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Original Article

A Turkish Version of Children's Emotional Manifestation Scale: Reliability and Validity Assessment

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ABSTRACT

Aim: This study aims to determine the reliability and validity of the Turkish version of the Children's Emotional Manifestation scale (T-CEMS).

Materials and Methods: The sample of this methodological-type study consisted of 62 children between the ages of 7 and 12 years who presented at the clinic for day surgery.

Results: The Content Validity index of the scale is 0.96, and thus, the scale is statistically significant. Internal consistency was found to be between 0.95 and 0.96 using Cronbach's alpha reliability coefficient. These results show that inter-rater reliability is sufficient.

Conclusion: T-CEMS is valid and reliable for measuring the emotional reactions of children before stressful medical processes or during the preoperative period.

Keywords: Stressful medical procedures, pediatrics, emotional stress, reliability and validity, nurse

Introduction

Stressful medical procedures are invasive procedures that children often face in their hospitalization process. Procedures like blood tests (1), intramuscular injection (2), intravenous catheterization (3,4) immunization (5), nasogastric tube insertion (6) and urethral catheter insertion (7) are stressful medical procedures for children that can be commonly encountered in hospital admissions.

Behavioral reactions of those children hospitalized relating to diagnosis and treatment procedures are reported to occur due to some fears such as fear of getting body damage, pain, body image deterioration, wrong treatment, disability and death (8).

It is also stated that behavioral distress signs during stressful medical procedures in children include crying, hiccups, physical resistance, verbal resistance, asking for emotional support, rigidity in the muscles, expressing pain, despair, aggressive behaviors and seeking escape (9).

Some other behavioral reactions of children relating to diagnosis and treatment were identified as the request for protection and crying to arouse pity for themselves (10).

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All invasive medical procedures, especially surgical procedures, result in emotionally negative behavior changes and increased anxiety (11-19).

Surgical procedures are a potentially threatening experience for children, regardless of whether they are minor operations in an ambulatory surgery unit (15) or major surgeries at a larger hospital (20,21).

Children who are anxious in the preoperative period exhibit negative emotional behavior during anesthesia induction and after surgery. Severe anxiety affects some physiological states such as pulse, blood pressure (15,22) and respiration (23) as well as the psychological state. It also deters the child from dealing with medical treatment, causes negative behaviors associated with health care and affects postoperative recovery negatively (12,24,25).

In the literature, it is stated that those medical interventions causing intense stress levels are more likely to be recalled in children's future lives (26,27).

In order to protect children from these negative influences, nurses must meet the emotional needs of the child and keep them informed before each procedure. This situation helps reduce the child's stress and leads to more effective treatment (28).

Studies indicate that negative physiological and psychological changes seen in children during stressful medical procedures can be reduced by appropriate interventions (3,5-7,9,16,19,22,28-31).

To the best of our knowledge, no objective measurement tool was used to assess the effect of nursing interventions to reduce the anxiety of Turkish children during stressful medical procedures. In this regard, the Children's Emotional Manifestation scale (T-CEMS) that has been adapted to be used in the Turkish context may be a simple and objective measurement tool to evaluate the effectiveness of intervention studies to reduce negative emotional behaviors and anxiety. The aim of this research is to determine the validity and reliability of the Turkish version of T-CEMS developed to measure the emotional responses of children during stressful medical procedures.

Materials and Methods

Design, Sample and Setting

The present study employed a methodological design and was conducted at a state hospital in the Aegean Region in western Turkey. The population of the study consisted of children aged between 7 and 12 years old who were admitted to hospital for ambulatory surgery. Those children admitted to hospital for ambulatory surgery for circumcision, hernia repair, undescended testis or minor ENT operations (tonsillectomy, adenoidectomy, tube insertion) were included in this study which was conducted in the Pediatric Surgery Service, Otorhinolaryngology Service, General Surgery Service, Urology Service or Operating Room.

The sample size of the study was determined based on the idea that the sample size in the validity and reliability studies of methodological researches should be at least 5 and at most 10 times the number of scale items (32). Since the scale to be used in the study included 5 items, it was decided to enroll at least 50 children into the study as the sample and eventually a total of 62 children constituted the sample group of this study.

