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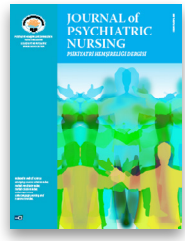

Original Article

Child delirium assessment scale: Validity and reliability study

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Abstract

Objectives: This study aims to develop the child delirium assessment scale to determine the factor structure and to determine its validity and reliability.

Methods: The sample of the methodological type study consists of 105 children who were admitted to the third-level pediatric intensive care unit of a public hospital in a province in eastern Türkiye between February and May 2019 and met the inclusion criteria. Content and construct validity and reliability analyses of the items created using the Delphi technique were performed.

Results: In the exploratory factor analysis of 28 items obtained with the Delphi technique, a one-dimensional structure consisting of 28 items explaining 49.99% of the total variance was obtained. In confirmatory factor analysis, it was determined that the scale structure had sufficient fit indices. The Cronbach's alpha value was 0.96, and the test half value was 0.91. There was a strong correlation between them and the Cornell Pediatric Delirium Scale used as a parallel test ($r=0.957$, $p<0.05$).

Conclusion: This study determined that the child delirium assessment scale is a valid and reliable measurement tool for nurses in determining delirium in children hospitalized in the intensive care unit.

Keywords: Child delirium assessment scale; pediatric delirium; pediatric nursing; reliability; validity.

Delirium (acute confusional state, acute brain disorders, or encephalopathy) is a disorder of consciousness.[1] As defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), delirium is "the deterioration and change of basic attention and awareness that develops in a short time with a fluctuating course."[2] There are very little data available on the epidemiology and risk factors of pediatric delirium due to the lack of extensive screening, poor recognition, and lack of evidence-based data.[3] The prevalence of delirium in children is estimated to be between 4% and 49%.[4–6] Delirium seen in the pediatric intensive care unit (PICU) is often not noticed and untreated.[1] Studies have demonstrated that length of hospital stay and mortality rates are significantly greater in children diagnosed with delirium.[6] Although the pathophysiology of delirium cannot be fully explained, it is considered to be caused by reversible cerebral oxidative metabolism, increased energy metabolism, disordered cellular homeostasis, and multiple neurotransmitter abnormalities. Delirium can occur as hypoactive, a hyperactive, or mixed type.[7] In hyperactive delirium, the patient is hypersensitive to stimuli, and psychomotor activity has increased. In hypoactive delirium, psychomotor behaviors and sensitivity are decreased, sleep, and the patient communicates little. It is more difficult to diagnose delirium in such patients. In mixed-type delirium, unpredictable agitation and fluctuations can be seen between.[8] As it can minimize long-term problems in children, early diagnosis of delirium and identifying and treating its underlying causes are urgent medical issues.[9] Since the hyper-

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metabolic state associated with delirium may hinder recovery in critically ill patients, timely diagnosis of pediatric delirium is essential for its treatment. The agitated behaviors associated with hyperactive delirium can prevent care, and the psychological effects can be traumatic.[10,11] A full psychiatric evaluation is required for the diagnosis of delirium. However, this is time-consuming. In addition, it is limited due to the shortage of existing personnel and the high patient needs. Therefore, assessment tools that can be used at the bedside are essential for the rapid diagnosis and monitoring of ongoing delirium in patients hospitalized in intensive care units.[12] Developing clinical screening tools and standardizing evaluations for the detection of delirium is extremely important for critically ill patients of all ages.[9] In light of this information, nurses needed to be able to diagnose delirium in children and make this diagnosis with bedside assessment tools. These purposes required a scale that nurses could easily apply. This study aims to develop the child delirium assessment scale, determine the factor structure, and determine its validity and reliability.

What is presently known on this subject?

- The epidemiology and risk factors for pediatric delirium are not well defined due to the lack of widespread screening, recognition, and evidence-based data. Unfortunately, little is known about the incidence, clinical presentation, response to treatment, and outcomes of pediatric delirium in intensive care units because of the unavailability of appropriate diagnostic tools for use with children.

What does this article add to the existing knowledge?

- Raising awareness about delirium and identifying ways to detect it in children hospitalized in pediatric intensive care units will contribute to improving the health and quality of life of children, facilitating treatment, and reducing possible risk factors. What is its contribution to the practice?

What are the implications for practice?

