Psychometric Properties Evaluation of Persian Version of the Maastricht Clinical Teaching Questionnaire

Abstract

Background: Students are a significant source of data for the evaluation of clinical instructors' performance. This study was undertaken with the aim of adaptation and validation of the Persian version of the Maastricht Clinical Teaching Questionnaire (MCTQ). The main objective of the researchers in this study was to evaluation the psychometric properties of the Persian version of the Maastricht Clinical Training Questionnaire (P-MCTQ) in Iran, considering cultural and social differences. **Materials and Methods:** This methodological study was conducted from 2019 to 2021 at four teaching hospitals affiliated with Sabzevar University of Medical Sciences, Iran. Qualitative and quantitative face and content validity, and construct validity methods were used for the validity evaluation. Stability and internal consistency methods were used, respectively, for the reliability evaluation of the questionnaire. Exploratory Factor Analysis (EFA) stage, 264 students studying in the fields of nursing, midwifery, anesthesiology, operating room, emergency medicine, and laboratory sciences completed the P-MCTQ. **Results:** The value of scale-content validity index (0.92) is indicative of the overall content validity of the questionnaire. EFA extracted a single-factor structure that could explain the overall variance of the clinical education structure at about 76.61%. The alfa and intraclass correlation values were equal to 0.98 and 0.82, respectively, indicating the excellent internal consistency and high overall stability of the questionnaire. **Conclusions:** The P-MCTQ is a valid and reliable tool for the evaluation of the teaching performance of clinical instructors.

Keywords: *Factor analysis, statistical, psychometrics, validation study*

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Introduction

Clinical teaching provides the student with an opportunity to intermingle his/her theoretical knowledge with a variety of mental-psychological and motor skills necessary for the patient's care.[1] The clinical teaching space represents an interaction network between the existing elements in the clinic affecting the consequences of the student's clinical education.[2-4] The results of various studies have demonstrated the lack of desirable coordination between hospital instructors and personnel in terms of theoretical learning and clinical services.[5-7] Evidently, the improvement and promotion of clinical teaching performance require assessment of the current situation and specifying weaknesses and the solution to problems.[4] Today, there exist various questionnaires for the assessment of the quality of the clinical teaching provided to medical sciences students in clinical environments.[8]

Most of the available questionnaires however have strengths and weaknesses. Some of these tools are void of an effective theoretical base for clinical teaching, and some have ignored the other educating stakeholders, while others have diminished the instruments' value in terms of the evaluation of clinical teachers.[9] A clinical teaching assessment questionnaire must rely on a valid and reliable scientific theory. The most important instruments found in the medical sciences education literature are the Cleveland Clinical Teaching Effectiveness Instrument (CCTEI) and the Stanford list, both of which have their own strengths and weaknesses. The advantage of the CCTEI instrument is the engagement of stakeholders in the process of assessment designs; however, the ambiguity of the specified dimensions may prevent from effective feedback. The Stanford list has

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a strong theoretical basis, but the focus of this list is on a wide range of educational backgrounds, making the instrument less suitable for individual feedback from educators in the clinical environment.[10,11]

The Maastricht Clinical Teaching Questionnaire (MCTQ) is one of the instruments currently used in many countries to evaluate the clinical teaching of medical sciences students.[12,13] Cognitive Structural Theory (CST) constitutes the theoretical basis of the MCTQ. The teaching propounded in the MCTQ is learner-centered, and advocates the principle of "learning is guided by experience," aiming at acquiring skills for the management of complex tasks. At the heart of this questionnaire, there exist teaching methods such as modeling, coaching, articulation, exploration, and learning environment.[12] In the previous studies conducted in other countries, the MCTQ model has been approved as a questionnaire with a strong and valid theoretical basis for the performance evaluation of clinical teachers in environments with short-term shifts, making it a reliable assessment model with clinical education value. The MCTQ emphasizes the role of instructor facilitation (role modeling, and creating a safe learning environment), stimulating teacher/student interactions (coaching, and providing support), and facilitating student self-regulation (expressing feedback and exploration).[14-16] Literature review showed that in Iran the researcher-made questionnaire, student survey, student learning, self-assessment, and peer assessment are used to evaluate clinical teaching.[5] Teacher evaluation is one of the most intricate educational evaluations due to the complexity, low credit, and inaccuracy of the measuring instruments and methods.[17,18] None of these sources provide accurate and unbiased information, but the results are important. At present, in Iran, there is no coordinated and integrated questionnaire to evaluate clinical teaching with an emphasis on the individual performance of the clinical teacher. Often, researches on clinical teaching evaluation criteria have been published qualitatively.[19-21]

