



## Review Paper

# Psychometric Properties of the Children's Hand-use Experience Questionnaire in Different Languages: A Narrative Review



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## ABSTRACT

**Background and Objectives:** Appreciative assessment tools are necessary to implement the evaluation process in children with different disabilities. Versions of the children's hand-use experience questionnaire (CHEQ) are available in several languages and are used in clinical environments. However, no study is conducted to compare the validity and reliability of this questionnaire in different languages. The current study aims to investigate the psychometric features of CHEQ in other languages.

**Methods:** The search was conducted in PubMed and Science Direct. Keywords included CHEQ, hand assessments, cross-cultural validation and psychometric properties.

**Results:** We identified 5 articles in which the psychometric properties of this questionnaire were investigated. In this paper, we reviewed all 5 articles and presented the results according to consensus-based standards for the selection of health status measurement instruments (COSMIN).

**Conclusion:** CHEQ is highly regarded to assess bimanual activities, particularly in children with hemiplegia. Its focus on hand usage experiences differentiates it from other tools in this domain. With demonstrated high validity and reliability, the CHEQ is adaptable across various societies and cultures, making it a valuable tool for treatment planning and evaluation.

**Keywords:** Translation, Psychometrics, Validity, Reliability, Questionnaire, Children, Review



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↑ *What is “already known” in this topic:*

*The use of standard evaluation tools in the field of participation of children, especially children with cerebral palsy, is of particular importance. And there are several evaluation tools in this field.*

→ *What this article adds:*

*Among the assessment tools for children with cerebral palsy, the tool that is specific for assessing the participation of children with cerebral palsy and hemiplegia and evaluates bilateral activities is the CHEQ tool. In this study, the psychometric characteristics of this tool are reported in different languages.*

## Introduction

Standardized assessments aim to be objective, comparable, and usable [1]. Nowadays, many tools were developed to assess the function of the upper limbs in activities of daily living in children with spastic unilateral cerebral palsy (CP) [2]. These tools, such as the Jepsen-Taylor hand function test [3] and the Melbourne assessment of upper extremity function [4] assess upper limb functions during unimanual activities, respectively. However, none of the mentioned questionnaires specifically focuses on performing tasks that are usually done using two hands. Among the questionnaires available so far, ABILHAND-Kids, pediatric motor activity log and caregiver functional use survey have been introduced as the most suitable tools. The ABILHAND-Kids questionnaire is completed by the caregivers and by scoring the perceived problems of the child in performing bimanual activities. This questionnaire has good validity, but still, three-quarters (75%) of its activities include activities that can be done with one hand [5, 6].

The pediatric motor activity log was developed for children with CP and includes a combination of unimanual and bimanual activities [7].

Caregiver functional use survey examines bimanual function, but it is not necessarily applicable to the use of both hands to perform activities [8]. The only questionnaire that clearly and fully focuses only on two-handed activities is the prosthetic upper extremity functional index. However, this questionnaire can only be used for children who use upper limb prostheses, so since no standard tool was observed that could evaluate the functions that require two hands, the children's hand-use experience questionnaire (CHEQ) was created [1].

## CHEQ

As mentioned, for proper assessment of two hands in children with CP, CHEQ has a special focus on bimanual activities and also considers the child's experience and satisfaction and can be used in the treatment process used for better treatment planning. This questionnaire has these characteristics. This questionnaire was published in 2010 by Skold et al. [6] at the Karolinska Institute in Sweden for children aged six to eighteen years with unilateral upper extremities disorders.

In this questionnaire, 27 two-handed activities were selected with the following conditions:

1) Need to use both hands; 2) To be done frequently by many people during everyday life; 3) It can be done for a wide age range; 4) Do not depend on a particular season of the year; 5) Do not depend on gender or culture; 6) Do not depend on other functions of the person, such as balance, gross movements, high cognitive skills, etc.

Completing the questionnaire is done on the Internet and the therapist or the parents or the child must go to the website related to the questionnaire [6] and start completing it after reading the instructions. After completing the questionnaire, the answers and results will be presented and visible in the form of a PDF file. This possibility will be provided for the Iranian society after the translation and verification of the psychometric properties.

In this questionnaire, 3 scales and questions are examined for each of the 27 activities:

1) The quality of getting and using objects; 2) The amount of time it takes to do the activity; 3) Experiencing the degree of difficulty and discomfort in doing of activity.