- In this study, a diagnostic form was created to identify children with delirium in pediatric intensive care units. Nurses in pediatric clinics will benefit from this form.

Materials and Method

Study Design

This study was designed with a methodological method to develop a scale to be used in the diagnosis of delirium in children hospitalized in the PICU. The steps followed in the development of the scale are shown in Figure 1.

Creating the Scale Item Pool

The Delphi method was used to create the item pool of the scale. Delphi technique: people who observe a problem from different sides and use it to reach a consensus among groups. In this method, panelists are administered a series of questionnaires, one after the other. According to the analysis of the questionnaires, it is determined whether there is consensus on the problem in question.[13] Fifty-six experts were asked for their opinions, and the study was completed with 38 participants using the Delphi technique. As a result of the statistical analysis of the participants' opinions, 32 items were created.[14]

Expert Opinion and Content Validity Studies

The opinions of 16 experts were asked to test the scope and validity of 32 items created using the Delphi method. According to the literature,[15,16] a minimum of 5 and a maximum of 40 expert opinions are needed. Among the 16 experts whose opinions were requested, 11 experts have responded. Experts were asked to express their opinions on the following questions for each item:

- Are the items in the child delirium assessment scale, which was created with the Delphi method based on nurse observations and experiences, gathered under the appropriate title?
- When you examine the items in the table, which of these items do you consider should be included?
- Do you find the items understandable in terms of expression? If not, what is your suggestion?
- Do you think that any item has the same meaning as another item and should be combined? If yes, which are they?
- Is there any item that is not included but that you think should be included? If so, what are they?

The content validity ratios (CVR) of the items were calculated. To test the statistical criteria and significance of the item whose CVRs were determined, the minimum values of CVRs at the α=0.05 significance level of the content validity criteria (scope validity criteria) in Veneziano and Hooper's (1997) table were taken as a basis.[17] The statistical significance of the items was obtained by using the content validity index (CVI) (the mean of the CVRs of each item).

Validity and Reliability Studies

The child delirium assessment scale was applied to 105 children hospitalized in the 3rd level PICU, and validity and reliability studies were performed.

Validity

Factor analysis is "a statistical method used to describe variability with a small number of factors by bringing together variables that measure the same structure or quality."[18] Exploratory factor analysis (EFA) was used to determine the factorization status and the factor loadings of the scale items. Confirmatory factor analysis (CFA) was performed to check whether the result tested in EFA was confirmed.

Reliability

To determine the reliability of the scale, the Cronbach-alpha reliability coefficient and the split-half method were used. According to Osburn (2000), it is one of the most frequently used reliability determination methods in parallel with 18 different

Figure 1. Scale development steps.

reliability estimation methods.[19] The Cornell Assessment of Pediatric Delirium was used as a parallel test in this study.

Study Universe and Sample

The universe of the study consists of children aged 3–18 years who received inpatient treatment in the PICU of the hospital, where the study was conducted for 1 year. According to the data received from the hospital, this number is 342 children for 2018. The sample was selected based on the number determined by the simple random sampling system. The Epi Info 7.2.4.0 version package software was used to determine the sample size. There are different rates reported in the literature regarding the current frequency of delirium in PICUs; this rate was accepted as 10% in determining the sample.[4–6] The sample number was determined with a 95% confidence interval (α: 0.05), a 5% deviation, and a 10% prevalence of 98 people using the known universe sample formula of the Epi Info package software. Within the scope of the study, 133 children were reached in 3 months. 28 children were excluded from the evaluation, who did not meet the inclusion criteria for different reasons, and the study was completed with 105 children.

Inclusion Criteria

a. Children whose sedation level is low (richmond agitation-sedation scale [RASS] score -4, -5);
b. Children who are not in a state of coma (Glaskow coma scale >9);
c. Children who stay in the intensive care unit for at least 24 h;
d. Children without chronic neurocognitive disorders (diseases such as cerebral palsy, sub-acute sclerosing panencephalitis, etc.);
e. Children over the age of three are admitted to the PICU.

Data Collection

Data Gathering Tools

Five forms were employed to collect the data of the study. The Child Identification Form, designed by the researcher, the draft scale, and the child delirium assessment scale were used in the study. In addition, two scales that must be applied before starting the delirium assessment in children were also used. These scales are the RASS, which determines the sedation level of patients, whose validity and reliability study was conducted in Türkiye by Sılay and Akyol (2018), and the Glasgow coma scale, which determines the coma status of patients.[20,21] In this study, the parallel test method, which is one of the methods used in validity and reliability studies, was used.

