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Original Article

Evaluating the reliability and validity of the Turkish version of the Parents' Perceptions of Uncertainty Scale (PPUS-TR)

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ABSTRACT

Background: The disease process can negatively affect both children and their parents, causing them to experience uncertainty. This study aims to determine whether the Turkish version of the Parents' Perceptions of Uncertainty Scale (PPUS) is a valid and reliable instrument for measuring Turkish parents' perceptions of uncertainty.

Methods: Data were collected from 351 parents. Data collection tools included the Descriptive Data Form, PPUS, and the Brief Symptom Inventory (BSI). Language, face, and content validity, descriptive statistics, internal consistency analyses, explanatory and confirmatory factor analyses, and convergent validity analyses were conducted.

Results: The content validity index (CVI) was calculated as 0.96. As a result of the exploratory factor analysis, a four-factor structure with 23 items explaining 57.98% of the total variance was obtained. Confirmatory factor analysis supported the model fit. The Cronbach's alpha coefficient for the final version of the scale was 0.923. Convergent validity showed a significant positive relationship with the BSI (r=0.69).

Conclusions: The Turkish version of PPUS (PPUS-TR) was found to be a valid and reliable measurement tool.

Key words: nursing, parents, pediatrics, uncertainty.

The concept of uncertainty has been defined in healthcare as the inability to determine the meaning of disease-related events, which occurs when the decision-maker cannot assign a precise value to objects or events or predict outcomes accurately.[1] Uncertainty in illness can arise from limited information, unpredictable symptoms, unclear disease progression, inadequate social and healthcare support, and difficulties in understanding or making sense of disease-related developments.[2] Therefore, especially in chronic diseases, the disease is often accompanied by uncertainty, significantly affecting patients' adaptation to the process, quality of life, and disease prognosis.[1,3] So much so that adapting to life during the disease and overcoming its uncertainty is sometimes shown as a more significant source of stress than the disease itself.[4]

The experience of uncertainty negatively affects both child and adult patients, significantly raising anxiety levels and reducing tolerance even in healthy children and adolescents.[5] The uncertainty created by the phenomenon of chronic disease due to its variable nature and unpredictable process also causes similar

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problems in children and adolescents. In two different studies conducted with children with autism[6] and children with attention deficit-hyperactivity disorder[7], it was found that there is a positive relationship between uncertainty and anxiety and that uncertainty intolerance increased the incidence of anxiety disorders. Disease uncertainty has also been associated with a lower quality of life in children diagnosed with cancer.[8] Uncertainty related to chronic illnesses in children and adolescents negatively affects their psychosocial well-being throughout the diagnosis, care, and rehabilitation processes. Similarly, the uncertainty experienced by primary caregivers, particularly parents, also has an adverse impact.

The perception of uncertainty experienced by the parents of pediatric patients was defined by Merle H. Mishel.[9] Mishel states that uncertainty, as a perceptual variable, prevents a precise evaluation of events and limits coping; the ability to resolve uncertainty also affects how well a person can cope with any situation.[1,10] Considering the profound impact of parents' emotional state on their children, particularly during illness, Mishel assumed that parents' ability to navigate the uncertainties of illness could significantly boost their children's confidence and peace of mind.[10] It is stated that parents' perception of uncertainty regarding their child's illness increases the level of uncertainty and stress experienced by the sick child.[11] Even if the treatment outcome is positive, the perception of uncertainty causes families to have difficulty adapting to the process and coping with the current situation.[12] Research has indicated that the perception of uncertainty not only adversely affects parents' mental health but also leads to an increase in their children's levels of uncertainty, resulting in psychological issues.[13-16] In this context, identifying uncertainty in parents of children and adolescents with chronic diseases with valid and reliable methods is essential in terms of protecting the mental health of children and adolescents and their parents, managing the disease process more effectively, and facilitating adaptation to the process.

The Parent Perception of Uncertainty Scale (PPUS)[10] has been widely used for parents' perceptions of uncertainty. The scale has been translated into many languages, such as Arabic, Chinese, and Spanish[17-20], and the versions in these cultures have been found to have high validity and reliability. It has also been determined that the scale has been used in studies conducted with parents of children with many different diagnoses.[21-24] On the other hand, to date there have been no tool that measures the perceptions of uncertainty of parents of children with chronic diseases in Türkiye although the perceptions of uncertainty experienced by this population have been mentioned in some qualitative studies.[25,26] Within the scope of the literature review, a congress abstract was found stating that the psychometric properties of the Turkish version of the PPUS (PPUS-TR) were performed.[27] Still, since the full text of the study was not available, the details of the analyses could not be accessed. Furthermore, no study using this version in Türkiye has been obtained.

