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RESEARCH PAPER

Validation and cross-cultural adaptation of the Persian version of Craig Handicap Assessment and Reporting Technique (CHART) short form

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Abstract

Objective: To test the psychometric specifications of the Persian version of the Craig Handicap Assessment and Reporting Technique (CHART) short form in an Iranian population. *Design*: Cross-sectional study. *Subjects*: Fifty-two individuals with a mean age of 49.3 years (SD 7.9, minimum 38 years and maximum 80 years), who had chronic spinal cord lesions, were included in this study. Most of them were paraplegic (88.5%) and unemployed (76.9%). *Methods*: Reliability (internal consistency) of the measure was examined by applying Cronbach's alpha. In addition, validity (construct) was tested by Pearson's correlation. *Results*: Overall, the internal consistency of the questionnaire was found to be satisfactory (Cronbach's alpha 0.613). Regarding construct validity, the minimum and maximum significant correlations were among Physical Component Summery and Cognitive Independence ($r = 0.267$, $p < 0.05$), Vitality and Social Integration ($r = -0.429$, $p < 0.01$) respectively. *Conclusion*: By analyzing data regarding the psychometric specifications of the Persian version of CHART, we can conclude that this version is a valid, reliable and unique measure that can be used for spinal cord–injured individuals. As demonstrated in our preliminary study, it is easy to be filled out and is not confusing.

➤ Implications for Rehabilitation

- The Persian version of the CHART has been successfully validated.
- It can be used by those working specifically in the field of spinal cord injury and also more generally.
- It will enable both initial assessment and follow-up for people in Persian-speaking areas of the world.

Keywords

Assessment, Craig handicap reporting technique, short form, spinal cord injury, validity

History

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Introduction

Community reintegration is an indicator in measuring the quality of life (QOL) of spinal cord–injured (SCI) individuals [1]. However, community reentry or reintegration of SCI individuals is a concept that has not been greatly considered in past researches despite its importance, although nowadays many researchers are in favor of including it in their QOL assessments [1,2]. QOL is related to personal relationships and social roles of the SCI individual [3]. Recently, the World Health Organization (WHO) model for disabilities has begun to focus more on ''participation'' including the social function of SCI people in their community [4]. Many efforts have been made to create an effective and relevant instrument for assessing SCI patients in their coping with the community while they are newly experiencing a spinal cord injury.

Two SCI individuals in the same rehabilitation program can have a different functional status. Their dissimilarity is not only in their independency, but also in their success in social relations (e.g. finding new friends), finding and keeping a job, being productive and supporting themselves. As a result, the Craig Handicap Assessment and Reporting Technique (CHART) has been created to assess these factors. CHART can determine the ability of disabled people to act as active members of their family and communities. In addition, CHART can illustrate how one's disability impacts social activities and can examine the effectiveness of rehabilitation and other social issues in order to reintegrate these patients in their communities. CHART [5,6] is an instrument which measures six different aspects. It is the most widely used questionnaire to assess community reintegration in SCI persons and it has been recommended in a study by Wood-Dauphinee et al. [1]. CHART has been evaluated extensively and its psychometric features have been explored by various researchers. The test–retest reliability of the survey in SCI persons was checked by Tozato et al. and it ranged from 0.53 to 1.00 [7]; however, Whiteneck et al. found it to be between 0.80 and 0.95. The reliability, as well as the validity, of CHART has

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also been examined and confirmed by Whiteneck et al. [8]. These psychometric properties have been well supported by Hall et al. as well [9]. Apart from this, Gontkovsky et al. found adequate to excellent correlation between the Community Integration Questionnaire (CIQ) and CHART total score as well as poor to adequate correlation between CIQ and CHART domains [10]. In Iran, such a study, which evaluates community reintegration in SCI individuals, has not been done so far. As a result, we decided to test the psychometric specifications of the Persian version of CHART in an Iranian population.