The Cornell assessment of pediatric delirium scale (revised) whose validity and reliability study was conducted in Türkiye by Ergin et al.[22] (2018), was used as a parallel test in this study.[9]

Child Delirium Assessment Scale

This scale was designed by the researcher for the use of nurses to diagnose delirium in children aged three and over who are at risk for delirium. It was designed as an observational scale that does not require patient participation. Unlike other delirium detection tools, it measures the sensory, cognitive, physiological, and psychomotor findings of the patient's. The scale consists of 28 items synthesized from the knowledge and experience of nurses who work or have worked in the PICU. It can be applied quickly and easily by nurses. It has been proven that it takes about 3 min per patient at the 1st time it is applied by nurses, but when it is routinely applied, it takes <2 min per patient. Each item in the form is scored from 0 (lowest) to 2 (highest). A total score of ≥16 indicates the presence of delirium.

Pre-application with Children

Pre-application was carried out by the researcher and four nurses with the participation of 20 children to test the clarity and applicability of the items in the draft scale and to measure the application duration of the scale. After the application, the nurses who applied the scale were interviewed, and a pre-application evaluation was performed. The nurses who applied the scale stated that "the items in the scale are understandable, the application period took about 3 min at first, but <2 min when it was routinely performed, and its applicability was problematic in children under the age of three, children with some chronic neurocognitive diseases, and children hospitalized in the intensive care unit for a short-term procedure (such as opening a dialysis catheter). In the evaluation made after the pre-application, being 3 years old and over, not having any neurocognitive disease, and staying in the PICU for at least 24 h were included in the inclusion criteria. The data collected during the pre-application were excluded from the scope of the main data of the study.

Data Collection Process

Data for the study were collected by the researcher in February–May 2019. Before conducting the study, the researcher explained the purpose of the study and obtained informed consent from the child or guardian who was included in the study. Between 08:00 a.m. and 08:00 p.m., the researcher constantly observed children. Information about the child was obtained from the primary nurse and, if any, the accompanying person from 08:00 to 08:00 a.m. Children were evaluated for delirium by the researcher twice a day. A total of 133 patients were evaluated, and since they did not meet the inclusion criteria, 28 children were excluded from the study. The study was completed with 105 children.

Ethical Aspects of the Study

For the study, ethics committee approval dated January 21, 2019 and numbered 40 was obtained from the non-interventional clinical research ethics committee of a university. Official permission was obtained from the institution where the study was conducted. Verbal and written consent was obtained from the children and their relatives who agreed to participate in the study. Written consent was obtained from the children and their relatives with the "Informed Consent Form, which contains information about the purpose, duration, and implementation of the study; participation in the research is voluntary; they can leave the research at any time; and their names will be kept confidential." Furthermore, permission was obtained from the researchers, who adapted the measurement tools used in the study. Thus, the ethical principles of "Voluntarism Principle," "Principle of Protection of Confidentiality," "Principle of Informed Consent", and "Principle of Doing No Harm" were fulfilled. This study is conducted in accordance with the guidelines of the Declaration of Helsinki.

Data Analysis

Statistical Package for the Social Science (SPSS) 22.0 package software for Windows was used for the evaluation of distribution measures (mean, standard deviation, min-max values, etc.), correlation analysis, Student's t-test, paired sample t-test, analysis of variance, post-hoc analysis, Mann–Whitney U test, Kruskal–Wallis test, and EFA. The SPSS AMOS 22.0 package program was used for CFA. Statistical significance was accepted as $p<0.05$.

Results

Expert opinion for the items created with the Delphi technique, demographic characteristics of the study group, and the findings of the validity and reliability studies are discussed in this section.

Expert opinion for the Child Delirium Assessment Scale

To ensure the content and validity of the items created using the Delphi method, the opinions of 16 experts were asked. Among the 16 experts whose opinions were requested, 11 experts have responded. The content validity rates of the Child Delirium Assessment Scale items are presented in Table 1.