The effectiveness of intervention studies relies on identifying specific needs within target populations using valid, reliable, measurable, and repeatable tools. In this context, a valid and reliable measurement is essential for interventions designed to support Turkish parents facing uncertainty about their children's chronic illnesses. Additionally, given the evolution of healthcare systems and cultural shifts since the PPUS was developed, it is necessary to confirm its applicability for assessing parental uncertainty across different cultures in a changing world. Therefore, this study addresses these gaps by evaluating the PPUS's validity and reliability in measuring Turkish parents' perceptions of uncertainty. The aims of our study were to determine the validity and reliability of PPUS-TR and the relationship between PPUS-TR and the Brief Symptom Inventory (BSI) in parents of children with chronic diseases in Türkiye.

Materials and Methods

Study methodology

This study's methodological design was to test the psychometric properties of the Turkish version of the PPUS for parents of children between the ages of 0-18 years with chronic diseases.

Participants

The research population included parents of newborns, children, and adolescents with chronic diseases between the ages of 0-18 years who were receiving inpatient and/or outpatient treatment in Ankara. The research was conducted in the clinics of one university and two state hospitals to ensure a diverse and representative sample. The following clinics were visited in the institutions where approval was obtained to conduct the study: pediatric emergency, pediatric surgery, pediatric intensive care, neonatal intensive care, general pediatrics, hematology, endocrinology, cardiology, cardiovascular surgery, neurology, orthopedics and traumatology, plastic and reconstructive surgery, urology, adolescent ward, and infant ward. Convenience sampling method was chosen to select the sample from the population. The criteria for parents to be included in the study were as follows: 1) having at least one child between the ages of 0-18 years with a chronic disease (such as diabetes, epilepsy, asthma, or cancer), 2) confirming that the child does not have any mental or physical condition that would prevent participation in the study, 3) being able to read and understand Turkish. Parents who did not meet these criteria were excluded from the study.

In scale adaptation studies, the recommendation is to reach at least 8-10 times the number of items[28]; some sources even suggest reaching 200-500 people during the translation and adaptation processes, regardless of the number of items on the scale.[29,30] To align with literature recommendations and achieve ten times the scale items, the target sample size was set at a minimum of 350 participants.

Procedures

The research was conducted per international guidelines on the cross-cultural adaptation of self-report scales.[30,31] First, due to Mishel's death, who had the right to authorize all versions of the scale, the necessary permission was obtained by contacting the institution where Mishel worked when she developed the scale. The scale was translated by two native Turkish speakers proficient in English: one with no clinical background, and the other with an academic specializing in psychiatry/psychology. Both translators received a report addressing complex or ambiguous expressions and word choice justifications. Their translations were synthesized, discrepancies discussed, and merged into a single version. This version was then back-translated by two other translators. All versions were reviewed by 10 psychiatry/psychology experts. A field expert finalized the pre-test version of the scale. After obtaining the necessary permissions from the institutions, the final version of the scale was piloted with 20 parents who met the inclusion criteria. The second researcher regularly visited the institutions from October 2022 to February 2024 until the target number of participants was reached. After explaining the research's purpose and scope, forms were administered face-to-face to parents who verbally and in writing confirmed their willingness to participate. Filling out the scales took approximately 15 minutes. Participants provided feedback on the clarity of scale items and their appearance, but this data was excluded to ensure study rigor. Once face and language validity were confirmed, the scale was administered to 351 parents, completing the research process.

Outcome measures

Descriptive data form: This 13-question form, developed by the researchers based on a literature review[17,32], includes information on participants' age, gender, marital status, education level, income status, knowledge of the diagnosis, and opinion about the severity of the diagnosis, as well as the child's age, gender,

diagnosis, diagnosis time, primary caregivers, and numbers of hospitalizations.

