Validity and Reproducibility of the STarT Back Tool (Dutch Version) in Patients With Low Back Pain in Primary Care Settings

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Objective. The purpose of this study was to translate and to investigate the reliability and validity of the STarT Back screening tool (SBT) in the primary care setting among patients with nonspecific low back pain (LBP).

Design. The SBT was formally translated into Dutch following a multistep approach for forward and backward translation. General practitioners and physical therapists included patients with LBP.

Methods. Patients completed a baseline questionnaire and a follow-up at 3 days and 3 months. The construct validity was calculated with Pearson's correlation coefficient. The reproducibility was assessed using the quadratic weighted kappa and the specific agreement. Predictive validity was assessed using relative risk ratios for persisting disability at 3 months. Content validity was analyzed using floor and ceiling effects.

Results. In total, 184 patients were included; 52.2% were categorized in the "low-risk" subgroup, 38.0% "medium-risk," and 9.8% "high-risk." For the construct validity we found, as expected, a moderate to high Pearson's correlation for questions 3 to 9 and a low correlation for questions 1 and 2 with their respective reference questionnaires. The reproducibility had a quadratic weighted kappa of 0.65 and the specific agreement of 82.4% for "low-risk," 53.3% for "medium-risk," and 33.3% for "high-risk." For the predictive validity for persisting disability we found a relative risk ratio for "medium-risk" of 1.8 (95% confidence interval [CI]: 1.0–3.1) and 2.7 (95% CI: 1.4–4.9) for "high-risk" compared with "low-risk." For the content validity, we found that no floor and ceiling effects were present.

Limitations. There was a relatively small sample size for the retest reliability study. Patients were not compared between physical therapist and GP, as there were not enough patients in both groups. For practical reasons, the patients filled out the baseline questionnaire after receiving the first treatment/consultation; however, the questionnaire is intended to be filled in before the first consultation/treatment.

Conclusion. The SBT has been successfully translated into Dutch. The psychometric analysis showed acceptable results and, therefore, the SBT is a valid screening tool for patients with LBP in Dutch primary care.

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[Bier JD, Ostelo RWJG, van Hooff ML, et al. Validity and reproducibility of the STarT Back Tool (Dutch version) in patients with low back pain in primary care settings. *Phys Ther.* 2017;97:561–570.]

Published Ahead of Print: March 9, 2017
Accepted: March 7, 2017
Submitted: July 18, 2016

Low back pain (LBP) is a major public health problem. Globally it is the most prevalent musculoskeletal disorder causing disability.[1] In the Netherlands the point prevalence of LBP is found to be 26.9%.[2] LBP is a condition that is broadly divided into 3 major subgroups. First, LBP with a specific (serious) underlying pathology, such as tumors, fractures, and infections; second, LBP caused by nerve root compression as a result of a stenosis or herniated disc. The third group, the majority of people with LBP (85%–90%), is called nonspecific LBP, as no cause can be found.[3,4] Despite the fact that nonspecific LBP is regarded as self-limiting, as it often resolves within 6 weeks, more recent prognostic studies concluded that for ~40% of patients with LBP, recovery will take longer than 12 weeks.[4–6] LBP is a burden on the health care system, consuming in the Netherlands €385–€455 million in direct medical costs and €3–€3.1 billion in indirect costs.[7] In the United States, reports on combined direct and indirect costs for LBP vary between $86 billion and $238 billion.[8–10]

Although it has been suggested that patients with nonspecific LBP are not a homogeneous patient group, defining subgroups is challenging but important for targeting treatment to the individual patient.[3,11,12] So far subgrouping based on a patho-anatomical source of the pain appears to be of limited value because often an anatomical structure as cause of pain cannot be found.[4] Certain psychosocial factors are known to influence patients' recovery. Subgrouping patients based on psychosocial factors may result in successful risk stratification. The Keele STarT Back Tool (Subgroups for Targeted Treatment) (SBT) is a tool using different function, psychosocial, and comorbid factors for subgrouping. It was developed in England to allocate primary care patients with LBP into 3 subgroups concerning their prognosis: low, moderate, or high risk for persisting disability,[13] and to apply the appropriate stratified care.[14]

