

# Cross-cultural adaptation, validity, and reliability of the pediatric constipation score-parent report in pediatric functional constipation in an Iranian population

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## ABSTRACT

**Aim:** We evaluated the Persian version of the pediatric constipation score-parent report (PCS) validity and reliability.

**Background:** Functional constipation in children results in physical and psychological problems. Therefore, it is necessary to utilize a questionnaire to assess the health-related quality of life in children with chronic constipation.

**Methods:** First, our team translated the English version of the questionnaire into the Persian language. Second, the psychometric properties of the Persian version were collected in 149 children with functional constipation referred to a pediatrics hospital by an expert team. We assessed content validity (CV) through the CV index (CVI) and CV ratio (CVR). The construct validity was evaluated by exploratory factor analysis, and reproducibility was tested based on test-retest reliability using the intra-class correlation coefficient (ICC). Internal consistency was calculated using Cronbach's  $\alpha$ . We also evaluated the ceiling or floor.

**Results:** Results showed acceptable CVI in relevancy, clarity, and simplicity, acceptable CVR for all items, moderate internal consistency (Cronbach's  $\alpha=0.548$ ), and almost perfect reproducibility (ICC=0.93). No ceiling or floor effect was seen.

**Conclusion:** The Persian version of PCS showed good validity and reliability in children with functional constipation in Iran. Therefore, we can use it in clinical and research domains in Persian-speaking countries.

**Keywords:** Constipation, Surveys and questionnaires, Pediatrics, Child.

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## Introduction

Constipation is a common pediatric problem responsible for 3% and 25% of general and gastroenterologist pediatricians' referrals (1). We can define functional constipation (FC) as constipation without any organic and structural origin (2-4). Only 5% of patients have an underlying disease classified as structural and biochemical constipation (5). Generally,

we can divide FC into two subtypes: slow transit constipation (STC) and outlet dysfunction (6). Colonic transit time determines the colonic motor function. STC means a delay in colonic transit time (7, 8). It occurs in 13-25% of pediatric constipation (7). Outlet dysfunction means abnormalities in the anorectal mechanism. This form of constipation includes:

- 1) Lack of relaxation or paradoxical contraction of pelvic floor muscles during defecation.
- 2) Inadequate intraabdominal and rectal pressure to expel the stool from the rectum (8).

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FC in children is a significant health issue with a reported pooled worldwide prevalence of 9.5% (95% CI 7.5–12.1%) (9).

FC symptoms in children are almost identical to adult symptoms, but there are some key differences. Children with FC also have urinary symptoms, including urinary incontinence and urinary infections (10). In addition, they present with fecal incontinence symptoms due to the overflow of soft stool passing around the fecal impaction. Adults with FC often perform manual maneuvers to defecate, but children with FC rarely report this symptom (9).

The pathophysiology of FC is multidimensional in children. It is commonly related to genetic, psychological, geographic location, and lifestyle factors (6). Previous studies reported psychological and physical burdens on children with FC (11).

Most of the available constipation assessment tools are suitable for adults and do not address all symptoms of children's constipation (12). More focus should be placed on painful defecation, incomplete evacuation, and straining during evacuation (13).

Pediatric constipation score (PCS) was developed and validated in Germany in the English language (14). Considering that Persian is the most commonly spoken language in Iran, Afghanistan, Tajikistan, and some parts of Pakistan and Iraq (15). This study assesses the reliability and validity of this questionnaire in Persian-speaking countries.

## Methods

We did a cross-sectional validation study design to determine the structural validity and reliability of the Persian version of the Pediatric Constipation Score.

### First phase: the translation process

We obtained permission to translate PCS into Persian from the developers. Two translators conducted Forward Persian translation (a pelvic floor physiotherapist and a professional translator). We solved the discrepancy between the two questionnaire versions through joint meetings and dialogs.