Methods

Translation procedure

At first, in order to make the forward translation (the Persian version) three health professionals who were bilingual in Persian and English translated the original version of the CHART (English transcript). Then, an English-speaking individual who was not involved in the process of the validation retranslated this version. In case of finding dissimilarities between the four versions, it was then brought to a panel to make the provisional Persian version. If there was a pivotal disagreement, then retranslation of the original version was considered. Finally, to test the comprehensibility of the preliminary Persian version and to create the final version of the questionnaire, it was presented to 15 individuals with SCI [11]. There was no need to change the final version of the translated questionnaire after this pilot study was done (Figure 1).

Questionnaires

CHART

The CHART survey measures six different parts of social function:

(1) Cognitive Independence
(2) Physical Independence
(3) Mobility
(4) Occupation
(5) Social Integration
(6) Economic Self-sufficiency

Every dimension can have a score range from 0 to 100 (lowest to highest). Although the scores can be added together to obtain a total score (the result of six dimensions), recently it has been claimed that in the case of creating the total score, there would be the risk of losing important information [9]. High scores indicate a low level of dependency. The original long form of CHART has 32 items; however, its short form consists of 19 questions. Nowadays, both forms are used by researchers around the world.

For the purpose of cultural adaptation for the Economic Self-sufficiency domain, reliable information about the poverty line and Gross National Product (GNP) in an Iranian population is lacking. As a result, we could not adjust this domain to our community in order to be applied to our survey.

The SF-36 health survey

In order to test the convergent validity of CHART, the Persian version of the SF-36 questionnaire, which has been shown to be a valid measure in the Persian language, was administered to the study participants [12]. This health survey, which was first presented by Ware and Gandek in 1998, is a well-known instrument for assessing the general health of people and it consists of 36 items and 8 subscales: Physical Functioning (PF), Social Functioning (SF), Vitality (VT), Role Emotional (RE), Bodily Pain (BP), Role Physical (RP), Mental Health (MH) and General Health (GH). Each dimension can have a score from 0 to 100 (worst to best) [13–17].

Participants

We conducted this validation study of CHART on 52 veterans with a chronic spinal cord injury as a result of the Iran–Iraq war (1980–1988) in the Janbazan Clinic of Mashhad, in the northeast of Iran. Patients voluntarily participated in the study and all signed consent forms. The study was approved by the research committee of Mashhad University of Medical Sciences, Mashhad, Iran.

Psychometric testing

Reliability

Internal consistency. Internal consistency of the survey was measured after analyzing Cronbach's coefficient alpha [13]. The lowest acceptable level was considered to be 0.4 or more [13].

Floor and ceiling effects. These effects are the determinant factors that have a negative influence on the reliability of the survey and show inability of the instrument in distinguishing the minimum or maximum possible scores. They limit the competency for evaluating outcomes [16]. In the present study, if more than 15% of the scores of each dimension of the questionnaire were between 0–5 and 95–100, then the floor and ceiling effect was presumed to occur respectively [15].

Validity

Construct validity (convergent and divergent validity)

Validity of the survey was assessed using convergent analysis. This test was applied to discover the extent of the correlation between the components of SF-36 and CHART. On the other hand, it was expected that CHART, due to its type of questions, would show a divergent validity with SF-36, as we did not expect that CHART should be totally correlated to the latter. Pearson's correlation coefficient (ρ) computed between CHART and SF-36. It was expected that Physical Independency and Mobility and Occupation, which are related to physical function (PF, RP, BP, GH, Physical Component Summery (PCS)), would correlate more with the items of SF-36; whereas, the Cognitive and Social Integration subscales would correlate higher with mental components (VT, SF, RE, MH, Mental Component Summery (MCS)). When we talk about the convergent validity, a desirable result would be a moderate correlation between the two instruments ($0.40 < r < 0.70$) [16].

Statistical analyses

Student's *t*-test was used for the purpose of group differences. Statistically significant p was considered to be less than 0.05. All needed statistical analysis of the survey was computed by SPSS 16.0 software (SPSS Inc., Chicago, IL) that was initially validated by Ware and Sherbourne in California in 1992 [17].

Results

Initially we invited veterans with long-term spinal cord injuries (23–31 years since they first acquired their injury from the Iran–Iraq war), who have been living in Khorasan Razavi, the northeastern province of Iran. Fifty-two veterans with chronic SCI filled out the CHART and the SF-36 questionnaires. All of them were male with a war-related spinal cord injury from the Iran–Iraq war. The mean age of the individuals was 49.3 years (SD = 7.9). Their age was between 38 and 80 years. Most of

Figure 1. The Persian version of the CHART short form.

