



Brazilian Journal of Physical Therapy

<https://www.journals.elsevier.com/brazilian-journal-of-physical-therapy>



ORIGINAL RESEARCH

Construct and discriminant validity of STarT Back Screening Tool – Brazilian version



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Received 19 February 2016; accepted 4 May 2016

Available online 14 January 2017

KEYWORDS

Physical therapy;
Low back pain;
STarT Back Screening
Tool;
Outcome
measurement;
Validity

Abstract

Background: The STarT Back Screening Tool (SBST) was developed to stratify low back pain patients according to their risk of future physical disability so that prognostic subgroups can receive matched treatments in primary care.

Objective: To measure the construct and discriminative validity of the SBST-Brazil questionnaire.

Method: A hundred and fifty one patients were recruited to test the construct and discriminative validity comparing the SBST-Brazil to the Brazilian Version of the Oswestry Disability Index (ODI), Roland Morris Disability Questionnaire (RMDQ) and Fear-Avoidance Beliefs Questionnaire-Work (FABQ-W) and Physical Activity (FABQ-PA) subscales at baseline. Spearman's rank-order correlation and area under the curve (AUC) derived from receiver operating curves (ROC) for total scores and psychosocial subscale score of the SBST-Brazil were used for construct and discriminant validity analysis, respectively.

Results: The SBST-Brazil total and psychosocial subscale scores had good and moderate correlation with ODI ($r=0.61$; $r=0.56$, respectively) and good with RMDQ ($r=0.70$; $r=0.64$, respectively). Both scores of the SBST-Brazil total and psychosocial subscale correlated weakly and moderately with the FABQ-PA ($r=0.28$; $r=0.34$, respectively) and weakly with the FABQ-W ($r=0.18$; $r=0.20$, respectively). The discriminant validity with AUCs for the total and psychosocial subscale scores against reference standard ranged from 0.66 for kinesiophobia to 0.88 for disability.

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Conclusion: The SBST-Brazil showed a moderate to good correlation with the disability tools, but a weak correlation with fear-avoidance beliefs. The results of discriminant validity suggest that SBST-Brazil is able to discriminate low back pain patients with disability and fear-avoidance beliefs.

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Introduction

The high prevalence of low back pain (LBP) and its socio-economic implications have led to a search for improved methods of diagnosis, treatment, and especially assessment of physical disability, which may be either temporary or permanent.¹ Currently, LBP is the primary cause of years lived with disability in Brazil, as well as in most developed and developing countries.² Many psychosocial factors, such as fear, kinesiophobia, depression, pain catastrophizing, and bothersomeness, can influence the prognosis of LBP patients, increasing the chance of developing chronic pain over time.^{3–7}

The early identification of individuals who are at risk of poor clinical outcomes is an important component in the management of LBP. Identification of elevated psychosocial factors has been strongly linked to poor clinical outcomes in a variety of health care settings.^{3,6,8,9} The optimal method of assessing psychosocial factors is the subject of debate.¹⁰

More recently, the STarT Back Screening Tool (SBST) was developed and validated by Hill et al.¹¹ to identify subgroups of patients and to guide initial treatment decision-making in primary care.^{8,11–13} The SBST has already been translated and cross-culturally adapted to Brazilian Portuguese (SBST-Brazil).¹² Its reliability (measured by intraclass correlation coefficient) has been tested, showing acceptable results of 0.79 (95% CI 0.63–0.95) for the classification score, Standard Error Measurement (SEM) of 1.9%, and internal consistency of 0.74 for the SBST total score and 0.70 for the SBST psychosocial subscale score.¹² The Brazilian version also showed good correlation with OMPSQ ($r=0.73$), as well as with the Tampa Scale of Kinesiophobia (TSK) ($r=0.60$) and with the Roland Morris Disability Questionnaire (RMDQ) ($r=0.76$). However, when correlated with pain intensity at the time of assessment, it demonstrated moderate correlation ($r=0.31$).¹⁴ Some other versions of the SBST have also been translated and have had their psychometric properties tested.^{1,11,15–19} It is adequate that the Brazilian version of the SBST has its construct and discriminative validity established, as this will increase its applicability and external validity.