The Parent Perception of Uncertainty Scale (PPUS): Mishel developed PPUS to describe parents' perceptions of uncertainty.[10] PPUS is a 5-point Likert-type scale consisting of 31 items. The scale has four sub-dimensions: "Ambiguity" refers to the lack of clues or uncertainty regarding the planning or execution of the child's care. "Lack of clarity" is related to the lack of clarity regarding receiving or perceiving information about the child's treatment and care system. "Lack of information" refers to the absence of information regarding the diagnosis and severity of the condition. "Unpredictability" includes items related to the inability to make daily or future predictions about symptoms and disease outcomes. While the scale's total Cronbach's alpha value is 0.91, its subscales have Cronbach's alpha values of 0.87, 0.81, 0.73, and 0.72, respectively. The lowest score to be obtained from the scale is 31, the highest score is 155, and an increase in the score indicates that the perception of uncertainty increases.[10]

Brief Symptom Inventory (BSI): The scale, developed by Derogatis[33] as a short form of the 90-item Symptom Checklist (SCL-90-R), allows individuals to evaluate their psychological state across various dimensions and consists of 53 items. The scale has five sub-dimensions: "anxiety", "depression", "negative self", "somatization" and "hostility". BSI is a 5-point Likert-type scale; the total score that can be obtained from the scale varies between 0 and 212. A high total score indicates the frequency of psychological symptoms. The Turkish scale adaptation was conducted in two studies.[34,35] These studies found that the internal consistency coefficient for the entire BSI varied between 0.95 and 0.96, and that of the subscales ranged between 0.55 and 0.86.

Statistical analysis

All validity and reliability analyses were conducted using SPSS 29 and AMOS 29. Participants' characteristics were described with descriptive statistics. Expert opinions were examined with the content validity index (CVI) in the 'language and appearance' validity phase. Correlation coefficients were calculated to assess each item's relationship with its sub-dimension, and corrected item-total correlations were used to minimize random measurement errors.[36] The minimum value for corrected item-total item correlation coefficients was accepted as 0.3. In addition, the anti-image correlation matrix was calculated to determine whether the items were sufficiently related. The coefficients in the diagonal of the anti-image correlation matrix were examined to see whether they were greater than 0.5.[37] The reliability analysis for the sub-dimensions was conducted using Cronbach's alpha coefficient, including item deletion. A half reliability analysis was also performed, by calculating the Spearman-Brown coefficient. The data set's suitability for factor analysis was assessed through the Kaiser-Meyer-Olkin (KMO) value and Bartlett's test. Following these assessments, exploratory factor analysis was performed, and Cronbach's alpha coefficients were recalculated for the new scale structure. The validity of the factor structure was evaluated using confirmatory factor analysis employing the indices given in Table I.

Table I. Criterion ranges of model fit indices.

Fit index	Perfect fit range	Acceptable fit range
$\chi 2/df$	$0 \leq \chi 2/sd \leq 2$	$2 \leq \chi 2/sd \leq 3$
AGFI	0.90≤ AGFI≤1.00	0.85≤ AGFI≤0.90
GFI	0.95≤GFI≤1.00	0.90≤GFI≤0.95
CFI	0.95≤ CFI≤1.00	0.90≤ CFI≤0.95
NFI	0.95≤NFI≤1.00	0.90≤NFI≤0.95
RFI	0.95≤ RFI≤1.00	0.90≤ RFI≤0.95
IFI	0.95≤IFI≤1.00	0.90≤IFI≤ 0.95
RMSEA	0.00≤RMSEA≤0.05	0.05≤RMSEA≤0.08

AGFI, Adjusted Goodness of Fit Index; CFI, Comparative Fit Index; GFI, Goodness of Fit Index; IFI, Incremental Fit Index; NFI, Normed Fit Index; RFI, Relative Fit Index; RMSEA, Root Mean Square Error of Approximation; $\chi 2/df$, chi-square/degrees of freedom.

Convergent validity was determined through Pearson correlation analysis between the scale's total score and the BSI score, with all analyses conducted at a significance level of 0.05.

Ethical considerations

Ethical approvals were obtained from Hacettepe University Health Sciences Research Ethics Committee, decision number GO22/13-66. Necessary permissions were also obtained from the hospitals, which allowed the research to be conducted.