In the evaluation of expert opinions, since the CVR of the 12th and 18th items was <0, these items were removed. The CVI is obtained over the total CVR means of the items that are significant at the level of 0.05 and will be taken into the final form. The CVI was found to be 0.89. In this study, to test the statistical criteria and significance of 30 items with CVR >0, content validity criteria were taken as α=0.05 significance level, and Veneziano and Hooper's Table (Table 2) were taken as a basis for minimum values of CVCs (scope validity criteria).[15]

Table 1. Content validity ratios of items and content validity indices

Items		Valid	Not valid	Content validity ratios
1	Communication cannot be established with child	11	0	1
2	Child talks non-sense	11	0	1
3	No eye contact with the child	11	0	1
4	There is meaningless gaze in the child	10	1	0.81
5	The child is not aware of what they are doing	11	0	1
6	The child's unconsciousness begins suddenly and fluctuates throughout the day.	10	1	0.81
7	The child has no awareness of day and night	9	2	0.63
8	The child has an attention disorder (directing, focusing, etc.)	11	0	1
9	Some children hallucinate or hear	11	0	1
10	The response to the stimuli given to the child is very low.	10	1	0.81
11	The child does not know where he/she is	11	0	1
12	There is a disorder in child's perceptions	5	6	-0.09
13	Sudden changes occurs in the child's level of consciousness	8	3	0.45
14	There is memory deterioration	11	0	1
15	Patient not responding to commands	9	2	0.63
16	The child is restless	11	0	1
17	The child shows resistance to the care and treatment given	10	1	0.81
18	The child's mood is mixed and experiences emotional destruction	5	6	-0.09
19	The child has fear and anxiety	8	3	0.45
20	Child overreacts to physical contact	11	0	1
21	The child is indifferent to his/her environment	11	0	1
22	The child is often agitated and hard to distract	11	0	1
23	Child becomes combative and aggressive	10	1	0.81
24	The child constantly moves his/her hands, arms, head uncontrollably; It is difficult to restrain the child	11	0	1
25	There is a decrease in the motor functions of the child during the day	11	0	1
26	There is an increase in the motor functions of the child during the day	11	0	1
27	There is a change in the motor functions of the child during the day, while it decreases in the morning, it increases in the afternoon and at night.	10	1	0.81
28	The child tend to harm self or others	11	0	1
29	The child has tachycardia	11	0	1
30	The sleep-wake cycle of the child is disrupted.	11	0	1
31	The child is breathing fast	11	0	1
32	The child is usually awake and makes loud noises	9	2	0.63
	Number of experts	11		
	Content validity criterion	0.59		
	Content validity index	0.89		

As can be seen in Table 2, the content validity criterion for 11 experts corresponds to 0.59. As a result, the scale was considered statistically significant since CVI>CVC (0.89 >0.59).

The verbal opinions of the experts were also requested on whether the language of the items is understandable, whether the form of expression is correct, and whether they can be combined with other items. The 10th and 15th items were combined since they are similar to each other, and the phrase "verbal or painful" was added to the item. The 22nd and 24th items were combined, and the phrase "agitated" in item 22 was removed. In addition, the "Does the child have awareness day and night?" statement in item 7 was changed to "Is the child aware of day and night?." The expression "child" in item 8 was changed to the expression "child's." The expression "can" in item 23 was changed to "is it possible?". The expression "Is it in condition?" was added to the end of item 32. Thus, the form, consisting of 28 items, was finalized.

Findings of the Study Group

In this study, 133 children were evaluated. However, since they did not meet the inclusion criteria, 28 children were excluded from the study. The study was completed with 105 children. When the demographic characteristics of the children were

Table 2. Minimum values for CVRs at significance level =0.0516

Number of experts	Minimum value	Number of experts	Minimum value
5	0.99	13	0.54
6	0.99	14	0.51
7	0.99	15	0.49
8	0.78	20	0.46
9	0.75	25	0.37
10	0.62	30	0.33
11	**0.59**	35	0.31
12	0.56	40+	0.29

CVRs: Content validity ratios.

examined, it was determined that 65.71% of the children were female and 34.29% were male, 40% of the children were in the 3–7 age group, 39.05% were in the 13–17 age group, and 20.95% were in the 8–12 age group, 54.29% of the children were going to school, 30.48% were in the pre-school period, and 15.24% were not going to school.

Validity and Reliability of the Child Delirium Assessment Scale

Factor Analysis

EFA was used to determine the factorization status and the factor loadings of the scale items. CFA was performed to check whether the result tested in EFA was confirmed.