So far, this questionnaire has been translated into 15 different languages, including Swedish, Brazilian, Arabic, Turkish, English, Italian, German, French, Japanese, Russian, Malaysian, Norwegian, Spanish, Hebrew and Dutch [6].

## Materials and Methods

Measurement, which is vital in the research process, needs standard tools. For this purpose, either a new tool should be designed or after confirming the psychometric properties of external tools, they should be used [9, 10].

One of the most comprehensive criteria in choosing a suitable tool is the list of “consensus-based standards for choosing measurement tools called consensus-based standards for selection of health status measurement instruments (COSMIN)” which was designed by Mokkink et al. using the Delphi method [11]. The COSMIN checklist was used to evaluate the features of the CHEQ in different languages [12]. In this study, the evaluated psychometric properties (validity and reliability) were based on Terwee et al.’s study [11]. In this checklist, “+” means (presence of sufficient information), “-” means (insufficient information related to psychometric properties), “?” means (unknown assessment methods) and “0” means (no information on psychometric properties available) are defined. Table 1 presents the results about the psychometric properties of the criteria.

The list designed by this group evaluates the quality of research based on the psychometric characteristics of the tools used in that research [12]. The COSMIN list has 12 separate areas that examine psychometric properties in 4 stages.

The 10 areas related to the third step of the COSMIN list are, respectively, the following:

1) Validity: In evaluating the validity of a tool, three characteristics of content validity, construct validity, and criterion validity should be evaluated [13]; 2) Reliability: In checking the reliability of a tool, mainly the characteristics of test re-test, internal consistency, inter-rater, intra-rater, and measurement error are evaluated [13]; 3) Responsiveness: Measuring tools should be sensitive to changes and have the ability to respond. Accountability is divided into internal and external categories. The tool’s ability to detect reliable changes and eliminate random changes in a specific time frame, internal responsiveness and the degree of correlation between detecting the same changes in a tool with standard and benchmark tools are relevant indicators of external responsiveness [14].

In this article, we reviewed all 5 articles and presented the results based on the COSMIN checklist.

To collect data, two researchers individually (a librarian and an occupational therapist) searched articles based on keywords and English database sources, including Medlin, PubMed, Google Scholar, CINAHL, OVID Medline, Cochrane, ProQuest, Update, Web of Science, OT search, OT direct, Pedro.

## Results

A total of 5 studies met the inclusion criteria for this narrative review. These studies were conducted across 8 different countries and languages, focusing on the CHEQ in diverse populations.

In 2010, Skold et al.’s research led to the development of the CHEQ. The items of this questionnaire were collected in three ways, which include review and selection from existing questionnaires, discussion and exchange of opinions between experts and interviewing and soliciting opinions from children and adolescents and their parents. Among the 373 collected activities, 27 activities were finally selected, all of which specifically evaluate bimanual activities. Each item is evaluated with three scales, which include the quality of carrying and grasping, the time it takes, and the level of difficulty and discomfort while doing that activity. Rasch analysis was used to check the validity of this questionnaire, and the results show the high validity of this questionnaire [6].

Amer et al. in 2015 assessed psychometric characteristics of the CHEQ questionnaire in children with unilateral CP. Data were collected from six European countries. A total of 20 children from the study sample participated in the re-test with an interval of 7-14 days from the first test. Validity was done based on the rating scale model and Rasch analysis. According to the reported results, the questionnaire for unilateral CP children has appropriate validity and reliability [15].

In a study in 2022, Amer et al. translated and checked the cultural adaptation and reliability of the CHEQ in Arabic. In the first phase of the translation, four steps were performed, forward translation and modification according to the feedback received from parents and children’s growth process (14 children), backward translation and revision, review cognitively with parents and children, and revision and correction. A total of 161 children participated in the next step (analysis of psychometric characteristics) [16].