The aim of this study is to measure the construct and discriminative validity of the SBST-Brazil questionnaire by assessing its association with the Oswestry Disability Index (ODI), the Roland Morris Disability Questionnaire (RMDQ), and the Fear-Avoidance Beliefs Questionnaire-Work (FABQ-W) and Physical Activity (FABQ-PA) subscales in a sample of low back pain patients.

Method

Sample

One hundred and fifty one patients were conveniently recruited at a private clinic called *Instituto Wilson Mello* in Campinas, SP, Brazil. All subjects had low back pain of any duration, with or without nerve root compromise, were at least 18 years old, and could read and speak Brazilian Portuguese. As part of a standard examination procedure, patients were screened and excluded from the study if they had potentially serious spinal pathology (e.g., cauda equina compression, lumbar fracture, malignancy, and cognitive, neurological, or rheumatological disorders), pregnancy, or history of spinal surgery in the past 6 months.

All participants provided written informed consent and the study protocol was approved by the Research Ethics Committee of *Pontifícia Universidade Católica de Campinas* (PUC-Campinas), Campinas, São Paulo, Brazil (number 150.139).

Description of the SBST questionnaire

The SBST is based on the presence of modifiable physical and psychosocial factors for persistent and disabling symptoms, measured by nine questions. Of these, the first four items are related to referred leg pain, disability, and comorbid shoulder or neck pain, and the other five items make up a psychosocial subscale (items 5–9) that investigates bothersomeness, pain catastrophizing, fear, anxiety, and depression. The patients are classified as having a high risk of poor prognosis (high levels of psychosocial prognostic factors are present with or without the physical factors present); medium risk (physical and psychosocial factors are present, but not a high level of psychosocial factors); or low risk (few physical or psychosocial prognostic factors are present).^{8,11–13}

Instruments used to measure construct and discriminative validity

Oswestry Disability Index (ODI)

The ODI includes 10 six-point scales, and the results vary from 0 to 100%, where higher scores represent worst function. The items are related to intensity of pain, personal care (washing, dressing, etc.), lifting, walking, sitting, standing, sleeping, sex life, social life, and traveling. The Brazilian

version of this tool was tested in accordance with the internationally recommended methodology and showed good internal consistency (Cronbach's alpha of 0.87) and good reliability (ICC of 0.99).²⁰ The ODI showed moderate correlation with pain intensity ($r=0.66$) and a relatively high correlation with the RMDQ scores ($r=0.81$). A significant correlation ($P \leq 0.01$) was also found between the ODI scores and the 8 scales of the SF-36.²⁰

Roland Morris Disability Questionnaire (RMDQ)

The RMDQ is a 24-item questionnaire related to normal activities of daily living^{21,22} and the results vary from 0 to 24 points, where higher scores represent worst function. The ICC score was 0.94 for the test-retest reliability and 0.95 for the inter-rater reliability. The correlation coefficient was 0.80 ($P < 0.01$) between the Pain Scale and the RMDQ score and 0.79 ($P < 0.01$) between the Visual Analog Scale and the RMDQ score.²¹

Fear-Avoidance Beliefs Questionnaire (FABQ)

This instrument assesses how beliefs and fear of individuals with lower back pain affect two subscales related to physical activities (FABQ-PA) and work (FABQ-W). The results of the FABQ-PA vary from 0 to 24 points, where higher scores represent more fear avoidance related to physical activities. In addition, the results of the FABQ-W vary from 0 to 42 points, where higher scores represent more fear avoidance related to work. The test-retest intraclass correlation coefficients (ICC = 0.84 and 0.91) and the internal consistency (Cronbach's alpha = 0.80 and 0.90) for the FABQ-PA and FABQ-W, respectively, were acceptable. The correlation coefficient (Pearson correlation) between the FABQ-W and RMDQ-Brazil was $r=0.72$; $P < 0.01$, and $r=0.35$; $P < 0.01$ for the FABQ-PA and the same questionnaire. It was also correlated with the numeric pain scale ($r=0.76$; $P < 0.01$ for FABQ-Work $r=0.35$; $P < 0.05$ for FABQ-PA).²³

Construct and discriminant validity

Construct validity was tested by comparing the SBST-Brazil total and psychosocial subscale scores with the Brazilian Portuguese version of the ODI, RMDQ, and FABQ-W and FABQ-PA subscales applied at baseline. For discriminant validity, AUCs derived from receiver operating Curves for the SBST-Brazil total and subscale scores were calculated against reference standards for disability (ODI and RMDQ), fear-avoidance beliefs related to physical activity (FABQ-PA subscale), and fear-avoidance beliefs related to work (FABQ-W subscale).