Instruments

Demographic Information Form

Demographic Information Form designed to describe the children consists of three questions including age, gender and type of ambulatory surgery.

Turkish version of the Children's Emotional Manifestation Scale (T-CEMS)

T-CEMS was developed by Li and Lopez (22) in 2005 with the aim of measuring the emotional responses of children during stressful medical procedures. This scale, which allows for direct observation of behaviors, consists of 5 different behavior categories including "Facial expression", "Vocalization", "Activity", "Interaction" and "Level of cooperation". Each category consists of 5 different observable behaviors graded by level and intensity. Scale scoring is performed by reviewing the explanations of the behaviors in each category and selecting the numerical value that represents the observed behavior best. Each category is scored between 1 and 5. The total point is obtained by calculating all the points given for each category and it ranges between 5 and 25. A higher scale score indicates the manifestation of more negative emotional behaviors. The observable behaviors in each category of the scale are explained in detail with a guideline for the raters using this scale to carry out the evaluation properly in an objective manner. When the reliability analysis of the scale was considered, it was found that the inter-rater reliability coefficient was 0.96, the internal consistency coefficient was 0.92, and inter-item correlation ranged from 0.41 to 0.92.

As a result of this study, it was determined that there is sufficient inter-rater reliability, high internal consistency reliability, good content validity and excellent convergent validity (22).

Turkish Version of State-Trait Anxiety Inventory for Children

The State-Trait Anxiety Inventory for Children was developed by Spielberger and Edwards (33) in 1973 with 4th and 6th grade children, and its validity and reliability analysis for Turkish was conducted by Özusta (34) in 1995 with 615 children aged between 9-12 years. In this study, the State Anxiety scale, a sub-scale of State-Trait Anxiety Inventory for Children, which is composed of 20 items was used with the aim of evaluating emotions such as tension, strain, anxiety and nervousness. The Cronbach alpha coefficient of the State Anxiety scale was 0.82. At least 20 and at most 60 points can be obtained from this scale. A high total score indicates a high level of anxiety.

Physiological Measurement Form

The Physiological Measurement Form consists of children's physiological measurements including heart rate, mean arterial pressure (MAP) and breathing rate. Physiological measurements were based on heart rates (60-95 beats/min), MAP (100-120/60-75 mmHg) and breathing rates (14-22 breaths/min) (35).

Data Collection

The researcher ensured that those children admitted to the service for ambulatory surgery who met the study criteria filled in the Demographic Information Form and the Turkish version of the State Anxiety Inventory for Children (T-CSAS). Then the researcher went on to the operating room to collect data.

The MAP, breathing rate and heart rate of the children transferred to the operating room were measured when they were transferred to the operating table before the anesthesia induction, and recorded by the researcher. The emotional behavior of the children during anesthesia induction was observed by the same researcher and two nurses at the same time. The nurses had been trained on the use of the scales beforehand. They were experienced in the field of pediatric operating room nursing. The nurses observing the children evaluated their observations on the T-CEMS.

Ethical Considerations

Permissions for the adaptation of T-CEMS into Turkish, the use of the Turkish version and the use of T-CSAS were obtained from the authors via email. Legal permission was obtained from the State Hospital where the study was carried out and approval was obtained from the non-interventional Clinical Research Ethics Committee of the relevant university. The parents of the children aged between 7 and 12 admitted to ambulatory surgery who were included in the study as the sample were informed about the study and their consent was obtained in a written form. This study was granted permission by the Ethical Board of non-interventional Clinical Research Ethics Committee of the Pamukkale University (approval number: 16/5.12.2017).

Statistical Analysis

The data obtained from the study were analyzed using the SPSS version 21 software package. The significance level was 0.05, and it was stated that there was a significant difference in the case of $p<0.05$ and no significant difference in the case of $p>0.05$. The data demographic information of the children are presented using descriptive statistics.

