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Psychometric Testing of the Turkish Version of Children's Emotional Manifestation Scale

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ABSTRACT

Aims and objectives: This study was conducted to determine the Turkish validity-reliability of the Children's Emotional Manifestation Scale (CEMS).

Design: A methodological study design was used.

Methods: The research was comprised 100 children aged between 7 and 12 who underwent a surgical operation. To ensure the reliability of the scale, necessary permissions were obtained from the creator of the scale and the ethical committee. Language, content, and structure were validated for the validity of the scale.

Results: Content validity index was calculated as 0.96. Confirmatory factor were performed for construct validity. The scale was found to have relatively good model fit indicators. To determine the reliability of the scale, internal consistency coefficient and compliance between observers were evaluated. The Cronbach Alpha coefficient of the scale was found to be 0.94, and the ICC coefficient evaluated among the observers ranged between 0.970 and 0.981.

Conclusion: As a result, CEMS was identified as a simple, objective, valid and reliable measurement tool that can be used to evaluate the emotional indicators of children in the Turkish population.

Practice implications: CEMS is appropriate clinical research tool to use in evaluating the children response to stressful medical procedures and effectiveness of interventions directed towards minimizing anxiety and bolstering coping mechanisms in children undergoing surgery.

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Introduction

Hospitalization for any surgical operation can be a concern for children and their parents. Anxiety experienced in the surgical process can affect the psychological and physiological health of children, and hinders their ability to cope with medical interventions (Törüner & Büyükgönenç, 2012; Ünver & Yıldırım, 2013). The emotional responses to a surgical process differ between children. Some children show clear or active reactions such as crying, screaming, whining, adhering to the parent, resisting treatment, fighting, harming themselves and destroying the environment, while some children show passive reactions such as non-interaction, reduced communication, reduced activity and excessive sleep (Power, Howard, Wade, & Franck, 2012).

Excessive anxiety affects children's ability to cope with medical treatment, reduces cooperation, and increases their behaviors such as crying, restlessness, strong verbal protest, withdrawal and destructive reactions (Li & Lopez, 2006). In addition, excessive anxiety reduces the child's pain threshold and increases their response to pain signals,

which will lead him/her to feel more pain (Chieng, Chan, Klainin-Yobas, Wang, & He, 2013; He et al., 2015; Li, Chung, Ho, & Kwok, 2016).

Therefore, interventions, practices and evaluations that will improve children's ability to control stress and pain caused by hospitalization and medical treatment are needed (Antunes & Diogo, 2017; Binay & Yardımcı, 2018). To interfere with the anxiety experienced by children, first, it is necessary to evaluate the negative emotions that children experience. Despite the children not having the skills to sufficiently express their emotions, their anxiety levels can be determined by via evaluating their behavioral and emotional indicators that they reflect outwardly and appropriate interventions can be made (Andersen, Langius-Eklöf, Nakstad, Bernklev, & Jylli, 2017). Therefore it is very important that valid and reliable measurement tools are used accurately to assess the child's response to stressful medical procedures.

Questionnaires used to evaluate the emotional state of the child and scales evaluated based on the child's expression can increase the child's stress or children may report incorrectly. In addition, the information acquired may not be valid or reliable due to the limited reading and understanding skills of the children (Bakır, 2017). Thus, observational evaluation is a convenient, practical, and reliable method to collect data regarding children's emotional state.

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Children's Emotional Manifestation Scale (CEMS) was developed by Li Lopez with the aim of presenting a simple, objective, and consistent method for nurses to determine children's emotional behaviors based on observation during stressful medical procedures. A scale adaptation study involves evaluating the reliability and validity of a scale that was developed in different culture of reliability was tested in another language and culture, making it ready for use (Baykul, 2010). Validity and reliability are the most important features to be found in measurement tools. This study was carried out to determine the validity and reliability of CEMS, a comprehensive and effective assessment tool used to evaluate 7–12-year-old children's emotional indicators in the Turkish population.

Purpose

The purpose of this study was to determine the validity-reliability of the CEMS in Turkish.

Methods

Study design

A methodological study design was used. The data collection commenced in March 2017 completed in June 2018.

Sample population and sampling

The population of the study consisted of children between the ages of 7–12 who underwent an operation in a university hospital.