Another expert translator translated the final Persian version into English. Expert panel consensus resolved discrepancies. This group consisted of two English translators, a pediatric surgeon, a colorectal surgeon, two pediatricians, three pelvic floor physiotherapists, and an epidemiologist.

We made minor changes in the translated version.

### Second phase: validity and reliability Participants

We conducted this study in Tabriz Children's Hospital, Tabriz, Iran, from June 2021 to February 2022. Parents of 149 children with chronic constipation participated in this study. All participated parents filled out the final Persian version of the PCS questionnaire; after explaining items to them. We asked them to answer independently. An assistant filled out the questionnaire for illiterate ones.

### Inclusion criteria

We included children between one to fifteen years old with a diagnosis of FC according to Rome IV Criteria (3). We obtained a signed consent form from their parents.

### Exclusion criteria

Exclusion criteria: chronic health problems (neuro-developmental and growth problems, prior anorectal surgery), prolonged drug consumption causing constipation, face any complaints like pain or bleeding from anorectal area during test-retest interval and reluctant to continue.

The Ethics Committee of Tabriz University of Medical Sciences approved this validation study (code: IR.TBZMED.REC.1399.955).

### Instrument

Stefan Fichtner-Feigl et al. developed the PCS in 2003 (14). It includes ten items graded on a 3-point Likert scale from 0 to 2. The first item shows the regularity of soiling the underclothes; a score of zero means "always," a score of one means "sometimes," and a score of two means "no". Item 2 is incomplete emptying, which scores zero, one, and two means "always," "sometimes", and no episodes of incomplete emptying. Item 3 is the daily frequency of bowel movement for which a score of 0 means "several times a day," a score of 1 means "once daily," and a score of 2 means "less often." Item 4 is about stool types, for which a score of 0 means "watery", a score of 1 means "variable", and a score of 2 means "thick". Lots of bowel wind, the ability to differentiate between stool and air, and feeling pain during the evacuation, are items 5, 6, and 7, respectively, for which a score of zero, one, and two means "always", "sometimes" and "no", respectively. Item 8 is pressing hard to empty the

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bowel, for which a score of 0 means "yes", and a score of 1 means "normal", a score of 2 means "no". Suffering from constipation and pain in the tummy, are items 9 and 10, respectively, for which scores of 0 to 2 mean "always", "sometimes" and "never", respectively. The developer assumed that a score of 20-22 was considered normal within the age range 0-12 years (14).

### Content validity

Simplicity, comprehensibility, and accuracy of each item of the Persian version of the PCS qualified by ten experts. This group consisted of pediatric surgeons, colorectal surgeons, pediatricians, and pelvic floor physiotherapists. We used the Frequency × Importance formula. Frequency and importance mean a percentage of experts scored the items 4 or 5, and mean value of items, respectively. On the Likert scale a score of 1, 2, 3, 4 and five mean, "unimportant", "slightly important", "relatively important", "important" and "very important", respectively. We kept back items with an impact score greater than 1.5 and excluded all the rest (16, 17).

We studied CV according to CVI and CVR. We used a three-point Likert scale to determine CVR. On the Likert scale a score of 1 means "not necessary", 2 means "useful but not necessary", and 3 means "necessary". We evaluated CVI by a 5-point Likert scale for each item's simplicity, specificity, and clarity (18).

### Construct validity

The construct validity was measured by Exploratory Factor Analysis (EFA) to determine possible dimensions of PCS. Since there was no supposition about its dimensions, we performed principal component analysis on eigenvalues greater than 1, rotated by the Varimax method. Factor loading at the  $\geq 0.40$  level was accepted. Participants perfectly fulfilled the questionnaire with the researcher's supervision to limit the missing data (19).

### Reliability

Internal consistency shows the complementary nature of items, and Cronbach's alpha is used to

calculate that. A value equal to or greater than 0.7 is considered acceptable (20).

We studied reproducibility by a one-week test-retest examination on 40 children with functional constipation. We calculated the Intra-class correlation coefficient (ICC) and evaluated it based on Landis and Koch's benchmarks (21).