چه کمکی نیاز دارید؟

✔ افراد معلول اغلب نیاز به کمک دارند. مامی خواهیم که بین مراقبت شخصی برای ناتوانی های جسمی و نظارت بر مشکلات شناختی تفاوت بگذاریم. اول تمرکز روی کمک فیزیکی (ایدی)، این شامل کمک در غذا خوردن، آرایش کردن، حمام رفتن، لباس پوشیدن، مدیریت دستگاه تنفس مصنوعی و یا دیگر تجهیزات، انتقال و غیره می شود. با در نظر گرفتن این فعالیت های روزانه ....

1- در 24 ساعت معمول شبانه روز، چند ساعت شما فردی را همراه خود دارید تا کمک فیزیکی در انجام فعالیت های مراقبت شخصی همانند غذاخوردن، حمام رفتن، لباس پوشیدن، توالت رفتن و تحرک را فراهم نماید؟

..... ساعت کمک با مزد

..... ساعت بدون مزد (خانواده، دیگران)

✔حال، تمرکز روی نظارت بر مشکلات شناختی به جای کمک های فیزیکی. این شامل به یاد آوردن، تصمیم گرفتن، قضاوت و غیره می شود.

2- چه میزان زمان یک نفر در خانه شماست تا در فعالیت هایی که نیاز به یادآوری، تصمیم گیری و قضاوت دارد به شما کمک کند؟

1. ☐ فرد دیگری همیشه با من است تا مشاهده یا نظارت کند.
2. ☐ فرد دیگری همیشه اطراف من است ولی تنها گاهی اوقات آن ها مرا چک می کنند.
3. ☐ گاهی اوقات من برای یک یا دو ساعت تنها گذاشته می شوم.
4. ☐ گاهی اوقات برای اغلب روز تنها گذاشته می شوم.
5. ☐ من برای تمام شب و روز تنها گذاشته شده بودم ولی یک نفر به من سر می زند.
6. ☐ من تنها گذاشته شده ام بدون اینکه کسی به من سر بزند.

3- چه میزان زمان یک نفر با شماست تا به شما در یادآوری، تصمیم گیری یا قضاوت در زمانی که شما دور از خانه هستید کمک کند؟

1. ☐ من درترک منزل محدودیت دارم حتی با شخص دیگری
2. ☐ یک نفر همیشه هر وقت جایی می روم با من است تا در یادآوری، تصمیم گیری یا قضاوت به من کمک کند
3. ☐ من خودم به مکان هایی می روم که آشنا هستند
4. ☐ من برای رفتن به هیچ جا به کمک نیاز ندارم.

✔حالا من یکسری سوالات درباره فعالیت های معمول شما دارم.
آیا شما به طور منظم بیرون از خانه هستید؟

4- در یک روز معمول، چند ساعت شما بیرون از بستر هستید؟ ..... ساعت

5- در یک هفته معمول، چند روز شما بیرون از خانه رفته و به جایی می روید؟ ..... روز

6- در یک سال گذشته، چند شب را شما بیرون از خانه سپری کرده اید؟ (به جز بستری در بیمارستان)

☐ [0] هیچ، ☐ [1] 1-2 ، ☐ [3] 3-4، ☐ [5] 5 یا بیشتر

✔چگونه وقت خود را سپری می کنید؟

7- چند ساعت در هفته را صرف انجام کاری می کنید که برای آن به شما مزد داده می شود؟..... ساعت، شغل .....