In the analysis of the data, language validity, content validity and the construct validity studies were performed. For construct validity, the correlation between T-CEMS total score and MAP, heart rate, breathing rate and T-CSAS total scores were calculated using the Spearman Correlation Coefficient. In the reliability studies, the intra-class correlation coefficient was calculated for inter-rater reliability, and also inter-item correlations and item-total correlations were determined. Within the scope of the reliability studies, Cronbach Alpha coefficient was calculated in order to evaluate the internal consistency of the T-CEMS.

Results

Demographic Characteristic of the Children

The demographic characteristics of the children included in the study are given in Table I.

Validity

Language Validity and Content Validity

In the validity study of the scale, language validity was performed first. The scale was translated from English to Turkish by a pediatrician who knows an advanced level of English, a nursing academician and a translator. After these three translations were combined and finalized by the researchers and a single translation text was created, it was retranslated from Turkish back to English by an academician, adept in both languages, who had never seen the scale before. Upon the comparison of the scale that was retranslated from Turkish back to English with the original English scale, the finalized version of Turkish scale was developed.

For the content validity, 12 experts consisting of 7 nursing academicians in the field of pediatric nursing, one pediatric

surgeon and 4 pediatricians were asked for their opinions. In order to evaluate the appropriateness of the scale items, the experts were asked to score the items between 1 and 3 using a 3-point scoring system (1= required, 3= unnecessary). According to the Lawshe technique, expert opinions are graded as (a) "essential", (b) "useful but not essential", (c) "not necessary". The content validity ratio was found to be 0.56 and Content Validity index-(CVI) was calculated as 0.96 in our study. As CVI>CVR is the case, the content validity of the entire scale developed was statistically significant (36).

Construct Validity

When the correlation between T-CEMS total score and MAP, heart rate, breathing rate and T-CSAS total scores were examined, there was a moderately significant positive relationship between T-CEMS and T-CSAS (r=0.26, p=0.05). There was a moderately significant positive correlation between T-CEMS and heart rates (r=0.41, p=0.01). If r=0.00 - 0.24, correlation strength is weak; if r=0.25 - 0.49, it is moderate; if r=0.50 - 0.74, it is strong; and if r=0.75 - 1.00, it is very strong (37). No relationship was found between T-CEMS and MAP and breathing rates (Table II).

Table I. Sample characteristics (n=62)

Sample characteristics	**n (%)**
Gender	
Female	10 (16.1)
Male	52 (83.9)
Age (years)	
7	24 (38.7)
8	14 (22.6)
9	12 (19.4)
10	4 (6.5)
11	7 (11.3)
12	1 (1.6)
8.34±1.43; median 8 (7-12)	
Type of surgery performed	
Circumcision	40 (64.5)
Adenoidectomy	4 (6.5)
Myringotomy tube insertion	1 (1.6)
Tonsillectomy	2 (3.2)
Adenoidectomy & Tonsillectomy	8 (12.9)
Adenoidectomy, tonsillectomy & Myringotomy tube insertion	2 (3.2)
Adenoidectomy & Myringotomy tube insertion	3 (4.8)
Orchidopexy	1 (1.6)
Adenoidectomy & Circumcision	1 (1.6)

n: Number

Reliability

Intra-class correlation coefficients for observer 1 and observer 2 ranged from 0.94 to 0.99 (p<0.05). Intra-class correlation coefficients for observer 1 and observer 3 were between 0.94 and 0.97 (p<0.05). Intra-class correlation coefficients for observer 2 and observer 3 were between 0.96 and 0.98 (p<0.05) (Table III).

It was seen that inter-item correlation coefficients of T-CEMS ranged from 0.73 to 0.93 (Table IV).

For observer 1, item-total correlations were found to be between 0.83 and 0.91. For observer 2, they ranged from 0.84 to 0.94, while for observer 3, it was determined to be between 0.85 and 0.92. The item-total score correlation values of T-CEMS ranged from 0.83 to 0.94 (Table V).

The Cronbach's Alpha values of the scale were found to be 0.96 for observer 1; 0.97, for observer 2 and 0.96 for observer 3.