Results

Sample characteristics

A total of 351 participants were included, with a mean age of 34.1±5.5 years, predominantly consisted of mothers (74.1%). Almost all parents were married (98.9%), and the majority had a high school education or higher (61.6%), with 73.8% reporting a medium income level. A minority (8.0%) were unsure of their child's diagnosis, and nearly half (47.3%) reported caring for the child with their spouse. Parents rated the severity of the child's illness at an average of 8.7±1.7. Approximately 45.9% of the children were under three years old, with a nearly equal gender distribution. Children had various chronic diagnoses, including heart conditions (20.8%), diabetes (15.1%), and epilepsy (14.2%). Most children had been hospitalized at least once (40.2%), and the duration of diagnosis was less than six months (Table II).

Language, face, and content validity

After the translation processes were completed, all versions of the scale (see procedure section) were sent with a draft final form to 10 academics who are experts in the field of psychiatric nursing. Experts were asked to make a face evaluation regarding the understandability and necessity of each statement. In addition, for the first stage of content validity, experts rated the suitability of each statement on a scale from 1 to 4. In line with the experts' opinions, the scale was finalized by a field expert, and the CVI was calculated. According to the Davis technique[38], the CVI value, which is expected to be 0.8 and above, was found to be 0.96.

In the final stage of face and content validity, a pilot study was conducted with 20 parents who met the inclusion criteria. With the suggestion of five parents, a word ("expect") was removed from one item of the scale (item 7) to make it more comprehensible. Thus, the item became clearer and more understandable in its Turkish version.

Internal consistency-1

As a result of the correlation analysis, the relationship between the items and the sub-dimension they belonged to was determined. The corrected correlation coefficient of the 29th item was below 0.3, and the item was deleted (Table III). After this stage, the analyses continued with 30 items. In the correlation analysis conducted to determine the relationship between the scale items and the total item, the correlation coefficient was found to be over 0.3 for all items, and as a result of the anti-image matrix, the diagonal values were over 0.5. The sub-dimension reliability analysis was calculated using the Cronbach alpha coefficient when the item was deleted. Cronbach's alpha coefficient for the reliability of all scale items was found to be 0.945, 0.919 for ambiguity, 0.836 for lack of clarity, 0.796 for unpredictability, and 0.658 for lack of information. No item was excluded from the analysis at these stages. In addition, as a result of the split-half reliability analysis, the Cronbach alpha coefficient of the first part was found to be 0.912, and that of the second part was found to be 0.882. The Spearman-Brown coefficient value was found to be 0.926.

Exploratory factor analysis

The KMO value indicating the suitability of the data set for factor analysis was found to be 0.937, and Bartlett's test was found to be

Table II. Characteristics of the sample.

Characteristics	n (%) or mean±SD
Parents' age, years	34.1 ± 5.5
Parents' gender	
Mother	260 (74.1%)
Father	91 (25.9%)
Parents' marital status	
Married	347 (98.9%)
Single	4 (1.1%)
Parents' educational status	
Only literate	4 (1.1%)
Elementary	131 (37.3%)
Highschool	99 (28.2%)
Bachelor's	100 (28.5%)
Postgraduate	17 (4.9%)
Parents' perceived income status	
Low	70 (19.9%)
Medium	259 (73.8%)
High	22 (6.3%)
Parents' knowledge of child's diagnosis	
Knows the right diagnosis	323 (92.0%)
Misunderstands / does not know the diagnosis	28 (8.0%)
Caregivers of child	
Mother	53 (15.1%)
Mother and father	166 (47.3%)
Mother, father, grandmother/mother-in-law	95 (27.1%)
Mother and grandmother/mother-in-law	25 (7.1%)
Other	12 (3.4%)
Parents' opinion of severity of the diagnosis*	8.7 ± 1.7
Child's age	
0-6 months	35 (10.0%)
7-12 months	51 (14.5%)
1-3 years	75 (21.4%)
4-5 years	86 (24.5%)
6-12 years	66 (18.8%)
13-18 years	38 (10.8%)
Child's gender	
Boy	186 (53.0%)
Girl	165 (47.0%)
Child's diagnosis	
Heart failure	73 (20.8%)
Diabetes	53 (15.1%)
Epilepsy	50 (14.2%)
Chronic renal failure	34 (9.7%)
Thyroid disease	33 (9.4%)
Asthma	32 (9.1%)
Obesity	21 (6.0%)
Other**	55 (15.7%)
Time since child's diagnosis	
0-6 months	141 (40.2%)
7-12 months	83 (23.6%)
1-3 years	56 (16.0%)
4-5 years	27 (7.7%)
5+ years	44 (12.5%)
No. of hospitalizations	
0	80 (22.8%)
1	128 (36.5%)
2	65 (18.5%)
3	32 (9.1%)
4	15 (4.3%)
≥ 5	31 (8.8%)