8- چند ساعت در هفته را شما در دانشگاه به منظور کسب درجه یا در یک برنامه آموزشی فنی معتبر صرف می کنید؟ (شامل تعداد ساعت حضور در کلاس و مطالعه)؟ ..... ساعت

9- چند ساعت در هفته را شما در در کارهای فعال زنده خانه شامل انجام نقش پدر و مادری، خانه داری و آماده سازی غذا صرف می کنید؟ ..... ساعت

10- چند ساعت در هفته را شما در خانه صرف فعالیت های نگهداری مانند باغبانی، تعمیرات خانه و یا بهبود خانه می کنید؟ ..... ساعت

11- چند ساعت در هفته را شما صرف فعالیت های تفریحی مانند مسابقات ورزشی، نرمش، بازی فکری یا رفتن به سینما می کنید؟ (لطفا ساعت هایی که صرف تلویزیون نگاه کردن و گوش دادن به رادیو می شود لحاظ نشود) ..... ساعت

✔با چه کسی وقت می گذرانید؟

12- با چند نفر شما زندگی می کنید؟

13- آیا یکی از آن ها همسر شما یا فرد مهم دیگری است؟ بلی ☐ خیر ☐ غیرمرتبط (فرد تنها زندگی می کند) ☐

14- از افرادی که شما با آن ها زندگی می کنید چند نفر اقوام شما هستند؟

15- حداقل یک بار در ماه چه تعداد موسسات سازمانی یا تجاری را شما بازدید می کنید، تلفن می زنید یا به آنها نامه می نویسید؟ ..... موسسه

16- چه تعداد دوست (افراد غیرفامیل که خارج از تجارت یا محیط سازمانی ارتباط دارید) را شما حداقل یکبار در ماه می بینید، تلفن می زنید یا نامه می نویسید؟ ..... دوست

17- در ظرف یکماه گذاشته با چه تعداد غریبه شما شروع به صحبت کرده اید (برای مثال برای اینکه اطلاعات بگیرید یا سفارش بگذارید)؟

☐ [0] هیچ، ☐ [1] 1-2، ☐ [3] 3-5، ☐ [6] 6 یا بیشتر

✔چه منابع مالی ای شما دارید؟

18- تقریبا در سال گذشته مجموع درآمد سالیانه تمام اعضاء خانواده در خانواده شما چه بوده است؟ (تمام منابع شامل دستمزد و درآمد، مزایای از کارافتادگی، درآمد بازنشستگی و از کار افتادگی، درآمد ناشی از جبران خسارت دادگاه، سرمایه گذاری و مبالغ امانت گذاشته شده، حمایت از کودک و نفقه، کمک اقوام و هر منبع دیگری را در نظر بگیرید) ..... تومان

19- تقریبا شما سال قبل چقدر جهت هزینه های مراقبت پزشکی پرداختید؟ (هر مقدار پرداخت شده توسط شما یا اعضا خانواده در خانه شما که به وسیله بیمه یا مزایا بازپرداخت نشده است). ..... تومان

Table 1. Demographic data.

Item	Levels	*N* (%)
Neurologic classification at discharge from rehabilitation	Paraplegia	46 (88.5)
	Tetraplegia	6 (11.5)
Educational level when injured	Less than high school	33 (63.4)
	High school	15 (28.8)
	More than high school	4 (7.8)
Change in their education status	Unchanged	26 (50.0)
	High school	14 (27.0)
	More than high school	12 (23.0)
Employment level at the time of interview	Unemployed/Retired	40 (76.9)
	Student	2 (3.8)
	Teacher	1 (1.9)
	Employee	9 (17.4)
Mobility	Using electric wheelchair	6 (11.5)
	Using manual wheelchair	41 (78.9)
	Walk with crutches or cane	3 (5.8)
	Walk without assistance	2 (3.8)

Table 3. Descriptive statistics in SF-36.

Subscale	Range (0–100)	Mean (SD)
PF	0–90	21.4 (23.2)
RP	0–100	48.1 (40.8)
BP	0–100	36.9 (24.6)
GH	10–97	53.0 (22.3)
VT	5–100	62.8 (24.2)
SF	0–100	61.6 (24.2)
RE	0–100	50.0 (43.0)
MH	20–100	64.4 (18.8)
PCS	17–51	30.5 (8.1)
MCS	27–70	50.0 (11.3)

Table 4. Internal consistency of the CHART.

Items	Corrected item – total correlation	Cronbach's alpha if item deleted
Physical Independence	0.385	0.512
Mobility	0.236	0.580
Occupation	0.293	0.571
Cognitive Independence	0.562	0.435
Social Integration	0.351	0.540

Table 2. Absolute values of CHART and comparison with another study [10].

