM model demonstrates strong psychometric properties and reliability, the moderate GFI and NFI values suggest that further refinement may be needed. Additionally, the differences in optimal factor

structures between cultural contexts (e.g., the Chinese 5-factor model) highlight the necessity of culturally sensitive adaptations of the SMBM. The 19-item SMBM model is a reliable and effective measure of burnout with good psychometric support from CFA and EFA. However, critical appraisal reveals potential areas for improvement and underlines the importance of cultural considerations in assessing burnout. These insights are valuable for future research and clinical practice and ensure the measure remains relevant and accurate across different populations.

Strength and Limitations

High KMO values and significant Bartlett's test results confirm the adequacy and suitability of the sample for factor analysis and support the robustness of the findings. The 19-item version of the SMBM demonstrated strong internal consistency, high content validity, and effective factor structure, making it a reliable instrument for measuring burnout. Detailed pilot testing increased the applicability of the scale in the Turkish context by ensuring the cultural appropriateness and comprehensibility of the items. However, the study also has limitations. The fact that the sample consisted mainly of mothers limits the findings' generalizability to all families. Future studies should include a more diverse sample, including other family members and parents of children with various diagnoses and treatment durations.

Furthermore, although cultural adaptation is extensive, the influence of socio-economic and educational backgrounds on the interpretation of burnout items has not been investigated in depth. Further research should consider these factors to improve the applicability of the scale across different subgroups. A limitation of our study is using the same sample for both EFA and CFA. Although we used rigorous statistical methods and cross-validation techniques to mitigate these issues, the overlap in samples could potentially affect the robustness and generalizability of the findings. Recognizing this limitation, future research should aim to replicate our findings using independent samples for EFA and CFA to strengthen the validity and reliability of the identified factor structures.

Conclusion

The Turkish version of SMBM was found to be a reliable and valid instrument for the assessment of burnout in parents of pediatric oncology patients. The adapted 19-item version of the Shirom−Melamed Burnout Measure demonstrates good psychometric properties and cultural relevance for assessing burnout among Turkish parents of pediatric oncology patients. The high internal consistency, efficient factor structure, and strong content validity underscore its reliability and validity.

Implications for Practice

The validated 19-item SMBM provides healthcare professionals with a reliable and culturally appropriate tool to assess burnout in Turkish parents of pediatric oncology patients. Its reliable psychometric properties accurately determine burnout levels, facilitating timely and effective interventions. Healthcare providers can use this measure to monitor parental burnout, design targeted support programs, and assess the impact of caregiving on parents' well-being. The findings emphasize the importance of considering cultural differences in burnout assessment, guiding the adaptation of similar tools for different populations. This measure could significantly increase the support provided to parents and ultimately improve the quality of care for pediatric oncology patients.

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Declaration of competing interest

CRediT authorship contribution statement

Ayşe Ay: Writing − review & editing, Writing − original draft, Visualization, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Remziye Semerci:** Writing − review & editing, Writing − original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Pınar Taşpınar:** Writing − review & editing, Writing − original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Gülşah Tanyildiz:** Writing − review & editing, Writing − original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Serap Karaman:** Writing − review & editing, Writing − original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Data Availability Statement

The data supporting this study's findings are available upon reasonable request from the corresponding author.

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