*Measured on a 10-point scale. SD, standard deviation.
**Other diseases: cystic fibrosis, liver cyst, hearing loss, esophageal atresia, neuroblastoma, soft tissue sarcoma, cerebral palsy, eczema, juvenile idiopathic arthritis.

significant (x^2 [435]:5738.180 , p=0.0001). In the factor analysis, items 1, 2, 12, 21, and 25 were excluded because they had high loadings on different sub-dimensions, and items 17 and 20 were excluded from the analysis because they had low factor loadings. A structure with four sub-dimensions was obtained with the remaining 23 items (Table IV). The first sub-dimension explained 38.677% of the variance, the second sub-dimension explained 8.418% of the variance, the third sub-dimension explained 5.921% of the variance, and the fourth sub-

Table III. Corrected item-total correlation values in each sub-scale.

Ambiguity	Corrected item - Total correlation	Cronbach's alpha if item deleted	Lack of clarity	Corrected item - Total correlation	Cronbach's alpha if item deleted	Unpredictability	Corrected item - Total correlation	Cronbach's alpha if item deleted	Lack of information	Corrected item - Total correlation	Cronbach's alpha if item deleted
A_3	0.696	0.911	LC_2	0.583	0.813	U_11	0.820	0.463	LI_1	0.483	0.669
A_4	0.659	0.913	LC_5	0.719	0.794	U_19	0.704	0.693	LI_12	0.387	0.672
A_8	0.728	0.91	LC_6	0.59	0.813	U_23	0.695	0.709	LI_26	0.441	0.594
A_13	0.695	0.911	LC_7	0.568	0.817	U_27	0.755	0.588	LI_28	0.422	0.600
A_15	0.705	0.911	LC_9	0.549	0.817				LI_30	0.327	0.641
A_16	0.651	0.913	LC_10	0.595	0.809						
A_17	0.583	0.916	LC_14	0.431	0.836						
A_18	0.782	0.907	LC_29	0.197	-						
A_20	0.57	0.916	LC_31	0.484	0.828						
A_21	0.71	0.911									
A_22	0.554	0.917									
A_24	0.711	0.911									
A_25	0.443	0.920									

A, ambiguity; LC, lack of clarity; LI, lack of information; U, unpredictability.

dimension explained 14.966%. The total variance explained by the four sub-dimensional structures was 57.982%. Eigenvalues were determined to be 8.896, 1.936, 1.362, and 1.142 in the sub-dimensions.

At this stage, it was also tested whether a single score could be obtained from the 23 items and four sub-dimensions obtained from the exploratory factor analysis, in other words, the additivity feature. ANOVA with Tukey's test for nonadditivity showed that the 23 items forming the scale were homogeneous and interrelated (p=0.0001), and the items confirmed additivity (p=0.0001).

Table IV. Exploratory factor analysis with Varimax rotation.

Items	Factors			
	1	2	3	4
A_16	0.795			
A_15	0.774			
A_4	0.735			
A_18	0.727			
A_3	0.706			
A_24	0.705			
A_8	0.680			
A_13	0.607			
A_22	0.464			
LC_7		0.706		
LC_5		0.697		
LC_14		0.682		
LC_10		0.530		
LC_6		0.458		
LC_9		0.432		
LC_31		0.418	0.404	
U_19			0.752	
U_23			0.714	
U_27			0.654	
U_11			0.576	
LI_30				0.756
LI_28				0.637
LI_26				0.625

A, ambiguity; LC, lack of clarity; LI, lack of information; U, unpredictability.

Internal consistency-2

As a result of the exploratory factor analysis, the Cronbach alpha value for the entire scale was 0.923, for ambiguity 0.906, for lack of clarity 0.813, for unpredictability 0.801, and for lack of information was 0.860. As a result of the split-half reliability analysis, the Cronbach alpha coefficient of the first part was found to be 0.913, and for the second part, 0.811. On the other hand, Spearman-Brown coefficient value was found to be 0.830.

Confirmatory factor analysis

Fig. 1. gives the path diagram of the confirmatory factor analysis conducted to test whether the factor structure obtained as a result of the exploratory factor analysis was valid. Four of the fit indices showed an "acceptable" level of model fit, while the others showed an "excellent" level of model fit.