	Current study ($n=52$)				Gontkovsky et al. ($n=28$)		
Variables	Range	Mean (SD)	Floor (%)	Ceiling (%)	Range	Mean (SD)	*p*
Physical Independence	4–100	55.8(38.0)	28.8**	15.3**	4–100	47.0 (44.2)	0.89
Cognitive Independence	0–100	48.9(23.5)	1.9	3.8	0–100	66.5 (36.4)	0.026*
Mobility	0–100	67.9(25.3)	1.9	19.1**	17–100	69.6 (30.7)	0.803
Occupation	0–100	39.5(36.1)	15.3**	19.2**	0–100	38.3 (39.4)	0.894
Social Integration	38–100	80.2(19.6)	0	69.2**	0–100	72.8 (35.2)	0.229
Economic Self-sufficiency	–	–	–	–	0–100	38.4 (33.2)	–

*Significant at the 0.05 level.
**Significant floor or ceiling effect.

them (88.5%) were paraplegic (88.5%) and unemployed (76.9%) (Table 1).

Apart from this, absolute values of CHART and the maximum and minimum scores, which were obtained by the patients, were calculated. Cognitive Independence was the only component that showed an acceptable correlation. Comparison of these scores was also done in a study by Gontkovsky et al. in patients with chronic SCI [10] (Table 2).

The *t*-test in the two studies revealed that among the five domains that we compared, our findings only in Cognitive Independence were different ($p<0.05$) and in the remaining four domains we had similar results. SF-36 scores of patients were also computed (Table 3).

Reliability (internal consistency)

Totally, internal consistency was found to be satisfactory (Cronbach's alpha = 0.613). The internal consistency of the five domains of CHART is presented in Table 4. Just one scale (Cognitive Independence) exceeded the lowest level of the internal consistency of 0.4. Generally, maximum and minimum total correlations were related to Cognitive Independence and Mobility, respectively.

Inter-correlation matrix between different domains of CHART was also done to find the dependency between various aspects within its subscales. The test yielded a highly significant correlation between Cognitive and Physical Independence ($r=0.553$, $p<0.01$). Table 5 has more information regarding the findings.

Validity (construct validity)

For the purpose of finding the dependency between different domains of CHART and SF-36, Pearson product–moment correlation coefficient was applied (Table 6). The minimum and maximum significant correlations were among PCS and Cognitive Independence ($r=0.267$, $p<0.05$), VT and Social Integration ($r=-0.429$, $p<0.01$), respectively.

Discussion

In agreement with the study of Gontkovsky et al. [10], we had similar results for the four domains of CHART. The only dimension that showed a difference was Cognitive Independence. The possible explanation for that could be the difference between the levels of education between patients, as in a person with a higher level of education we could expect decision-making and similar issues to be done more independently. A difference between our case series and Gontkovsky et al.'s study is that 100% of our SCI patients were male and in the latter study about 20% of SCI cases were women [10]. However, this finding needs more exploration in the future.

Reliability (internal consistency)

Cronbach's coefficient alpha examination revealed an acceptable internal consistency for the survey in general. In addition, the deletion of one score between the five domains did not result in a Cronbach's alpha < 0.435. Among Mobility, Occupation, Social

Table 5. Inter-correlation matrix of the CHART subscales.

Variables		Physical Independence	Mobility	Occupation	Cognitive Independence
Mobility	r*	0.154			
	p**	0.275			
Occupation	r*	0.130	0.099		
	p**	0.360	0.486		
Cognitive	r*	0.553***	0.201	0.366***	
Independence	p**	0.000	0.153	0.008	
Social	r*	0.243	0.251	0.268	0.139
Integration	p**	0.082	0.073	0.055	0.324

*Pearson's correlation of coefficient.
**Two-tailed p value.
***Correlation is significant at the 0.01 level (two-tailed).

Table 6. The Pearson correlation between CHART and SF-36.