EFA

Before performing EFA, to determine whether the data are suitable for factor analysis, the Kaiser–Meyer–Olkin (KMO) value should be checked, and the significance of Bartlett tests should be tested. The findings obtained as a result of EFA are presented in Table 3.

The KMO value was found to be 0.91, and the Barlett test was statistically significant in this study (χ^2=2303.52, p<0.05) (Table 3). Accordingly, it can be stated that the data have a normal distribution and the data are suitable for factor analysis. After determining the suitability of the data, as a result of the principal components method and varimax rotation in EFA, a single factor structure was found, this explained 49.99% of the total variance.

Item-total correlation explains the relationship between the scores obtained from the test items and the total score of the test. The factor loads of all items in the form were found to be between 0.398 and 0.874. These results reveal that the validity of the items on the scale is high.

CFA

CFA was performed using the AMOS package program to check whether the result tested in EFA was confirmed. It was determined that the fit indexes were not at an acceptable level at the first CFA. Therefore, modification indicators have been examined. The modification shows the reduction in Chi-square value that can be obtained by establishing the proposed correlations. Thus, it is aimed to ensure that the model fits better. The most significant point to be considered while making modifications is that the modification suggestions (items to be linked) have to be explained theoretically. The items to be modified should theoretically be related to each other. Modifications should be made sequentially, starting with the items that will contribute the greatest improvement to the Chi-square value, and the model should be retested after each modification.[23,24] With a total of five modifications made in light of these explanations, it was determined that the goodness of fit index (GFI) reached an acceptable level. The CFA model and modifications made are shown in Figure 2.

Chi-square, GFI, adjusted GFI, comparative fit index (CFI), normed fit index, relative fit index, root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) fit indices, which are common criteria used by researchers, were examined. The "good fit values," "acceptable fit values", and "fit values for the scale" for various fit indices are given in Table 4.

In the literature, although different ranges are expressed regarding the level of fit indices, it was observed that the generally mentioned values are close to each other. These value ranges are shown in Table 4.[25] The condition that the Chi-square (Chi-square)/degree of freedom ratio (df) in the CFA should be below 2 was sought. The ratio calculated by CFA (χ^2/sd) was 1.724. According to the proposed value ranges, this value revealed that the factor model fits well with the data. RMSEA (0.08), SRMR (0.07), and CFI (0.89) values for the scale were found to be within the acceptable limits. Other values were found to be close to acceptable limits.

Reliability

Reliability

To determine the reliability of the scale, the Cronbach-alpha reliability coefficient and the split-half method were used. As a result of the analysis, Cronbach's alpha value was determined to be 0.96, and the test split-half value was determined to be 0.91 (Table 3). Apart from these reliability methods, the parallel test method was also used. The closest results to the findings of the parallel test were obtained when the cut-off point of the Child Delirium Assessment Scale was accepted as 16 (Table 5).

When the Child Delirium Assessment Scale was compared with the Cornell Pediatric Delirium Scale, used as a parallel test, a strong correlation was determined (r=0.957, p<0.05). The results of all three methods show that the internal consistency of the scale is high and reliable.

Table 3. Factor structure and factor load of the child delirium assessment scale

Item no	Factor load	Cronbach-alpha	Split-half	Total variance explained	Kaiser meyer Olkin (KMO)	Barlett sphericity test (χ^2)	Sd and p value
1	0.849	0.96	0.91	49.99	0.91	=2303.52	Sd=378 p=0.000
2	0.852						
3	0.814						
4	0.874						
5	0.840						
6	0.800						
7	0.826						
8	0.699						
9	0.783						
10	0.750						
11	0.800						
12	0.658						
13	0.791						
14	0.787						
15	0.568						
16	0.683						
17	0.660						
18	0.756						
19	0.576						
20	0.553						
21	0.398						
22	0.478						
23	0.572						
24	0.800						
25	0.557						
26	0.657						
27	0.537						
28	0.544						

Discussion

Preliminary studies are needed to determine to what extent the scale item measures what it is intended to measure (content validity) or the ability of the item to predict the related construct (construct validity).[17] To ensure the content and validity of the items created using the Delphi method, the opinions of 16 experts were asked. Among the 16 experts whose opinions were requested, 11 experts have responded. According to the literature,[15,16] a minimum of 5 and a maximum of 40 expert opinions are needed. Hence, 11 experts in this study were considered sufficient to calculate the content validity rates of the items. If the CVR is zero or <0, the item is removed.[16] In the evaluation of expert opinions, since the CVR of the 12th and 18th items was <0, these items were removed. If CVI>CVC, the scale can be considered statistically significant when there is only one dimension in the scale.[14] The CVI was found to be 0.89 (Table 1). The CVC for 11 experts corresponds to 0.59 (Table 2). As a result, the scale was considered statistically significant since CVI>CVC (0.89>0.59).