**Table 1.** Validity and reliability of CHEQ

Country/Language	Sub/Scales, Number of Items	Study Population/n	Validity					Reliability			
			Face	Content	Construct	Criterion	Test re-test (ICC)	Internal Consistency (Cronbach's $\alpha$ )	Inter-rater (Kappa/ICC)	Intra-rater	
Sweden/Swedish	47	CP	+	+	0	0	0.88-0.91	0	0	0	
Jordan/Arabic	161	CP-URLD-OBPP-hand injury	+	+	0	0	0.77-0.88	0.94-0.96	0	0	
Turkey/Turkish	95	CP	+	+	+	0	0.96-0.99	0	0	0	
Brazil/Brazilian Portuguese	31	CP	+	+	0	0	0	0	0	0	
United Kingdom and Australia/English	33+27	CP	+	+	0	0	0.88-0.91	0	0	0	
Italy/Italian	46	CP	+	+	0	0	0.88-0.91	0	0	0	
Netherlands/Dutch	61	CP	+	+	0	0	0.88-0.91	0	0	0	
Israel/Hebrew	28	CP	+	+	0	0	0.88-0.91	0	0	0	
Spanish	0	0	0	0	0	0	0	0	0	0	
Malaysian	0	0	0	0	0	0	0	0	0	0	
Norwegian	0	0	0	0	0	0	0	0	0	0	
Russian	0	0	0	0	0	0	0	0	0	0	
French	0	0	0	0	0	0	0	0	0	0	
Japanese	0	0	0	0	0	0	0	0	0	0	
German	0	0	0	0	0	0	0	0	0	0	

Abbreviations: ICC: Intraclass correlation coefficient; K: Kappa; OBPP: Obstetric brachial plexus palsy; URLD: Upper limb reduction deficiency; CP: Cerebral palsy.

In 2016, de Brito Brandão et al. studied the translation and cultural adaptation of the CHEQ in the Brazilian language. In this study, 31 children/adolescents with unilateral CP were examined. This study consisted of five steps, individual translation by two translators, integration of existing translations, back translation, analysis by experts, and questionnaire implementation for 31 adolescent children [2].

In 2022, Eren et al. [17] investigated the Turkish version of the CHEQ psychometric properties. In this study, 95 children and adolescents with unilateral CP aged 6-18 years were examined. Non-parametric statistical methods was used for analysis. Test re-test reliability was done with 1-week interval by examining 35 children. The convergent and divergent validity of the question-

naire was investigated by the Spearman test compared to the pediatric evaluation of disability inventory (PEDI) and manual ability classification system (MACS) and gross motor function classification system (GMFCS). According to the obtained results, the CHEQ is a valid questionnaire in Turkey [18].

The psychometric properties of CHGEQ were presented in different language as seen in Table 1.

## Discussion

According to the contents stated in the previous sections, the CHEQ questionnaire has been translated into 15 languages. It has been translated into some languages,

such as Spanish, Russian, French, etc. and its translation is available on the website related to the questionnaire.

In other languages, in addition to translation, the cultural adaptation and psychometric properties of the questionnaire have also been investigated. In 2010, Skold et al. examined the psychometric properties of the CHEQ questionnaire by Rasch analysis [6]. In the Rasch analysis, person reliability for the three measured scales was between 0.90-0.94, and the item reliability was between 0.82 and 0.90. In this study, based on Rasch analysis, other items, such as person separation, item separation, person strata, and Item strata have been investigated, which contain more details than other studies.

In Amer et al.'s study, test re-test reliability was performed by Kappa analysis and intraclass correlation coefficient [15]. The four-category rating scale met the recommended criteria for the rating scale structure. One item among the items was removed due to the high percentage of non-use (45%). The test re-test reliability for the three scales was reported with intraclass correlation coefficient (ICC) of 0.91, 0.8 and 0.91, respectively. In this study, samples from six countries were examined and the results are considered for their total. This way has increased the speed of checking the validity and reliability of the CHEQ in different languages, but on the other hand, one of the limitations is that we cannot express the reliability of the questionnaire in a certain language separately.

Amer et al. investigated in 2022 to examine the validity and reliability of CHEQ in Arabic. Internal consistency was evaluated by Cronbach's  $\alpha$ , which reported a high score (Cronbach's  $\alpha$  0.94-0.97). The test re-test reliability was also measured by intraclass correlation coefficient and kappa, which reported moderate to excellent scores (ICC: 0.77-0.93). Kappa score was reported for 18 items from poor to good ( $\kappa$ : 0.28-0.66). As a result, it can be said that the Arabic version of the CHEQ questionnaire is understandable, culturally relevant, and has good validity.