Materials and Methods

This methodological study was conducted to evaluate the psychometric properties of the P-MCTQ at four teaching hospitals affiliated with Sabzevar University of Medical Sciences, Iran, from December 2019 to January 2021. The MCTQ was developed by Stalmeijer *et al*. in 2007 and 2008 at Maastricht Medical School. The MCTQ consists of five factors including modeling, coaching, articulation, exploration, and a safe learning environment. Moreover, the overall judgment of clinical teaching is scored from 1 to 10.[13] The steps recommended by Polit and Yang for questionnaire adaption were followed.[22] First, two bilingual translators whose mother tongue was Persian translated the English questionnaire into Persian (forward translation). After the resolution of differences by the committee (2 translators and authors of the paper), a single Persian

version of the questionnaire was obtained (synthesis). In the next step, two other bilingual translators, whose mother tongue was English, did a back translation into English and with the resolution of the differences by the committee, a single version of the English questionnaire was obtained. In the next step, the research team together with the primary translators prepared the pre-final version of the questionnaire in Persian by examining the differences. This version was provided to 30 operating room, anesthesiology, and nursing students of the Sabzevar University of Medical Sciences for pilot testing and they were asked to comment on the clarity of the questionnaire guide and items after refilling the questionnaire. Moreover, an investigation was made to identify those items, which caused a reduction in reliability. After making revisions based on the comments made by the participants, the final version of the questionnaire was prepared for the psychometric steps. Content validity (face and content), construct validity (structural validity), and reliability were used for the evaluation of the psychometric properties [Figure 1].

For the assessment of content validity, qualitative and quantitative methods were used. A 10-member expert panel in the field of clinical education and scale development was used for content validity assessment. To evaluate the qualitative face validity, the researchers interviewed 10 students of midwifery, operating room, anesthesiology, laboratory sciences, and nursing about the difficulty, relevancy, and
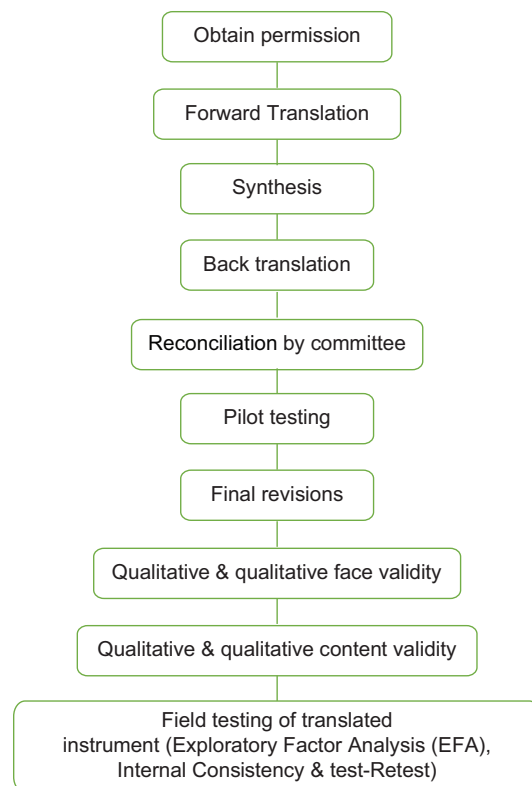