### Floor/ceiling effect

Ceiling or floor effects show restricted CV and diminished reliability.

Floor and ceiling effects will be existed if a high percentage of participants attained the minimum and maximum score on PCS. The maximum floor or ceiling effect value should not exceed 15% (20).

### Statistical analysis

We used descriptive analysis (mean $\pm$ SD) to calculate the central indicators, dispersion, frequency, and percentage of demographic characteristics (SPSS software version 20).

We obtained the CV of the Persian versions of the PCS by calculating CVR and CVI. EFA was conducted to measure the construct validity of the questionnaire. Because of the number of experts participating in this study ( $n=10$ ),  $CVR>0.591$  and CVI values  $>0.79$  were considered as acceptable. Principal axis factory with Varimax rotation was used to examine the nature of the interrelationship of the PCS measurements and the group-correlated measurements. We determined the number of components by eigenvalues $>one$ . Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) test were used to assess the appropriateness of the factor analysis model and the sampling adequacy, respectively.

Questionnaire's reliability and internal consistency were analysed by Cronbach's alpha coefficient (item to total). Internal consistency was evaluated by Cronbach's alpha (item to total). If alpha is equal to or greater than 0.70, the instrument is considered reliable.

We examined reproducibility by the test-retest method, which suggested two weeks to one month time interval between two tests. We interpreted the ICCs

**Table 1.** Descriptive demographic variables ( $n=149$ ).

Variable	Range	Minimum	Maximum	Mean	Std. Deviation
Age (years)	14	1	15	6.27	3.102
Weight (Kg)	90	7	97	22.47	13.489
Height (Cm)	108	67	175	114.57	21.491

according to Landis and Koch's criteria (0–0.2 as poor, 0.21–0.4 as fair, 0.41–0.7 as moderate, 0.71–0.80 as substantial, and 0.81–1 as almost perfect) (21).

## Results

Descriptive demographic variables are presented in Table 1.

### Content validity

We invited an expert panel (n=12) to approve the CV of the Pediatric Constipation Score. We drew the CVI and CVR results in Table 2.

**Table 2.** The content validity of the Pediatric Constipation Score (CVI and CVR)

Item	CVI Relevance	CVI Clarity	CVI Simplicity	CVR Necessity
1	1	1	1	1
2	1	0.9166	0.916	1
3	0.909	0.9166	1	1
4	0.909	0.833	0.833	0.666
5	0.818	0.833	0.833	0.666
6	0.818	0.666	0.833	0.666
7	0.909	1	1	0.833
8	0.909	1	0.916	0.833
9	0.909	0.916	1	0.833
10	0.909	0.916	0.916	0.833
Total	0.909	0.9	0.925	0.833

### Reliability

The result of reliability according to internal consistency (item to total) for questionnaire items was 0.548 (n=149). If we delete item 6, Cronbach's alpha reaches 0.623.

Deleting item 6 does not significantly improve Cronbach's, so we did not remove it due to the importance of this item in the questionnaire in factor analysis.

### Test-retest reliability

Test-retest reliability (n=40) of the Pediatric

Constipation Score showed excellent reliability. Total ICC was 0.93 with a 95% CI of 0.867 to 0.963.

### Construct validity

In this study, 149 parents with children suffering from chronic constipation participated with a mean age of 6.27 (3.10) years. The principal axis factory with Varimax rotation showed that the measurement items loaded to 4 components (variance=64.63%). The study sample was adequate based on the Kaiser-Meyer-Olkin test and Bartlett's test of sphericity (0.659). The correlation matrix ( $\chi^2=258.87$  and  $P<0.001$ ) was suitable for factor analysis (Table 3). Component 1 comprised four items (9, 2, 7, 8) with the highest factor loading (0.738) for item 1 loaded by factor 1. Component 2 comprised three items (3, 4, 1) with the highest factor loading (0.79) for item 3 loaded by factor 1. Component 3 included only item 5, mostly loaded by factor 1. Component 4 comprised items 6 and 10, with the highest factor loading of 0.79 for item 6 loaded by factor 2.