The inclusion criteria: having undergone a surgery, having stable hemodynamic values, having an accompanying primary care giver.

Exclusion criteria: having communication problems, having a chronic disease, being at high risk in the postoperative period.

For scale validity and reliability studies, the sample is required to be at least 5–10 times the number of items presented in the scale. In the case of low number of items, the sample size is recommended to be 20 times (Alper, 2016; Şencan, 2005). Subsequently, $5 \times 20 = 100$ children were included in the research. According to the results of the analysis conducted to determine whether the sample size in the study is sufficient for the analyses to identify validity and reliability, the Kaiser-Meyer-Olkin (KMO) coefficient was determined as 0.893 and Bartlett's Test $p = 0.000$. In line with these results, the sample size was concluded to be sufficient for further analyses.

Data collection tools

For data collection, child and parent identification information form and CEMS were utilised. The child and parent identification information form were created by the researcher. The form consists of questions including children's age, gender, medical diagnosis, and the age, educational background, occupation and income level of parents.

CEMS was developed by Li and Lopez (2005). It consists of five categories of emotional behaviors that can be observed (Facial expression, Vocalization, Activity, Interaction, Level of cooperation). Each category has a value between 1 and 5. The total score that can be obtained from the scale varies between 5 and 25. As the scores obtained from the scale increase, negative emotional indicators also increase. Observable behaviors in each category of CEMS are described in detail in the application directive. The Cronbach's alpha value of the scale was identified as 0.92 (Li & Lopez, 2005). The permissions required for the validity and reliability study were obtained from the scale owner.

Data collection

2–3 h after the operation, the child and parents who were conscious and met the inclusion criteria were invited to participate in the study by explaining the purpose of the study, and their consent was obtained. Later, the child and parent identification form information form was administered by the researcher via a face-to-face interview method. Then,

the child's heart rate was measured by the researcher. The CEMS was completed by three people including: 1. a nurse with 7 years of clinic experience including 4 years in the children's clinics, 2. a nurse academician with 10 years of experience including 3 years as a clinical nurse, and 3. a researcher simultaneously with independent observations. While the researcher measured heart rate, other observers observed the child, followed by everyone marking their evaluation independently on the form. Before the data collection, the researcher gave detailed information about the scale to the observers and pilot measurements were acquired from 7 children who were not included in the sample. The validity and reliability study was completed with a total of 100 children. Validity and reliability study of the CEMS was conducted by considering the principles stated in the literature and the opinions of experts.

Statistical analysis

For descriptive statistics, the number (n), percent (%), mean (X), standard deviation (SD) were selected. Kaiser-Meyer-Olkin coefficient and Bartlett's sphericity test were used to determine the sample sufficiency. Intraclass correlation coefficient was used in order to determine the interobserver agreement; item total score correlation coefficient and Cronbach Alpha coefficient were used in internal consistency coefficient calculations, confirmatory factor analysis were used in determining construct validity and Tukey additivity test was used to determine scale score additivity.

Evaluations were made by three independent observers. In the analyses, which observer's evaluations would be used was decided based on the corrected item total correlations obtained according to the two-way mixed-effect model. In the analysis, the evaluations of the 1st observer with the highest total item correlation were used (Alper, 2016; Esin, 2014).

Ethical aspects

Ethics committee approval and written institutional consent were obtained from the Yozgat Bozok University Health Practice and Research Center Ethics Committee. Written and verbal consents of the parents included in the study were acquired. Verbal consent was obtained from the children. Permission was obtained from the researcher who developed the scale to ensure the validity-reliability of the Children's Emotional Manifestation Scale.

Result

Findings related to scale validity

Language validity and content validity

Initially, language validation of the scale was conducted. The scale was independently translated from English, its original language, to Turkish by three English linguists, who are experts in their fields, and whose native language is Turkish. Next, the translations were compared by a specialist in the field of pediatric nursing, a bilingual person who is an expert in languages and a researcher. The most appropriate expressions were selected, and a draft scale form was created based on these three translations. The created form was translated back from Turkish to English by a linguist. Back translation was submitted to the scale owner and feedback was obtained regarding the appropriateness of the statements. Finally, the scale items were finalized in consultation with 10 experts in the field of pediatric nursing.

