

## RESEARCH ARTICLE

# Translation and Validation of the Persian Version the Boston Carpal Tunnel Syndrome Questionnaire

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### Abstract

**Background:** Carpal tunnel syndrome (CTS) is recognized as the most common type of neuropathies. Questionnaires are the method of choice for evaluating patients with CTS. Boston Carpal Tunnel Syndrome (BCTS) is one of the most famous questionnaires that evaluate the functional and symptomatic aspects of CTS. This study was performed to evaluate the validity and reliability of the Persian version of BCTS questionnaire.

**Methods:** First, both parts of the original questionnaire (Symptom Severity Scale and Functional Status Scale) were translated into Persian by two expert translators. The translated questionnaire was revised after merging and confirmed by an orthopedic hand surgeon. The confirmed questionnaire was interpreted back into the original language (English) to check for any possible content inequality between the original questionnaire and its final translated version. The final Persian questionnaire was answered by 10 patients suffering from CTS to elucidate its comprehensibility; afterwards, it was filled by 142 participants along with the Persian version of the Quick-DASH questionnaire. After 2 to 6 days, the translated questionnaire was refilled by some of the previous patients who had not received any substantial medical treatment during that period.

**Results:** Among all 142 patients, 13.4 % were male and 86.6 % were female. The reliability of the questionnaire was tested using Cronbach's alpha and Intraclass correlation coefficient (ICC). Cronbach's alpha was 0.859 for symptom severity scale (SSS) and 0.878 for functional status scale (FSS). Also, ICCs were calculated as 0.538 for SSS and 0.773 for FSS. In addition, construct validity of SSS and FSS against QuickDASH were 0.641 and 0.701, respectively.

**Conclusion:** Based on our results, the Persian version of the BCTQ is valid and reliable.

**Level of evidence:** II

**Keywords:** CTS, Persian, Translation, Validation

### Introduction

Carpal tunnel syndrome (CTS) is a condition in which the median nerve is compressed as a result of osteofibrosis and it is known as the most common type of the neuropathies (1). Various conditions have been recognized as CTS risk factors such as some types of hormonal disease, obesity, and pregnancy (1). This neuropathy can be diagnosed by a history of

numbness and pain in upper extremities in addition to electro diagnostic modalities (1, 2). Hand diagram and questionnaires are common and valid tools for diagnosis and evaluation of CTS (3).

The Boston carpal tunnel syndrome (BCTS) questionnaire is one of the available tools for evaluation of the functional and symptomatic aspects of CTS (4).

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Patient based questionnaires should be translated and validated in language and culture of the target population and community before using for clinical outcome evaluations (5,6). Although BCTS questionnaire has been translated into various languages and validated, no Persian version of it is yet available (2, 4-10). This study was performed to evaluate the validity and reliability of the Persian version of BCTS questionnaire.

## Materials and Methods

### Study design and set up

The objective of this prospective study was to validate the BCTS questionnaire in Persian language among patients suffering from CTS. This study was approved by an institutional review board and all patients signed an informed consent form.

### Instruments

#### QuickDASH

QuickDASH is a short form of the DASH questionnaire, consisting of 11 physical and mental items that measure the disability in the upper extremity. Each question points from one to five in Likert scale ranging from No Difficulty level to unable to do the task. The total score ranges from 0 to 100 (11).

#### The Boston CTS questionnaire

The Boston CTS questionnaire is designed to evaluate the severity of the condition in patients suffering from CTS. This questionnaire consists of 18 items in two different parts: the symptom severity scale (SSS) and the functional status scale (FSS). The SSS consists of 11 questions that considers wrist pain episodes, numbness, weakness, and difficulty of grasping scored from one (normal) to five (very serious, very difficult, more than five times, and continued). Furthermore, the FSS is an eight itemed subscale which access daily hand functions. The FSS is also scored from one (No difficulty) to five (Cannot perform the activity at all). The total score is calculated as the mean of all items for each subscale. Higher scores indicate a worse symptom or function (2, 7).

#### Participants and Procedures

142 patients suffering from CTS were enrolled in this study. Inclusion criteria consist of confirmed CTS with clinical and electrodiagnostic study; age range between 18 to 70 years old; native Persian language; and ability to read and answer the questions. In contrast, non-Persian speakers, uneducated and psychologically disabled patients were excluded from the study. Both parts of the original questionnaire (SSS and FSS) were independently translated into Persian by two individual translators. The translated questionnaires were merged after being discussed by the previously-mentioned translators. The merged translation was revised and confirmed by orthopedic researchers. The confirmed questionnaire was interpreted back into the original language (English). The new English version of questionnaire was compared with and verified against the original one [Appendix 1]. Once the final questionnaire was confirmed, it was answered

by 10 patients suffering from CTS in order to elucidate the comprehensiveness of the Persian questionnaire. Thereafter, the Persian questionnaire was filled out by all participants along with the Persian version of QuickDASH questionnaire. Within the next 2 to 6 days the translated questionnaire was refilled by some of the same patients who had not received any medical treatment during that period. Finally, all statistical analysis were done using SPSS version 16.0 (SPSS Inc., Chicago IL). Statistical significance was accepted for  $P<0.05$ .