Table II. Correlation of turkish version of the children's emotional manifestation scale and four components

	T-CEMS	**T-CSAS**	**Heart rates**	**MAP**	**Breathe rates**
T-CEMS	1.00	-	-	-	-
T-CSAS	0.26*	1.00	-	-	-
Heart rates	0.41**	0.19	1.00	-	-
MAP	0.19	0.20	0.21	1.00	-
Breathe rates	0.21	0.21	0.29*	0.07	1.00

T-CEMS: Turkish version of the children's emotional manifestation scale, T-CSAS: Turkish version of state-trait anxiety ınventory for children, MAP: Mean arterial pressure, *Correlation is significant at the 0.05 level, **Correlation is significant at the 0.01 level

Table III. Intra-class correlation coefficients for turkish version of the children's emotional manifestation scale

	Observer 1 and Observer 2	**Observer 1 and Observer 3**	**Observer 2 and Observer 3**
Items	ICC	ICC	ICC
Facial expression	0.94*	0.95*	0.96*
Vocalization	0.97*	0.96*	0.98*
Activity	0.99*	0.97*	0.97*
Interaction	0.95*	0.94*	0.96*
Level of cooperation	0.98*	0.97*	0.97*

*p<0.0001, ICC: Intensive coronary care

Table IV. Inter-item correlations for the Turkish version of the children's emotional manifestation scale

	Facial expression			Vocalization			Activity			Interaction			Level of cooperation		
	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3
Facial expression	1.00	1.00	1.00	-	-	-	-	-	-	-	-	-	-	-	-
Vocalization	0.81	0.80	0.81	1.00	1.00	1.00	-	-	-	-	-	-	-	-	-
Activity	0.79	0.81	0.78	0.86	0.89	0.85	1.00	1.00	1.00	-	-	-	-	-	-
Interaction	0.73	0.78	0.79	0.76	0.87	0.84	0.85	0.92	0.85	1.00	1.00	1.00	-	-	-
Level of cooperation	0.75	0.78	0.79	0.79	0.81	0.81	0.82	0.86	0.79	0.93	0.91	0.91	1.00	1.00	1.00

Table V. Item-total correlations for the Turkish version of the children's emotional manifestation scale

	Observer 1		Observer 2		Observer 3	
	Corrected item-total correlation	Cronbach's Alpha	Corrected item-total correlation	Cronbach's Alpha	Corrected item-total correlation	Cronbach's Alpha
Facial expression	0.83	0.94	0.84	0.96	0.85	0.95
Vocalization	0.87	0.93	0.90	0.95	0.90	0.94
Activity	0.91	0.93	0.94	0.94	0.88	0.94
Interaction	0.88	0.93	0.94	0.94	0.92	0.93
Level of cooperation	0.89	0.93	0.89	0.95	0.89	0.94

Discussion

In this study, the validity and reliability analyses of T-CEMS were performed to ensure its adaptation to Turkish society.

The content validity of T-CEMS is statistically significant in our study.

Content validity requires the measurement tool to measure all of the qualities it claims to measure, or to make a good measurement based on a good sample and make a valid measurement through each item it includes (38). The CVI of CEMS was also found to be 0.96 (22). The CVI values of T-CEMS and CEMS are the same.

As for the construct validity, while there was a moderately significant positive relationship between T-CEMS and T-CSAS, a moderately significant positive relationship was found between T-CEMS and heart rate and no relationship was found between T-CEMS and MAP or breathing rate.

Li and Lopez (22) stated that there was a considerably significant relationship between CEMS and heart rate (r=0.61, n=82, p=0.01). According to these results, CEMS and T-CEMS correlation analysis results are similar in terms of the direction and significance of the relationship.

No relationship was found between T-CEMS and MAP. Li and Lopez (22) revealed that they found a positive correlation with CEMS and MAP (r=0.43, n=82, p=0.01).

Li and Lopez (15) reported that they found a positive correlation between CEMS and MAP in a cross-sectional study they conducted to evaluate the effect of surgery on the emotional manifestation of 106 children aged between 7 and 12 years who were admitted to hospital for ambulatory surgery (r=0.39, p=0.01).Their findings were not similar to the findings of this study. It is thought that the reason of this difference may be due to the different number of samples.