		CHART				
SF-36		Physical Independence	Mobility	Occupation	Cognitive Independence	Social Integration
PF	r*	0.032	0.134	0.263	0.263	0.209
	p**	0.821	0.343	0.060	0.059	0.136
RP	r*	0.139	0.322***	0.173	0.208	0.086
	p**	0.327	0.020	0.221	0.140	0.546
BP	r*	0.198	0.095	0.026	0.064	0.062
	p**	0.158	0.503	0.855	0.651	0.664
GH	r*	−0.177	−0.175	0.057	−0.135	−0.243
	p**	0.210	0.215	0.690	0.340	0.083
VT	r*	−0.211	0.139	0.057	−0.114	−0.429****
	p§§	0.133	0.324	0.689	0.420	0.002
SF	r*	0.005	0.215	0.021	−0.061	0.287***
	p**	0.971	0.126	0.880	0.670	0.039
RE	r*	−0.116	0.099	0.162	−0.034	0.078
	p**	0.411	0.483	0.250	0.814	0.582
MH	r*	−0.175	0.160	0.024	−0.148	−0.213
	p**	0.214	0.257	0.868	0.294	0.129
PCS	r*	0.189	0.145	0.203	0.276***	0.116
	p**	0.181	0.304	0.149	0.047	0.415
MCS	r*	−0.220	0.129	0.030	−0.209	−0.129
	p**	0.117	0.363	0.831	0.138	0.361

*Pearson's correlation of coefficient.
**Two-tailed p value.
***Correlation is significant at the 0.05 level (two-tailed).
****Correlation is significant at the 0.01 level (two-tailed).

Integration, Physical Independence and Cognitive Independence dimensions, just Cognitive Independence showed an acceptable correlation (Cronbach's alpha >0.40). This means that Mobility, Occupation, Social Integration and Physical Independence scales have a poor relation with each other and with Cognitive Independence. This suggests that these domains need to offer specific types of questions solely related to them. Moreover, the items that are related to Cognitive Independence overlapped with other questions in the questionnaire, indicating that this particular scale is not as unique as other domains.

The assessment of the floor and ceiling effects revealed a ceiling effect in four out of five domains; whereas, the latter was shown to be in two dimensions. This finding has been confirmed by the study of Hall et al. [9] who discovered that in chronic SCI patients the R-CHART has marked ceiling effects that affected 25–81% of patients [18]. These prominent ceiling effects may be related to the design of the questions. For example, the physical independency of the patients was just examined by asking about the hours of receiving help from a nurse that most of the patients may have not needed as many of them have become adapted to their problem after a long period. Similarly, Social Integration was evaluated by asking about the number of people that the patient is living with or the frequency of seeing outsiders. These types of questions may be a result of the prominent ceiling effects which may need further examination in future studies.

Validity

Based on the analysis of Pearson's correlation between variables of CHART and SF-36, we can conclude that generally these instruments are fairly correlated to each other, as the purpose for designing the CHART questionnaire is to create a new measure to assess community reintegration. Besides this, CHART has shown adequate correlation with more specific measures for community re-entry (CIQ) [10]. In addition, we saw the highest correlation values for Mobility, Social Integration and Cognitive Independence. Another explanation can be better access to private residential places instead of living with parents or relatives. In addition, due to better support, which they received from various sources, they had less contact with strangers (questions 12–17 in the CHART survey).

Another finding confirmed that the convergent validity was the positive significant correlation between physical components of the questionnaires (RP and Mobility). Moreover, the same occurred for the Social domains.

By a brief review of the Cognitive Independence items, we have assumed that related questions have higher coherence with the Physical Independence domain (within CHART). Pearson's correlation matrix confirmed this hypothesis by showing these results ($r=0.553$, $p<0.01$). Similarly, a positive significant correlation was yielded between PCS (SF-36) and Cognitive Independence (CHART) dimensions.

As mentioned before, due to the lack of sufficient data regarding the poverty line in the Iranian population, we could not modify the Economic Self-sufficiency scale of CHART according to the different economic and GNP situations in our population. We hope that in the future with enough information we will be able to evaluate this domain as well.

In conclusion, by analyzing data regarding the psychometric characteristics of the Persian version of CHART, we have concluded that this version is a valid, reliable and unique measure that can be used for SCI people because of its ease in filling it out and its comprehensibility. Unfortunately, one of the limitations of the study was the lack of variety in the sex of the participants since all of them were male.

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Declaration of interest

The authors declare no conflicts of interest.

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