### Reliability testing

The Cronbach's alpha and Intraclass Correlation Coefficient (ICC) were used to evaluate the test reliability. The Cronbach's  $\alpha\geq 0.7$  was considered as good internal consistency. Moreover, the ICC or test-retest reliability was estimated by responding to the questionnaire on two different occasions, the first time by all 142 patients and the second time by few of them. The  $ICC>0.75$  was considered as reliable (4).

### Construct validity

Construct validity was assessed by testing the Persian BCTSQ against the QuickDASH questionnaire, which had already been converted into Persian and validated. Depending on the score distribution, Spearman's and Pearson's correlations were used to calculate the correlation.

### Results

Among all 142 patients 13.4 % were male and 86.6 % were female. The affected hand was as follow: 31.5 % right side, 29.2 % left side and 39.2 % both side. Mean of used questionnaires such as quick DASH, SSS and FSS were  $45.7\pm 23.1$ ,  $2.84\pm 0.872$  and  $2.21\pm 0.848$ , respectively. Mean retest of SSS and FSS were measured as  $2.61\pm 17.6$  and  $0.736\pm 1.02$  [Table 1].

**Table 1. Demographic Characteristics of Patients (n=142)**

	Male	19 (13.4)
<b>Sex</b>	Female	123 (86.6)
	Right	41 (31.5)
<b>Affected side</b>	Left	38 (29.2)
	both	51 (39.2)
<b>Quick- DASH, mean (SD)</b>		45.7 (23.1)
<b>SSS, mean (SD)</b>		2.93 (0.843)
<b>SSS (retest), mean (SD)</b>		2.64 (0.946)
<b>FSS, mean (SD)</b>		2.26 (0.837)
<b>FSS (retest), mean (SD)</b>		2.24 (0.903)

Quick- DASH: Quick- the Disabilities of the Arm, Shoulder and Hand Score

SSS: Symptom Severity Scale

FSS: Functional Status Scale

<b>Table 2. Statistics analysis of symptom severity scale after item deletion</b>				
	<b>Mean score</b>	<b>Standard Deviation</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
<b>Q 1</b>	3.26	1.29	0.630	0.841
<b>Q 2</b>	2.76	1.42	0.598	0.843
<b>Q 3</b>	3.06	1.15	0.611	0.843
<b>Q 4</b>	3.42	1.42	0.549	0.847
<b>Q 5</b>	3.32	1.46	0.407	0.859
<b>Q 6</b>	3.11	1.30	0.429	0.856
<b>Q 7</b>	2.62	1.26	0.532	0.848
<b>Q 8</b>	2.99	1.27	0.622	0.841
<b>Q 9</b>	3.04	1.31	0.654	0.839
<b>Q 10</b>	2.64	1.38	0.625	0.841
<b>Q 11</b>	2.02	1.11	0.416	0.856

Q: questionnaire

<b>Table 3. Statistics analysis of functional status scale after item deletion</b>				
	<b>Mean score</b>	<b>Standard Deviation</b>	<b>Corrected Item-Total Correlation</b>	<b>Cronbach's Alpha if Item Deleted</b>
<b>Q 1</b>	1.73	0.996	0.576	0.870
<b>Q 2</b>	1.65	0.916	0.554	0.872
<b>Q 3</b>	2.11	1.16	0.689	0.858
<b>Q 4</b>	2.23	1.21	0.697	0.857
<b>Q 5</b>	2.51	1.26	0.621	0.866
<b>Q 6</b>	2.74	1.13	0.698	0.857
<b>Q 7</b>	2.82	1.17	0.703	0.857
<b>Q 8</b>	2.31	1.22	0.597	0.868

Q: questionnaire

**Table 4. Internal consistency and test-retest reliability of Persian version of Boston Carpal Tunnel Syndrome**

<b>Cronbach's Alpha</b>	<b>Intraclass correlation coefficient (ICC)</b>	<b>95% Confidence Interval</b>		<b>P-value</b>
		<b>Lower Bound</b>	<b>Upper Bound</b>	
<b>SSS</b>	0.859	0.218	0.729	0.002
<b>FSS</b>	0.878	0.608	0.869	< 0.001

SSS: Symptom Severity Scale

FSS: Functional Status Scale

During the item deletion the Cronbach's alpha test varies from 0.839 to 0.859 for SSS and 0.857 to 0.872 for FSS [Table 2; 3]. The Cronbach's alphas for SSS and