Other factors affecting the validity of the measurement tool (such as the understandability of the items, their suitability for the target audience, and compatibility or incompatibility between expert opinions) are also used as estimators for content or construct validity.[16] The verbal opinions of the experts were also requested on whether the language of the items is understandable, whether the form of expression is correct, and whether they can be combined with other items. Some items (10–15 and 22–24) were combined since they are similar to each other, and in some of the items (7–8–10–22–23–32) changes were made in the verbal expressions. Thus, the form, consisting of 28 items, was finalized.

Factor analysis is "a statistical method used to describe variability with a small number of factors by bringing together variables that measure the same structure or quality."[18] Before performing EFA, to determine whether the data are suitable for factor analysis, the KMO value should be checked, and the significance of Bartlett tests should be tested. According to

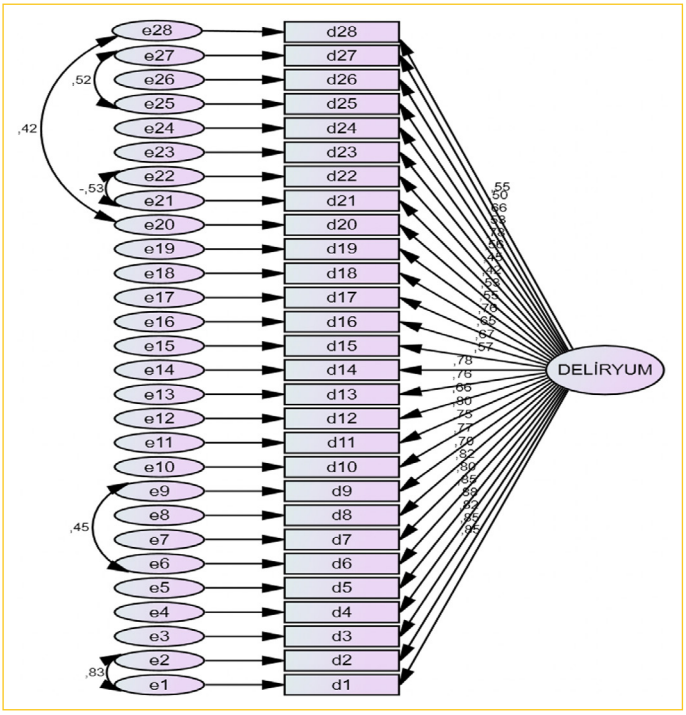

Figure 2. Path diagram and factor loads obtained from confirmatory factor analysis for CDAS.

CDAS: Child delirium assessment scale.

Büyüköztürk (2016), the fact that the KMO value is higher than 0.60 and the Barlett test is significant is accepted as an indication that the data are suitable for factor analysis.[18] According to Kaiser, KMO values above 0.5 are acceptable.[26,27] The KMO value was found to be 0.91, and the Barlett test was statistically significant in this study (χ^2=2303.52, p<0.05) (Table 3). Accordingly, it can be stated that the data have a normal distribution and the data are suitable for factor analysis. After determining the suitability of the data, as a result of the principal components method and varimax rotation in EFA, a single factor structure was found, this explained 49.99% of the total variance.

The variance explained by 30% or more on single-factor scales is considered acceptable.[18] In this study, the total variance explained in the EFA was found to be 49.99%, which is well above the acceptable amount of 30%. According to Tavşancıl, higher variance rates indicate a stronger factor structure of the scale.[28] Item-total correlation explains the relationship between the scores obtained from the test items and the total score of the test. The factor loads of all items in the form were found to be between 0.398 and 0.874. A total correlation coefficient of 30% or more is considered sufficient.[18] These results reveal that the validity of the items on the scale is high. The items on the scale exemplify similar behaviors, and the internal consistency of the scale is high.