The hypothesis is that the SBST-Brazil will demonstrate a good correlation with the Brazilian version of the RMDQ and ODI as the SBST-Brazil has two disability items that are related to these measures (Items 3 and 4) and because other versions have already demonstrated good correlations^{1,17} and excellent discriminant validity with disability reference standards.^{18,19} Another hypothesis is that the SBST-Brazil psychosocial subscale should correlate well with the Brazilian version of the FABQ-PA, as both are sensitive to change in the individual's fear-avoidance beliefs regarding physical activity.²³

Statistical analysis

All analyses were calculated using the software PASW Statistics 18.0 (SPSS Inc., Chicago, IL, USA), with a significance level (α) of 5%. Construct validity was evaluated by correlating the SBST-Brazil with the ODI, RMDQ, and Physical Activity and Work subscales of the FABQ at baseline, using Spearman's Rank Order Correlation. According to Fleiss²⁴ $r < 0.30$ indicates weak correlation, $r \geq 0.30$ and < 0.60 indicates moderate correlation, and $r \geq 0.60$ indicates good correlation. A score of 0.70 has been recommended for instruments that measure the same construct. When similar constructs are compared, scores lower than 0.70 should be accepted.^{25,26}

The discriminative validity of the SBST-Brazil was described using the AUC statistic derived from receiver operating curves for the total score and the psychosocial subscale score of the SBST-Brazil against baseline reference standards. These instruments were dichotomized to provide cases and non-cases using established cutoffs from the available literature. The definitions for reference standard were: Disability (RMDQ > 7 ¹¹ and ODI > 13 ²⁷), kinesiophobia (FABQ-PA > 13)²⁷ fear related to work activities (FABQ-W > 25).²⁸ Strength of discrimination was classified according to the following descriptors: 0.70–0.80 indicated acceptable discrimination, 0.80–0.90 indicated excellent discrimination, and 0.90 indicated outstanding discrimination.¹¹

Results

A total of 151 eligible patients were recruited and Table 1 shows the characteristics of the study participants for construct and discriminant validity.

Construct validity

Table 2 presents the construct validity of the SBST-Brazil total and psychosocial subscales. The scores of the SBST-Brazil total and psychosocial subscales correlated better with the RMDQ ($r=0.64$, $r=0.70$), respectively, but weakly with FABQ-W ($r=0.18$, $r=0.20$), respectively.

Discriminant validity

The discriminant validity of the screening tool is presented in Table 3, with AUCs for SBST-Brazil total and psychosocial subscale scores against reference standard cases, which ranged from 0.66 for kinesiophobia to 0.88 for disability.

Discussion

The aim of this study was to analyze the construct and discriminant validity of the Brazilian version of the STarT Back Screening Tool so it can be used with Brazilian low back pain patients. Our first hypothesis was that the SBST-Brazil would correlate well with the tools for disability (RMDQ and ODI), as it contains two specific items for this construct (items 3 and 4). Similar to the French,¹ Iranian,¹⁷

Table 1 Subjects' demographic and clinical characteristics.

Characteristic	Baseline (n = 151)
Gender: N (%)	
Male	69 (45.7)
Female	82 (54.3)
Body mass index (kg/m ²): mean (SD)	26.1 (3.78)
Age (years): Mean (SD); range [min-max]	47.4 (14.4); [19–81]
Pain NRS: Mean (SD); range [min-max]	5.6 (2.2); [1–10]
Education level, N (%)	
Elementary Level	0 (0%)
High School Level	27 (17.8%)
University Level	124 (82.2%)
FABQ-W: Mean (SD); range [min-max]	10.4 (9.5); [0–39]
FABQ-PA: Mean (SD); range [min-max]	14.5 (6.2); [0–28]
RMDQ: Mean (SD); range [min-max]	10 (5.3); [0–23]
ODI: Mean (SD); range [min-max]	26 (15); [2–70]
SBST-Brazil: Mean (SD); range [min-max]	3.97 (1.97); [0–9]
Low risk (n, %)	68 (45%)
Medium risk (n, %)	61 (40.5%)
High risk (n, %)	22 (14.5%)