Convergent validity

BSI was used to determine the scale's convergent validity. The BSI had a positive, significant relationship with the overall score of the scale (r=0.69) and the subscales (0.64; 0.57; 0.50; 0.41, respectively; Table V).

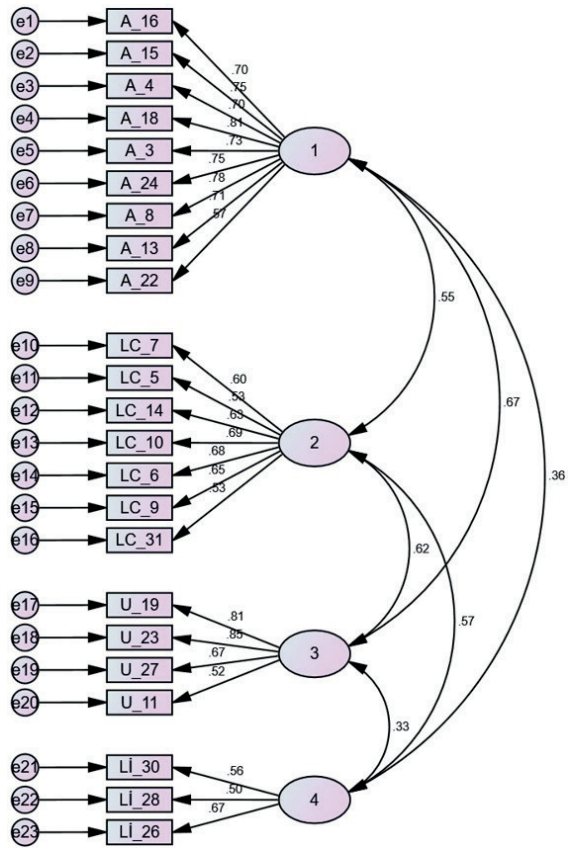

Fig. 1. Diagram from confirmatory factor analysis.

Four of the fit indices showed an "acceptable" level of model fit, while the others showed an "excellent" level of model fit (χ2/sd=2.47; AGFI=0.898; GFI=0,936; CFI=0.956; NFI=0.962; RFI=0.975; IFI=0.957; RMSEA=0.063).

A, ambiguity; AGFI, Adjusted Goodness of Fit Index; CFI, Comparative Fit Index; GFI, Goodness of Fit Index; IFI, Incremental Fit Index; LC, lack of clarity; LI, lack of information NFI, Normed Fit Index; RFI, Relative Fit Index; RMSEA, Root Mean Square Error of Approximation; U, unpredictability; χ2/df, chi-square/degrees of freedom.

Discussion

This study aimed to determine whether PPUS is a valid and reliable tool for measuring Turkish parents' perceptions of uncertainty. Within the scope of the literature review, since the full text of the study was not available in a summary report[27] regarding the psychometric properties

Table V. Correlation between Parental Uncertainty Perception Scale-Turkish Form score and general psychological symptoms of the Brief Symptom Inventory.

Variables (Mean ± SD)	Parents' perception of uncertainty (63.29±17.42)	Ambiguity (27.88±8.98)	Lack of clarity (16.70±5.68)	Unpredictability (12.47±3.94)	Lack of information (6.22±2.48)	Psychological symptoms (43.58±28.64)
Psychological symptoms	0.69*	0.64*	0.57*	0.50*	0.41*	1.00

SD, standard deviation.
*p<0.001

of the Turkish version of the PPUS, the detailed analyses of the scale could not be examined. In addition, to our knowledge no study was found in Türkiye using this scale. In this case, it was thought that due to the lack of details regarding validity and reliability analyses, a sufficient reference was not provided to the literature, and the scale's suitability for Turkish culture could not be fully assessed. Considering the persistent need to assess the uncertainty perceptions of parents of children with chronic diseases in Türkiye, this study addresses this gap by presenting a thorough adaptation process along with comprehensive validity and reliability analyses of the PPUS, thereby making a substantial contribution to the existing literature.