In the literature, although different ranges are expressed regarding the level of fit indices, it was observed that the generally mentioned values are close to each other. These value ranges are shown in Table 4.[25] The condition that the Chi-square (Chi-square)/degree of freedom ratio (df) in the CFA should be below 2 was sought. The ratio calculated by CFA (χ^2/sd) was 1.724. According to the proposed value ranges, this value revealed that the factor model fits well with the data. RMSEA (0.08), SRMR (0.07), and CFI (0.89) values for the scale were found to be within the acceptable limits. Other values were found to be close to acceptable limits. It is argued that the values slightly below the threshold values or close to the threshold values are related to the sample size.[29,30] Therefore, it can be stated that the CFA result of the scale confirms the structure explained in the EFA.

According to the literature, this value being over 0.70 indicates that the scale has internal consistency.[18] As a result of the analysis, Cronbach's alpha value was determined to be 0.96, and the test split-half value was determined to be 0.91 (Table 3). Apart from these reliability methods, the parallel test method was also used. When the Child Delirium Assessment Scale was compared with the Cornell Pediatric Delirium Scale, used as

Table 4. Fit indices and CFA values for CDAS

Fit indices	Good fit values	Acceptable fit values	Fit values for the scale
χ2/df	00<χ2/df<2	2<χ2/df<3	**1.724**
GFI	0.95<GFI<1.00	0.90<GFI<0.95	0.72
AGFI	0.90<AGFI<1.00	0.85<AGFI<0.90	0.64
CFI	0.95<CFI<1.00	0.90<CFI<0.95	**0.89**
NFI	0.95<NFI<1.00	0.90<NFI<0.95	0.78
RFI	0.95<RFI<1.00	0.90<RFI<0.95	0.75
RMSEA	0.00<RMSEA<0.05	0.05<RMSEA<0.08	**0.08**
SRMR	0.00≤SRMR≤0.05	0.05≤SRMR≤0.10	**0.07**

CFA: Confirmatory factor analysis; CDAS: Child delirium assessment scale; GFI: Goodness of fit index; AGFI: Adjusted goodness of fit index; CFI: Comparative fit index; NFI: Normed fit index; RFI: Relative fit index; RMSEA: Root mean square error of approximation; SRMR: Standardized root mean square residual.

Table 5. Correlation between scales

	Cornell assessment of pediatric delirium
Child delirium assessment scale	
r	0.957
p	**0.000**

a parallel test, a strong correlation was determined (r=0.957, p<0.05) (Table 5). The results of all three methods show that the internal consistency of the scale is high and reliable. When the reliability of other tools that determine pediatric delirium is examined, the reliability of the Cornell Assessment of Pediatric Delirium is 0.94, the reliability of the Pediatric Convulsion Evaluation scale for Intensive Care Units is 0.96, and the reliability of the Pediatric Anesthesia Emergence Delirium scale is 0.80.[6,31,32] When compared with other tools, the reliability level of the scale is quite high.

Implications for Nursing Practice

It was developed as a scale that nurses can easily apply at the bedside in the diagnosis of delirium in patients hospitalized in the PICU. Unlike other delirium detection tools, it measures the sensory, cognitive, physiological, and psychomotor findings of patients. Early diagnosis of delirium in children, identifying its underlying causes, and treating accordingly will minimize long-term problems. A full psychiatric evaluation is required to diagnose delirium in children; this is difficult as it is a time-consuming procedure, and there are not enough child psychiatrists. It is recommended that this scale be used in the diagnosis of delirium by nurses in clinics. Repeating the validity and reliability analysis on a larger patient group in different centers using the child delirium assessment scale is also recommended.

Limitations of the Study

This study is limited to children aged 3–18 years hospitalized in the PICU of the Training and Research Hospital in Diyarbakır province.

Conclusion

EFA and CFA results confirmed the factor structure and construct validity of the 28-item scale obtained in this study. According to the results of Cronbach's alpha internal consistency value, test split-half value, and item-total correlation coefficient, the internal consistency of the scale was found to be extremely high and reliable for the current patient group.

As a result, this study has determined that the child delirium assessment scale is a valid and reliable measurement tool to determine delirium in children hospitalized in the PICU.

Ethics Committee Approval: The study was approved by the Dicle University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (No: 40, Date: 21/01/2019).

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