Figure 1: Diagram of the adaptation and validation

ambiguity of the items, and the necessary corrections were made. Item impact method was used for quantitative evaluation of the face validity of the questionnaire. For this purpose, 10 students were asked to determine the importance of each item in terms of the clinical teaching structure based on their own experiences. Then, Item Impact Score (IIS) of each item was calculated, and the items with a score greater than or equal to 1.5 were considered as appropriate. IIS was calculated using the following formula: Item Impact Score = Frequency × Importance. In this formula, the frequency is the percentage of students who gave a score of 4–5 to the item and the importance is the mean score of the same item.[23,24] To qualitatively evaluate the content validity, the experts were asked to submit their comments in writing about grammar, the use of appropriate words, and the right placement of the items. Moreover, for the quantitative evaluation of the content validity, the Content Validity Ratio (CVR) and Content Validity Index (I-CVI) were used.[22,25] To this end, the experts were asked to comment on the essentiality and relevance of the items to the clinical teaching construct. The average scores of the CVI of all remaining items were calculated as the overall CVI of the questionnaire (S-CVI/Ave). CVR, I-CVI, and S-CVI of greater or equal to 0.62, 0.79, and 0.9, respectively, were acceptable.[22,26] CVR and I-CVI were calculated using the following formula: CVR = (Ne - N/2)/(N/2); I-CVI = P/N. In the above-mentioned formulas, Ne is the number of experts indicating the item as essential (rating 3), P is the number of experts indicating the item as relevant or clear (rating 3 or 4), and N is the total number of experts.[23] The normality of data in terms of skewness and kurtosis was examined using the univariate analysis method.[27] For the evaluation of construct validity, exploratory factor analysis (EFA), maximum likelihood extraction, and varimax rotation methods were used. The P-MCTQ questionnaire was completed by 264 students studying in the fields of nursing, midwifery, anesthesiology, operating room, emergency medicine, and laboratory sciences. The 5-step guide presented by Williams *et al*. was used for the EFA.[28] To extract the factors, the approach of using several appropriate methods was used as recommended by Thompson and Daniel. For this purpose, the researchers used the following three methods: 1) Kaiser criterion, 2) scree plot, and 3) percentage of cumulative variance explained by the extracted factors.[29] Having an eigenvalue greater than 1, placing the factors outside the horizontal line composed of pebbles, and explaining at least 50% of the desired concept variance by the extracted factors constituted the judgment basis.[30] Varimax rotations were used in this study. In this study, a 0.5 shear point was considered for the factor loading.[31,32] The reliability of the questionnaire was evaluated using the internal consistency and stability methods. Cronbach's alpha coefficient method was used to examine the internal consistency of the scale.[22] The stability of the questionnaire was evaluated using the test-retest method. For this purpose, the scale was given to 30 students to fill out twice within 10 days. An interclass correlation coefficient was used for the stability assessment.[33] In the present study, 7 patients (3%) obtained the minimum possible score and 19 patients (7%) obtained the maximum possible score. Therefore, considering that if more than 15% of the participants get the minimum and maximum possible score, it indicates the existence of ceiling and floor effect[34]; there is no ceiling and floor effect in the P-MCTQ and the questionnaire has no problem in measuring the minimum and maximum possible scores and has good validity and reliability.

Ethical considerations

This study has been approved by the regional ethics committee of the Sabzevar University of Medical Sciences, Iran under number (IR.MEDSAB.REC.1398.019). The participants were asked to fill out and give back the questionnaires only if they consented to participate.

Results

Characterization of participants

For construct validity assessment, 5 to 10 participants per item are needed. In addition, in factor analysis studies, 200 people have been suggested as the minimum suitable sample size.[35] Thus, 300 students were selected through stratified sampling at four teaching hospitals and received the questionnaires.

Finally, 264 completed questionnaires were returned and analyzed. All participants' demographic characteristics are presented in Table 1. Among the participants, 23.12% were men and the rest were women, with an mean(SD) age of 21.96 (2.23).