SD, standard deviation; Pain NRS, Pain numerical rating scale; FABQ-W, Fear-Avoidance Beliefs Questionnaire-Work Subscale, Brazilian version; FABQ-PA, Fear-Avoidance Beliefs Questionnaire Physical Activity Subscale, Brazilian version; RMDQ, Roland Morris Disability Questionnaire, Brazilian version; ODI, Oswestry Disability Index, Brazilian version.

and Brazilian versions,¹⁴ our results showed good to moderate correlations on both the total score ($r=0.70$ with RMDQ and $r=0.61$ with ODI) and the psychosocial subscale score ($r=0.64$ with RMDQ and $r=0.56$ with ODI). For discriminant validity, our findings for disability reference standards ranged from 0.78 to 0.88, being classified as acceptable to excellent discrimination.¹¹ These findings are consistent with the psychometric studies of the English¹¹ (0.92 for disability – RMDQ), Chinese¹⁸ (0.87 and 0.89 for disability – RMDQ), and Danish¹⁹ versions (0.84 and 0.85 for disability – RMDQ), suggesting that the SBST-Brazil appropriately discriminates disability for patients with low back pain.

On the other hand, our second hypothesis was that the SBST-Brazil would be correlated with the FABQ, mostly with its physical activity subscale (FABQ-PA). However, our results showed weak correlations. These correlations with the FABQ-W were expected because the SBST does not have any item related specifically to fear about work. In addition, it must be noted that our sample did not have many patients with work-related problems. In a previous report, the original English version has showed a similar weak correlation with the FABQ-W¹⁵ ($r=0.23$), but no other translated version had its correlation checked with the FABQ scale. The correlation of the Brazilian SBST version and the TKS was also good ($r=0.60$), which has the same construct as the FABQ-PA.¹⁴

Our analyses for discriminant validity showed better results for the SBST-Brazil total and psychosocial subscale scores against the FABQ-PA (0.66 and 0.68, respectively) and also against the FABQ-W (0.71 and 0.70, respectively), suggesting that even though the correlations were weak, the SBST-Brazil was still able to discriminate low back pain patients with fear-avoidance beliefs.

Table 2 Construct validity of the SBST-Brazil total and psychosocial subscale scores.

	Spearman correlation coefficient (r) SBST Brazil total score	Spearman correlation coefficient (r) SBST Brazil psychosocial scale score
FABQ-W	0.18*	0.20*
FABQ-PA	0.28*	0.34*
RMDQ	0.70*	0.64*
ODI	0.61*	0.56*

* $P < 0.05$.

Table 3 Discriminant validity: AUC for screening SBST-Brazil total scores and psychosocial subscale scores. Against reference cases at baseline.

Reference standards	Case definition	SBST-Brazil total score ROC (95%CI)	SBST-Brazil psychosocial subscale score ROC (95% CI)
FABQ-W (fear related to work)	>25	0.71 (0.54–0.87)*	0.70 (0.56–0.84)*
FABQ-PA (kinesiophobia)	>13	0.66 (0.56–0.77)*	0.68 (0.58–0.78)*
RM (disability)	>7	0.88 (0.81–0.95)*	0.84 (0.77–0.92)*
ODI (disability)	>20	0.81 (0.72–0.89)*	0.78 (0.70–0.86)*

* $P < 0.05$.

Conclusion

The SBST-Brazil showed a good to moderate correlation with the disability tools (RMDQ and ODI); however, it demonstrated weak correlations with the FABQ-PA and FABQ-W subscales. The discriminant validity ranged from 0.66 to 0.88, representing acceptable to excellent results and suggesting that the SBST-Brazil is able to discriminate low back pain patients with disability and fear-avoidance beliefs.

Conflicts of interest

The authors declare no conflicts of interest.

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