In determining the content validity of the scale items, Polit and Beck content validity index determination method was used (Polit & Beck, 2006). Content Validity Rate was calculated as 0.80 and above for each item, and Content Validity Index was calculated as 0.96 (Table 1).

Findings related to the construct validity of the scale

Distribution of the children included in the validity and reliability study is given in Table 2. Of the children 58% were male and 34% had

Table 1
Content validity (n = 100).

Scale items	Content Validity Rate (CVR)
Facial expression	1.00
Vocalization	0.90
Activity	1.00
Interaction	0.90
Level of cooperation	1.00
Content Validity Index (CVI)	0.96

Table 2
Descriptive characteristics of children (n = 100).

Descriptive characteristics	n	%
Age ($\bar{X} \pm SS$) (min-max)	8.84 ± 1.64	(7.0–12.0)
Gender		
Female	42	42.0
Male	58	58.0
The type of operation		
Appendicitis	34	34.0
Hernia	24	24.0
Circumcision	29	29.0
Otorhinolaryngology	13	13.0

undergone appendectomy. The average age of the children was found to be 8.84 ± 1.64 . Confirmatory factor analysis were used to determine the construct validity of the scale. To determine the sufficient sample size to factor analysis, **Kaiser-Meyer Olkin (KMO)** coefficient and **Bartlett test** were performed. The Kaiser-Meyer Olkin (KMO) coefficient was found to be 0.893 and the Bartlett test result was found to be highly significant (χ^2 : 506.87, $p = 0.000$). In line with this result, the scale was determined to be suitable for analysis.

In **Table 3**, confirmatory factor analysis model fit indicators are provided. According to the results, CMIN/DF was identified as 2.800, CFI as 0.982, GFI as 0.944, RFI as 0.946, AGFI as 0.832, NFI as 0.973, and RMSE as 0.023.

In **Table 4**, the correlation coefficient between the heart rate of the children and the scores they obtained from the scale was evaluated for the predictive validity of the scale. A significant positive correlation between children's heart rate and CEMS scores were identified.

Findings on the reliability of the scale

In order to determine the reliability of the CEMS, internal consistency and split-half testing methods and inter-observer agreement were used. Among the internal consistency tests, Cronbach's alpha internal consistency coefficients and total item score correlation coefficients were calculated to determine the reliability of the scale. The total scale Cronbach alpha value was determined as 0.94 (**Table 5**).

Table 6 shows the total correlation values of the CEMS item. The total correlation of the item being positive and significant indicates a good internal consistency of the scale. Corrected total correlations of the items range between 0.78 and 0.91 in all items.

In **Table 6**, Cronbach Alpha values calculated for split-half test reliability analysis are shown. The Cronbach Alpha value was determined as 0.927 for the first three items, and as 0.903 for the last two items.

According to the split-half test reliability analysis of the scale, the correlation value between the two halves of the scale was determined

Table 3
Confirmatory factor analysis model fit indicators (n = 100).

CMIN/df	CFI	GFI	RFI	AGFI	NFI	RMSA
2.800	0.982	0.944	0.946	0.832	0.973	0.023

Table 4
Relationship between CEMS and Heart Rate/Minute (n = 100).

Variables	Heart Rate/Minute	
CEMS	r	p
	716**	0.001

Table 5
Cronbach's alpha values when the item was deleted and Corrected item total correlation values (n = 100).

Scale items	Cronbach's alpha values when the item was deleted	Corrected item total correlation values
Facial expression	0.951	0.780
Vocalization	0.930	0.904
Activity	0.928	0.913
Interaction	0.936	0.871
Level of cooperation	0.941	0.845
Total	0.949	

Table 6
Split half cronbach alfa değerleri (n = 100).

Scale items	Cronbach Alfa
First three item	0.927
Last two item	0.903

Table 7
Split half corelation (n = 100).

Scale items	Last two item	
First three item	r	p
	0.883	0.001

as 0.883. A strong relationship was found between the two halves (**Table 7**).

Tukey analysis was performed to determine the additivity of scale scores. According to the analysis result; $F = 72.995$, $p < 0.001$. In line with the obtained result, the scores acquired from the scale items were found to be addible (**Table 8**).