Face validity: All items had an IIS of greater than 1.5, so they were considered appropriate and did not need to be removed or modified.

Content validity: The CVR and I-CVI values were within the range of 0.8–1. The S-CVI is equal to 0.92, which shows the strong content validity of the overall

Table 1: Characterization of participants in the Exploratory Factor Analysis (EFA) stage

Variables	n(%)
Gender	
Male	61(23.12)
Female	203(76.92)
Age	Mean(SD)
	21.96(2.23)
Field of study	
Nursing	103(29)
Midwifery	42(15.93)
Anesthesia	25(9.52)
Operative room	71(26.91)
Medical urgency	4(1.53)
Laboratory sciences	19(7.24)

questionnaire. Based on the obtained values, no item was removed.

Construct validity (EFA): The skewness value lay between +2 and -2 and the kurtosis value between +7 and -7, both representing data normality.[36] Sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) index and data factorability was examined using Bartlett's test of sphericity. In this study, KMO was equal to 0.973, indicating the adequacy of sampling. Moreover, the result of Bartlett's test of sphericity was significant ($p < 0.001$), which illustrates the items' factorability and factor extraction. According to the recommendation by Thompson and Daniel (1996) on the simultaneous application of several suitable methods, a factor with a specific value of more than 1 in the scree plot, and outside the horizontal line of pebbles (collectively explaining 76.61% variance of the desired structure) was extracted [Figure 2]. Thus, a scale with 14 questions in one factor was obtained [Table 2]; therefore, the rotation of the factors was not possible.

Reliability (internal consistency and test-retest): The internal consistency assessment of the questionnaire showed that the P-MCTQ has an excellent internal consistency (0.98). The test-retest was obtained to be 0.82 using the intraclass correlation test, which indicated the high stability of the whole questionnaire.

Discussion

The main aim of this study was the adaptation of the P-MCTQ to students of different fields of medical sciences in the Iranian community. The researchers' investigations showed that the Persian version of this questionnaire had not been adapted and validated. Face validity, content validity, and construct validity tests were used to evaluate the validity of the questionnaire, and the internal consistency (Cronbach's alpha) and test-retest

methods were used to assess its reliability. The results of this study showed that the P-MCTQ is a valid and reliable questionnaire. The S-CVI of the questionnaire was equal to 0.92, which indicated the strong validity of the P-MCTQ.[25] The internal consistency of the P-MCTQ was calculated using Cronbach's alpha coefficient method (0.98), and since values higher than 0.7 are acceptable for a new questionnaire, this value demonstrates that the P-MCTQ items have good homogeneity.[21] The intraclass correlation was equal to 0.82. Cicchetti *et al.* consider intraclass correlation to be a necessary criterion for evaluating a questionnaire,[37] and values above 0.75 indicate excellent questionnaire stability.[38] Therefore, the P-MCTQ has excellent stability in different measurement times.

The reason behind the use of EFA was its capability to allow the researchers to explore different dimensions of the construct under study.[39] Given the differences between the
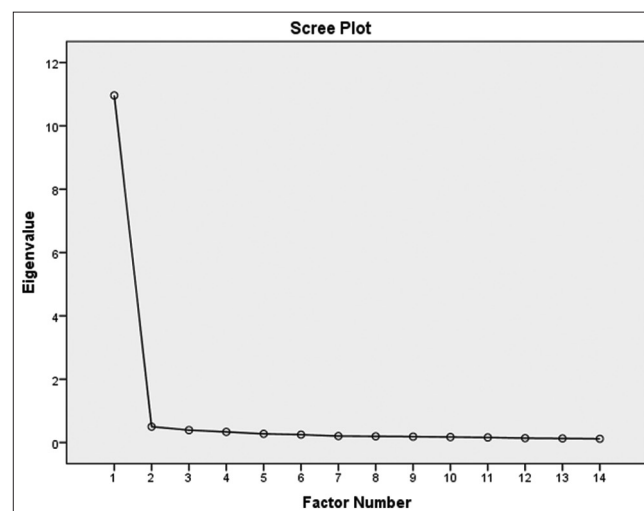