The intra-class correlation coefficients calculated within the scope of the reliability analysis were 0.96 for the CEMS (22). The intra-class correlation coefficients of T-CEMS and CEMS were found to be very close to each other. The independent inter-rater reliability of T-CEMS is sufficient.

It was determined from the inter-item correlation analysis of T-CEMS that there was a highly significant and positive correlation. The inter-item correlation of CEMS developed by Li and Lopez (22) was reported to range between 0.41 and 0.92. T-CEMS and CEMS inter-item correlation values are very close to each other.

The item-total score correlation values of T-CEMS ranged from 0.83 to 0.94 while the item-total score correlation values of CEMS developed by Li and Lopez (22) ranged from 0.51 to 0.90. In the evaluation of item-total score correlations, it is stated that the items which are generally above 0.30 distinguish individuals to a good degree, those that are between 0.20 and 0.30 should be tested if they are considered to be necessary, and those items less than 0.20 should not be included in the test (32,38,39). The item-total score analysis of both scales shows that it is over 0.30 and it distinguishes individuals to a good degree. The results of item-total score correlation values of CEMS and T-CEMS were found to be consistent.

It is recommended to calculate the Cronbach's alpha coefficient to indicate internal consistency which is a part of reliability studies (40). The Cronbach's Alpha values of the scale were 0.96 for observer 1, 0.97 for observer 2 and 0.96 for observer 3. These values demonstrate that the scale is highly reliable. The Cronbach's Alpha coefficient, which was calculated by Li and Lopez (22) to evaluate the internal consistency of CEMS was 0.92. According to these results, it can be seen that the reliability values of the CEMS and T-CEMS, the adapted Turkish version of the original scale, are quite high and similar. As a result, T-CEMS is found to be valid and reliable for Turkish society.

As T-CSAS used in the study was developed and adapted for children aged between 7-12 years, a younger age group could not be included in the study. Due to the limited number of ambulatory surgery cases in the study setting, different and comprehensive types of ambulatory surgery could not be included. Another limitation in our study is that it was conducted in a single center.

T-CEMS is a valid and reliable scale for measuring the emotional responses of children during stressful medical procedures. It was determined that the items in the scale could measure the emotional manifestation to a high degree. T-CEMS, which has been adapted into Turkish, can be used as a simple and objective measurement tool to evaluate the effectiveness of intervention studies to reduce negative emotional behaviors and anxiety. In this way, the child will be supported in terms of coping mechanisms and so he/she will be less affected both physically and emotionally.

Study Limitations

As the T-CSAS used in the study was developed and adapted for children between 7 and 12 years old, a younger age group could not be included in the present study. In addition, due to the limited number of ambulatory surgery cases in the study setting, different and comprehensive types of ambulatory surgery could not be included. Another limitation of our study is that it was conducted at a single center.

Conclusions

Stressful medical procedures cause emotionally negative behavioral changes in children. Nurses play a crucial role in protecting children from these negative effects caused by stressful medical procedures. Hospitalized children may have behavioral reactions related to their fears surrounding medical procedures, such as sustaining bodily damage, feeling pain, a deteriorating body image, receiving the wrong treatment or becoming disabled. The T-CEMS is an objective measurement tool that can be used to evaluate the effects of nursing interventions designed to reduce the negative emotional manifestations of children during stressful medical procedures. Using this scale, healthcare professionals can evaluate the effectiveness of interventions performed to minimize anxiety during stressful medical procedures and ultimately to reduce negative emotional behaviors in children.

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Ethics

Ethics Committee Approval: This study was granted permission by the Ethical Board of non-interventional Clinical Research Ethics Committee of the Pamukkale University (approval number: 16/5.12.2017).

Informed Consent: Their consent was obtained in a written form.

Peer-review: Enternally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.M.I., B.Ç., Concept: S.M.I., B.Ç., Design: S.M.I., B.Ç., Data Collection or Processing: S.M.I., B.Ç., Analysis or Interpretation: S.M.I., B.Ç., Literature Search: S.M.I., B.Ç., Writing: S.M.I., B.Ç.

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