In our study, PPUS-TR provided high face and validity in line with the original scale. The 29th item in the "lack of clarity" sub-dimension of the original scale was deleted because it had a low coefficient in the correlation analysis in which its relationship with the sub-dimension it belonged to was determined. This item refers to the expression of trust by the parents that nurses will be present when needed. While all other items emphasize aspects such as the severity of the child's illness, assuming responsibility for the child's care, and understanding the illness process, this particular item focuses solely on trust in nurses. In this context, item 29 may have shown a low correlation, as it does not fall under any of the subscales due to its distinctiveness from the other items and the fact that its direct relationship with uncertainty is not immediately clear. Similarly, in the Chinese adaptation of the scale, item 29 was removed from the scale due to its low associations with the rest of the scale.[20] As a result of the KMO value (0.937) and Bartlett test (p=0.0001) used to evaluate the suitability and adequacy of the sample size for the analysis for construct validity, it was found that the sample size was sufficient for factor analysis. In the exploratory factor analysis, items 1, 2, 12, 17, 20, 21 and 25 were deleted. The removal of items 1, 2, 12, 21, and 25 due to high loadings on different sub-dimensions indicates that these items lacked specificity to a single construct, potentially introducing conceptual overlap across factors. Additionally, the removal of items 17 and 20 because of low factor loadings highlights that these items may not adequately represent the latent constructs being measured. Despite the deleted items, the factor structure of the scale in our study overlaps with the factor structure of the original scale.[10] The confirmatory factor analysis results show that the model fit indices are sufficient and the model is valid. In addition, the four factors that explain 57.982% of the total variance due to the factor analysis show that the scale has significant structural validity in the Turkish sample. This supports the fact that the scale's factor structure is also suitable for Turkish parents. Similar findings were obtained in other studies where PPUS was adapted to different cultures[17-20], and it was emphasized that PPUS is a tool that can be adapted to different cultures.

When reliability analyses were evaluated, the fact that Cronbach alpha coefficients were found to be relatively high indicates that the scale's internal consistency is strong. Cronbach alpha coefficient was 0.860 in the Spanish version[19], 0.930 in the Arabic version[17], and 0.825 in the cancer-specific adapted Chinese version.[20] In this study, the total Cronbach alpha coefficient of the scale was 0.923, and for the sub-dimensions, it varied between 0.801 and 0.906, confirming that the scale and its sub-dimensions are reliable. At the same time, the high results of the split-half reliability analyses (Cronbach alpha of first part: 0.913, of second part: 0.811) reveal that the scale gives consistent results at a general level. These findings show that the scale is a reliable tool. In addition, the significant positive correlation between PPUS and BSI (r=0.69) supports the convergent validity of the PPUS, suggesting that parents' perceptions of uncertainty may be meaningfully associated with psychological symptoms such as depression and anxiety. In another study where both the PPUS and BSI were used together, a significant positive correlation between these

two scales was found.[39] Additionally, in other studies using the PPUS, consistent with the findings of our study, parents' perception of uncertainty was significantly related to factors such as anxiety, depression, and stress.[20,40,41]

According to the analyses, PPUS-TR has taken its final form with 23 items and a 4-factor structure. However, there are some limitations to this study. First, the predominance of mothers among participants may affect the generalizability of the findings to all parents. Additionally, the study was limited to hospitals in one city, potentially overlooking cultural and socioeconomic differences. In addition, the sample consists of parents of children with many different types of chronic diseases; the results may differ in a sample consisting only of specific patient groups. Therefore, the authors recommend using the scale in future studies in samples where mothers and fathers are equally distributed in different geographical regions and specific disease groups. In addition, since our sample includes parents of children aged 0–18 years, the authors also recommend examining parental perceptions of uncertainty in the context of different age groups.

In conclusion, this study demonstrates that the PPUS-TR is a valid and reliable tool for measuring the perception of uncertainty among Turkish parents. At the same time, further studies with more diverse and extensive samples may help better understand the role of uncertainty perception in the disease process and determine which factors affect this uncertainty perception. Adding the Turkish version of the scale to adaptation studies conducted in different cultures through this study may also pave the way for comparative studies on how parents' uncertainty perception is shaped in various cultural contexts.

Ethical approval

The study was approved by Hacettepe University Health Sciences Research Ethics Committee (date: 06.09.2022, number: GO22/13-66). Necessary permissions were also obtained from the hospitals, which allowed the research to be conducted. Informed consent was obtained from all participants.

Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: MAAK, SEB; data collection: SEB; analysis and interpretation of results: MAAK, SEB; draft manuscript preparation: MAAK, SEB; critical revision of the manuscript: MAAK. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

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