In evaluating the compatibility between the observers, intraclass correlation coefficient (ICC) was used (**Table 9**). As a result of the evaluation, the ICC coefficient evaluated between the observers was examined to range between 0.970. and 0.981 In line with these results, the harmony between the observers can be agreed to be at a very good level.

As a result of the analyses, it was determined that CEMS is a valid and reliable measurement tool that can be used to identify the emotional state of children in the postoperative period.

Discussion

In this study, the validity of CEMS was evaluated by language, prediction, content and construct validity, and its reliability was assessed

Table 8
Scale additivity test (n = 100).

Tukey additivity test	
F = 72.995	$p < 0.001$

Table 9
Evaluation of agreement between three observers (n = 100).

Scale items	Intra-class correlation coefficients values (ICC)	p
Facial expression	0.975	<0.001
Vocalization	0.981	<0.001
Activity	0.969	<0.001
Interaction	0.970	<0.001
Level of cooperation	0.980	<0.001

by internal consistency coefficient, item total correlations, observer reliability, Tukey additivity test and split half test.

According to the results of the confirmatory factor analysis was performed to verify the construct validity of the scale. The following values for an acceptable fit of the model were used: RMSEA \leq 0.08, NFI \geq 0.90, TLI \geq 0.90 and CFI \geq 0.90, GFI \geq 0.90 (Karagöz, 2016). In line with the obtained results, it can be said that the scale model fit is very well.

Stress and anxiety that occurs in response to surgical trauma affects the release of cortisol and catecholamines and stimulates the sympathetic nervous system. Stimulation of the sympathetic nervous system leads to increased heart rate by increasing the sensitivity of the vessels to adrenaline and the production of angiotensin in the liver (Yağcı & Saygın, 2019). To determine the predictive validity, the relationship between the score that the children obtained from the scale and their heart rate was evaluated. A significant positive relationship was found between children's heart rate and CEMS scores, and the scale was found to provide predictive validity. This result provided additional support for the validity of the scale.

Cronbach Alpha value of the entire scale was found to be 0.94. It is recommended that a scale to be used in the studies should have a Cronbach's Alpha value of 0.80 and above (Karagöz, 2016). Comparable to this study results in the original scale, the Cronbach's Alpha value was reported to be 0.92 (Li & Lopez, 2005). In addition, item-total correlation results showed that the items significantly correlated with the total score. In line with these results, it can be said that the internal consistency of the scale is relatively good.

Three independent observers evaluated the emotional indicators of children using CEMS. In order to determine the reliability coefficient among the raters, intraclass correlation coefficients were used according to the bidirectional mixed model, which is frequently used in reliability studies (Esin, 2014). Furthermore, the compatibility between the observers was found to be at a very good level. In the previous study, a high level of agreement between the raters were also identified (Li & Lopez, 2005). These results provided evidence regarding the reliability of CEMS. Tukey additivity test was performed to determine the additivity of the scores acquired from the scale and it was found that the scores obtained from the scale were addible.

Limitations

The scale was developed for 7–12 age children can only be used for these age groups.

Practice implication

In accordance with the obtained results, CEMS was determined to be a valid, reliable, measurement tool to be used for the assessment emotional responses of children of the Turkish population. CEMS is appropriate clinical measuring tool to use in evaluating the children response to stressful medical procedures and effectiveness of interventions directed towards minimizing anxiety and bolstering coping mechanisms in children undergoing surgery. Nurses can also use this scale to assess the emotional state of children undergoing surgery.

Conclusion

In this study, psychometric properties of CEMS were tested. The results of this study were found to be consistent with the results obtained from the analysis of the original version of the scale. The scale was found to have high internal consistency, observer compliance and construct validity. Accordingly, the scale can be used as a reliable clinical research tool to objectively evaluate the emotional responses of children undergoing surgery, and to determine the effectiveness of the interventions.

Contributions

Study design: SÇ, MB; data collection: SÇ and manuscript preparation: SÇ, MB.

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Authorship statement

All listed authors meet the authorship criteria and that all authors are in agreement with the content of the manuscript.

Author statement

Sevim ÇİMKE, Meral BAYAT were responsible for conception, design, analysis and interpretation of data and the final approval of the version to be published.

Declaration of Competing Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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