### Floor/ceiling effect

We observed no ceiling or floor effect for the Persian PCS. Less than 15% of participants attained the lowest and highest possible score for the total score of PCS.

## Discussion

In this study, we studied the psychometric properties of the Persian version of PCS to assess constipation in children with FC from their parents' viewpoint. Findings showed that the Persian version of PCS is a reliable and valid tool for evaluating constipation in children with FC. This questionnaire was developed and validated in 2003. It included the

**Table 3.** EFA (Principal Axis Factoring).  
Rotated Factor Matrixa

		Factor 1	Factor 2	Factor 3	Factor 4
Component 1	Item9	0.738	0.242	0.267	-0.075
	Item2	0.574	-0.131	0.075	-0.073
	Item7	0.573	0.172	-0.043	-0.006
	Item8	0.557	0.261	0.356	0.006
Component 2	Item3	0.079	0.565	0.031	0.058
	Item4	0.162	0.562	0.020	0.011
	Item1	0.204	-0.500	0.427	-0.251
Component 3	Item5	0.057	0.006	0.480	0.011
Component 4	Item6	-0.205	0.079	0.053	0.511
	Item10	0.343	0.033	-0.127	0.432

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

most common symptoms in children with FC, including soiling that most of the time is ascribed to incontinence. At the same time, it contributed to constipation based on the factor analysis results (14). PCS also addresses infrequent bowel movements (22), an essential aspect of pediatric FC. This questionnaire is applicable in defining the degree of the severity of constipation symptoms and monitoring the results of therapeutic procedures (14).

As we know, no study is available in the literature about PCS's CV and reliability. There are a few disease-specific questionnaires to assess pediatric constipation. Most of the questionnaires used in research on pediatric constipation evaluate the health-related quality of life in children with constipation that showed acceptable reliability and validity (23-27). However, despite the consistency in the literature about the pediatric constipation symptoms, the existing measures of children's constipation symptoms are sparse (28).

In the current study, the translation and validation procedures showed acceptable CVI in relevancy, clarity, and simplicity, acceptable CVR for all items, moderate internal consistency (Cronbach's  $\alpha=0.548$ ), and almost perfect reproducibility (ICC=0.93). Thus, we can use the Persian version of PCS as a standard tool in clinical and research domains in Persian-speaking countries. Parents of constipated children answered all questionnaire items in a short time, which indicates the items were comprehensible and clear.

### **Content validity**

The CV of the questionnaire demonstrated an acceptable score. An expert panel (English translators, pediatric surgeons, colorectal surgeons, pediatricians, pelvic floor physiotherapists, and epidemiologists) evaluated items precisely and agreed.

### **Construct validity**

Results of factor analysis showed 4 factors for four components with a total variance of 64.63%. Since it is impossible to assign a specific term to each component, considering the included items in each component, we suggested using the questionnaire with ten distinct dimensions to evaluate specific symptoms of pediatric constipation.

### **Reliability**

The internal consistency was moderate, implying that each questionnaire item examines a different aspect of pediatric constipation symptoms. One-week test-retest examination showed excellent reliability, so the measurements are representative and stable over time.

### **Limitations**

One of the limitations of this study is lacking a diagnostic validity measurement to develop a cutoff value for children with FC in Persian-language countries that should be considered in future studies. However, the original article defined about 20-22 points as no existence of FC within the 0-12-year-old children with constipation (14).

Secondly, we evaluated only FC in this study, so future studies can also address other types of constipation. Despite these limitations, this is the first Persian-language questionnaire validated for children with FC.

### **Conclusion**

The Persian version of PCS has an acceptable CV, moderate internal consistency, and perfect reproducibility. Accordingly, researchers and clinicians can apply this questionnaire in Persian-speaking countries.

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### **Conflict of interests**

The authors declare that they have no competing interests.

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