Figure 2: Scree plot

Table 2: Factor loading of the Persian version of the Maastricht Clinical Teaching Questionnaire items

Items	Loading	h2	Eigenvalues	Variance%	Reliability
Consistently demonstrated how to perform clinical skills	0.88	0.78	10.96	76.61	= 0.98
Created sufficient opportunities for me to observe him/her	0.89	0.80			ICC *= 0.82
Served as a role model as to the kind of doctor I would like to become	0.90	0.82			
Gave useful feedback during or immediately after direct observation of my patient encounters	0.87	0.76			
Adjusted his/her teaching activities to my level of experience	0.87	0.78			
Offered me sufficient opportunities to perform activities independently	0.88	0.76			
Asked me to provide a rationale for my actions	0.89	0.8			
Stimulated me to explore my strengths and weaknesses	0.85	0.74			
Asked me questions aimed at increasing my understanding	0.90	0.8			
Encouraged me to formulate learning goals	0.80	0.64			
Encouraged me to pursue my learning goals	0.88	0.77			
Created a safe learning environment	0.87	0.76			
Was genuinely interested in me as a student	0.88	0.77			
Showed that he/she respected me	0.86	0.74			

Overall judgment of clinical teaching (scale 1–10). =*Intercross-correlation

context of the present study (culturally and socially) and that in which the MCTQ was initially built (the Netherlands), the importance of using EFA is highlighted, especially since the cultural and social factors have proved to be effective in teaching and learning processes.[40] The results of the EFA led to the extraction of a factor that explained 76.61% of the variance in the desired construct. This shows that the P-MCTQ efficiently explains the construct and has suitable validity.[28] However, there is a difference in the number of extracted factors. The original questionnaire consists of five factors including modeling, coaching, articulation, exploration, and learning environment,[13] but in the P-MCTQ, only one factor with 14 questions was extracted. The fact that in the present study the experimental data obtained from the implementation of the questionnaire on Iranian students led to the extraction of only one factor, is probably related to the strong influence of the instructor in the Iranian clinical teaching environment and the lack of acceptance or serious participation of ward staff in the clinical education of the students. All the factors of the original questionnaire focus on the characteristics of the clinical instructor, while it seems that in the P-MCTQ all such factors are reflected in a factor that can be called "the role of the instructor in clinical teaching." Studies conducted in Iran have revealed that the characteristics of a clinical instructor affect clinical students' educational experience, making it bitter or pleasant for them.[7,41]

In fact, the results of this study exhibit that the Iranian student perceives education in the clinic only in the presence of the instructor and considers the absence of him/her as the loss of learning opportunities. The study conducted by Zardosht and Moonaghy has shown that the active and continuous presence of the instructor in the clinical environment, comprehensive education, student involvement, and exposing the student to acquire educational opportunities play an important role in clinical teaching so that the participants in those studies have mentioned the personal support and positive attitude of the instructor as the motivating factors for the student to seize opportunities and obtain even more clinical skills and competence.[7] Gorbanian and Abdolahzadeh Mahlani reported that most students considered the role of the instructor as effective in reducing clinical stress and increasing students' self-confidence and efficiency.[18] Most studies have highlighted educational skills as one of the main competencies of clinical instructors.[20,42] The results of another study showed that the presence of an instructor beside the students had the greatest impact, both directly and indirectly, on the quality of education.[17,20] In a qualitative study, the admission and obtaining of health team membership was the result of an active instructing process and acceptance of the clinical atmosphere and space.[39]

Conclusion

This study showed that the P-MCTQ was a valid and reliable questionnaire for evaluating clinical teaching in Iran. This questionnaire can be used to evaluate the performance of clinical instructors and improve their performance.

Conflicts of interest

Nothing to declare.

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