Eren et al. are similar to Amer's study and unlike Skold's study, they did not use Rasch analysis to check reliability. The ICC score was reported as 0.96-0.99, which shows a higher number than other articles. This article also measured construct validity using a MACS, PEDI and GMFCS, which was not measured in other articles.

de Brito Brandão et al. [2] translated and examined the validity of the CHEQ, which was mentioned in the re-

sults section. From a point of view, the reliability of the CHEQ should be checked. This is because some people have the opinion that considering that the CHEQ questionnaire is a performance-based questionnaire and all its activities are based on the daily life that is common among people, the reliability of the questionnaire is done only once in any language.

## Conclusion

According to the studies conducted, CHEQ is one of the most useful questionnaires available to assess bimanual activities, which has a special focus on bimanual activities and can be used for treatment planning of hand function of children with unilateral hand dysfunction. The fact that the CHEQ questionnaire measures the experience of using the hands of these children in addition to other components distinguishes the questionnaire from other questionnaires in this field. Also, this questionnaire has high validity and reliability and can be adapted and implemented in different societies and cultures.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of [Shahid Beheshti University of Medical Science](#) (Code: IR.SBMU.RETECH.REC.1402.332).

### Funding

The paper was extracted from the master's thesis of Sina Ghorbanpour, approved by the Department of Occupational Therapy, School of Rehabilitation, [Shahid Beheshti University of Medical Sciences](#).

### Authors' contributions

Conceptualization and supervision: Marzieh Pashmdarfard and Sina Ghorbanpour; Methodology: Marzieh Pashmdarfard; Writing the original draft: Sina Ghorbanpour and Reihaneh Askari; Investigation, review and editing: All authors. Funding acquisition and resources: Reihaneh Askari and Marzieh Pashmdarfard.

### Conflict of interest

The authors declared no conflict of interest.



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## مقاله مروری



# ویژگی‌های روان‌سنجی پرسشنامه تجربه استفاده از دست کودکان (CHEQ) به زبان‌های مختلف: مروری حکایتی

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## چکیده

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**مقدمه:** ابزارهای ارزیابی تایید شده برای ارزیابی و درمان کودکان دارای ناتوانی ضروری است. نسخه‌های پرسشنامه تجربه استفاده از دست کودکان به چندین زبان موجود است و در محیط‌های بالینی استفاده می‌شود. با این حال، مطالعاتی که به مقایسه روایی و پایایی این ابزار در کشورهایی که از آن استفاده می‌شود بپردازد، وجود ندارد. مطالعه حاضر به بررسی ویژگی‌های روان‌سنجی پرسشنامه تجربه استفاده از دست کودکان در زبان‌های مختلف می‌پردازد.

**مواد و روش‌ها:** جستجو در پایم‌د و ساینس دایرکت انجام شد. کلیدواژه‌ها شامل پرسشنامه تجربه استفاده از دست کودکان، ارزیابی دستی، اعتبار بین فرهنگی، ویژگی‌های روان‌سنجی بود.

**یافته‌ها:** ما ۵ مقاله را که در آن‌ها ویژگی‌های روان‌سنجی این پرسشنامه مورد بررسی قرار گرفته بود، شناسایی کردیم. در این مقاله، ما تمام ۵ مقاله را بررسی کردیم و نتایج را بر اساس استانداردهای مبتنی بر اجماع برای انتخاب ابزار سنجش وضعیت سلامت ارائه کردیم.

**نتیجه‌گیری:** پرسشنامه تجربه دست کودکان برای ارزیابی فعالیت‌های دو دستی، به‌ویژه در کودکان مبتلا به اختلال عملکرد یک‌طرفه دست، بسیار مورد توجه است. تمرکز آن بر تجربیات استفاده از دست، آن را از سایر ابزارهای این حوزه متمایز می‌کند. پرسشنامه تجربه استفاده از دست کودکان با روایی و پایایی بالا قابل انطباق در جوامع و فرهنگ‌های مختلف است و آن را به ابزاری ارزشمند برای برنامه‌ریزی و ارزیابی درمان تبدیل می‌کند.

## کلیدواژه‌ها:

ترجمه، روان‌سنجی، روایی، پایایی، پرسشنامه، کودکان، مروری



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