FSS were 0.859 and 0.878, respectively. The ICCs were calculated as 0.538 for SSS and 0.773 for FSS ( $P=0.002$  for SSS, and  $P<0.001$  for FSS) [Table 4]. Construct validities

<b>Table 5. Construct validity expressed by Pearson's Correlation between Persian Boston CTS (FSS, SSS) and Quick- DASH</b>		
<b>Quick- DASH</b>	<b>FSS</b>	<b>SSS</b>
Correlation	0.701	0.641
P-value	<0.001	<0.001

Quick- DASH: Quick- the Disabilities of the Arm, Shoulder and Hand Score

SSS: Symptom Severity Scale

FSS: Functional Status Scale

of SSS and FSS against QuickDASH were 0.641 and 0.701, respectively with  $P<0.001$  for both subscales of the Boston CTS questionnaire [Table 5].

## Discussion

The aim of the current study was to evaluate the

validity and reliability of the Persian version of the BCTQ. While both FSS and SSS had good consistency, the reproducibility was not satisfactory. Also, construct validity was moderate in both subscales of the questionnaire. Based on the present results, the Persian version of the BCTQ can be used with acceptable validity and reliability. Table 6 shows the comparison of the reliability and validity of Boston Carpal Tunnel Syndrome questionnaire with different studies.

As a limitation, this study was performed in a single medical center which cannot be a good representative of all Iranian population. Also, the participants' educational level, as a factor that might have affected their responses, was not evaluated.

Our study revealed high internal consistency of BCTSQ implying good coherence among all questions. The high level of internal consistency lowers the differences (10). Although Cronbach's alpha showed good internal consistency, it did not match its level reported in other studies (4, 9, 12). Furthermore, the current study

**Table 6. Comparing reliability and validity of Boston Carpal Tunnel Syndrome questionnaire with different studies**

<b>Author</b>	<b>Title</b>	<b>Cronbach</b>		<b>ICC</b>		<b>Validity against other questionnaires</b>	<b>Validity</b>	
		<b>FSS</b>	<b>SSS</b>	<b>FSS</b>	<b>SSS</b>		<b>FSS</b>	<b>SSS</b>
Kim, J. K.	The Korean version of the Carpal Tunnel Questionnaire. Cross cultural adaptation, reliability, validity and responsiveness	0.90	0.89	0.94	0.92	K-DASH	0.67	0.61
Lue, Y. J.	Validation of the Chinese version of the Boston Carpal Tunnel Questionnaire	-	-	-	-	DASH	0.75	0.63
		-	-	0.75	0.86	BP subscale of the SF36	-	72
		-	-	-	-	MH subscale of the SF36	-	0.28
		-	-	-	-	PF subscale of the SF36	0.48	-
		-	-	-	-	grip strength	0.35	-
Park, D. J.	Cross-cultural adaptation of the Korean version of the Boston carpal tunnel questionnaire	0.951	0.929	0.931	0.844	K-DASH	0.838†	0.800†
Mody, G. N.	Carpal tunnel syndrome in Indian patients: use of modified questionnaires for assessment	0.87	0.91	-	-	-	-	-
Upatham, S.	Reliability of Thai Version Boston Questionnaire	0.84	0.86	-	-	-	-	-
Sezgin, M.	Assessment of symptom severity and functional status in patients with carpal tunnel syndrome: reliability and functionality of the Turkish version of the Boston Questionnaire	-	-	-	-	VAS	0.39	0.48
de Campos, C. C.	Translation and validation of an instrument for evaluation of severity of symptoms and the functional status in carpal tunnel syndrome	0.90	0.83	-	-	-	-	-
Our study	Translation and validation of the Boston Carpal Tunnel Syndrome questionnaire	0.878	0.859	0.773	0.538	Quick- DASH	0.641	0.701

DASH: Disabilities of the Arm, Shoulder and Hand

VAS: Visual Analogue Scale

BP: Bodily Pain

"PF: Physical Functioning"

MH: Mental Health

revealed moderate agreement between the first and second responses on the same questionnaire. The lower ICC of SSS showed some change in symptoms within 2-6 days which is not logical. The reason for the lower reliability reported in this study is that the translated questionnaire was not as understandable as its version in other languages. It was suggested that some patients cannot distinguish the words "pain", "numbness", "tingling", and "weakness" in addition to pain severity (10). Therefore, the lower Cronbach's alpha for SSS is justifiable.

Construct validity was measured by testing our questionnaire against the previously validated QuickDASH questionnaire. Although many studies have validated BCTSQ against DASH with acceptable results, it was validated with QuickDASH in this study since it is as responsive as DASH (7, 8). The present construct validity was acceptable as both the BCTQ and QuickDASH measure the symptom severity and function of the hand.

The current study revealed satisfactory results in Cronbach's alpha, ICC, and construct validity tests, thus,

it is suggested that the Persian version of the BCTQ can be used as a reliable and valid tool to access functional and symptomatic aspects of CTS.

Informed consent was obtained from the study participants before enrollment in the study.

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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## پرسشنامه بررسی شدت علائم در CTS

<p>نام و نام خانوادگی: ..... نام پدر: ..... سن: ..... جنس: زن <input type="checkbox"/> مرد <input type="checkbox"/> تاریخ روز: .....          تاریخ حادثه: ..... علت حادثه: ..... آدرس و تلفن: .....</p> <p>سمت آسیب دیده: راست <input type="checkbox"/> چپ <input type="checkbox"/> سوالات این پرسشنامه جهت بررسی شدت علائم شما در طول یک شبانه روز در طول یک هفته گذشته است. از هرسوال فقط یک گزینه را که بهترین وضعیت شما را نشان می دهد علامت بزنید.</p>	<p>۱. شدت درد شبانه در دست و مچ دست شما چگونه است؟</p> <p>(۱) دردشبانه ندارم          (۲) درد خفیف          (۳) دردمتوسط          (۴) دردشدید          (۵) درد خیلی شدید</p>
<p>۲. بطور معمول در شب چند بار به علت درد دست و مچ از خواب بیدارمی شوید؟</p> <p>(۱) هرگز          (۲) یکبار          (۳) دو تا سه بار          (۴) چهار تا پنج بار          (۵) بیش از پنج بار</p>	<p>۳. بطور معمول ایا در ناحیه مچ و دستستان در طول روز درد دارید؟</p> <p>(۱) هرگز در روزانه ندارم          (۲) درد روزانه خفیف دارم          (۳) درد روزانه متوسط دارم          (۴) درد روزانه شدید دارم          (۵) درد روزانه خیلی شدید دارم</p>
<p>۴. چند بار در روز دچار درد مچ و دست می شوید؟</p> <p>(۱) هرگز          (۲) یک یا دو بار          (۳) سه تا پنج بار          (۴) بیش از ۵ بار          (۵) درد مداوم</p>	<p>۵. بطور متوسط مدت درد مچ و دست شما چقدر است؟</p> <p>(۱) درد ندارم          (۲) کمتر از ۱۰ دقیقه          (۳) ۱۰ تا ۶۰ دقیقه          (۴) بیشتر از ۶۰ دقیقه          (۵) در تمام طول روز درد دارم</p>
<p>۶. آیا احساس خوب رفتگی (بی حسی) در دست خود دارد؟</p> <p>(۱) ندارم          (۲) بیحسی خفیف          (۳) بیحسی متوسط          (۴) بیحسی شدید          (۵) بیحسی خیلی شدید</p>	<p>۷. آیا احساس ضعف در دست و مچ خود می کنید؟</p> <p>(۱) ضعی احساس نمی کنم          (۲) ضعف خفیف          (۳) ضعف متوسط          (۴) ضعف شدید          (۵) ضعف خیلی شدید</p>
<p>۸. آیا احساس سوزن سوزن شدن در دست خود دارد؟</p> <p>(۱) احساس سوزن سوزن شدن ندارم          (۲) احساس سوزن سوزن شدن خفیف          (۳) احساس سوزن سوزن شدن متوسط          (۴) احساس سوزن سوزن شدن شدید          (۵) احساس سوزن سوزن شدن خیلی شدید</p>	<p>۹. شدت بی حسی یا سوزن سوزن شدن دست شما در شب چقدر است؟</p> <p>(۱) احساس بیحسی و سوزن سوزن شدن ندارم.          (۲) خفیف          (۳) متوسط          (۴) شدید          (۵) خیلی شدید</p>
<p>۱۰. در طول شب چند بار به علت بی حسی و سوزن سوزن شدن از خواب بیدارمی شوید؟</p> <p>(۱) هرگز          (۲) یکبار          (۳) دو تا سه بار          (۴) چهار تا پنج بار          (۵) بیشتر از پنج بار</p>	<p>۱۱. آیا در گرفتن وسایل توسط دست و بکارگیری از وسایل کوچک مانند مداد و کلید مشکل دارد؟</p> <p>(۱) مشکلی ندارم          (۲) مشکل خفیف          (۳) مشکل متوسط          (۴) مشکل شدید          (۵) مشکل خیلی شدید</p>

۱۲. لطفاً میزان مشکل دست و یا مج دست خود را در طی دو هفته گذشته تعیین نمایید؟				
به شدت مشکل دارم	متوسط مشکل دارم	مختصری مشکل دارم	مشکل ندارم	نوع فعالیت
				نوشتن بستن دکمه های لباس نگه داشتن کتاب در حین مطالعه نگه داشتن گوشی تلفن باز کردن سرنشیشه مربا انجام کارهای خانه حمل سبد خرید روزانه حمام گرفتن و لباس پوشیدن