The SBT consists of 9 questions, 8 true/false questions and 1 question with a 5-point Likert scale as answer options. The validity of the SBT is often studied using a principal component factor analysis. In the United Kingdom (UK) study, as well as the Finnish, French, German, and Persian studies, it resulted in 2 subscales: biological (questions 1 to 4) and psychosocial (questions 5 to 9).[13,15–18] The psychosocial subscale is then viewed as a distress subscale with a Cronbach's alpha ranging from 0.52 (Finnish), 0.55 (German), 0.72 (UK), 0.74 (French), and 0.81 (Persian).[13,15–18] The discriminant validity has been determined by calculating the area under the curve (AUC) of the overall score with the Roland Disability Questionnaire (RDQ) (0.76–0.92),[13,16] the psychosocial subscale of the Pain Catastrophizing Scale (PSC) (0.70–0.83), or the Tampa Scale of Kinesiophobia (TSK) (0.81).[13,18] Other studies calculated the AUC for each separate question, resulting in AUCs ranging from 0.74 to 0.86.[16,19] The SBT is a questionnaire formed by combining known factors for delayed recovery of back pain. Based on these independent factors, it aims to predict poor disability. With each factor adding to the likelihood of a poor prognosis, this is called a formative model. In our formative model approach it is unnecessary to calculate internal consistency and the AUC against the overall score or the psychosocial subscale, as we approach them as independent factors and not as coherent factors.

The SBT's ability to predict poor disability at 6 months had sensitivity scores ranging between 39.6% and 80.1% and specificity scores ranging from 65.4% to 94.6%.[13] The English SBT has been found to be a reliable tool in the United Kingdom with a quadratic weighted kappa of 0.79.[13] It has been translated in several languages since its initial English publication in 2008.[16–22] No study has been published on the SBT to evaluate the validity and reliability in Dutch primary health care. Our aim is to evaluate the validity and reliability of the STarT Back Tool Dutch Version in Dutch primary care.

Methods

Translation of the SBT

The original SBT[13] (Appendix A and B) was formally translated following the multistep approach of Beaton et al[23] and the guidelines of Streiner and Norman.[24] Two Dutch native speakers independently performed a forward translation. After synthesis of a draft Dutch translation of the SBT, this version was backward translated into English by both a Dutch and an English native speaker. An expert committee was formed consisting of one translator who was also a clinical epidemiologist, one backward translator, and one clinician (orthopedic spine surgeon). The group examined the forward and backward translations and consolidated these to produce a "pre-final" version of the Dutch SBT. As it became apparent that 2 different study groups were preparing Dutch translations, a second expert meeting, consisting of a representative of each study group (R.O. and M.vH.) was held. A "combined pre-final" version was compiled based on all previous documents, and differences were resolved through consensus. The only difference was found in the translation of question 1: "spread down my leg(s)." We discussed whether to use "naar één of beide benen" (ie, "to one or both legs") or "naar mijn benen" (ie, "to both legs"). As in the original English version, the "s" of "legs" is written between brackets, and consensus was reached to use "naar één of beide benen" (ie, "to one or both legs") in the "combined pre-final" version.

Pre-final Testing

To test the "combined pre-final" version, 20 consecutive Dutch-speaking patients with LBP at the outpatient department of a secondary and tertiary spine referral center completed this version. In addition, a possibility was made to give comments and suggestions to improve. After completion, they were briefly interviewed about their thoughts of what was meant by each question and the chosen answer. They were also asked for their general comments on the questionnaire (eg, lay-out, wording, ease of understanding and completion, ambiguities). As no further comments or suggestions to improve were given, the expert group upgraded the "pre-final" version to the final version.[25] The Dutch version of the SBT is found in Appendix A and B.

Design

The final translated version was subsequently used in this clinimetric study as part of a prospective cohort (PRINS study; Prevalence of RIsk groups in Neck and back pain patients according to the STarT Back screening tool) including patients with LBP (and neck pain for a parallel study) of any duration in primary care. This is the first article published on this cohort. Patients received regular care by their general practitioner (GP) or physical therapist. In the Netherlands patients have direct access to physical therapist care and therefore this is regarded as primary care, as is GP care. Patients were asked to answer baseline and follow-up questionnaires. A power analysis showed that 100 patients were needed for a reliability study. The study was approved by the medical ethics committee of Erasmus University, Rotterdam, the Netherlands. (MEC-2014-256). For this study we only use the data of the LBP patients of the PRINS cohort.

Participants

General practitioners and physical therapists. We asked GPs and physical therapists who had previously shown their interest in the SBT to participate in the study and asked them to invite colleagues. Information about the study protocol was given through several meetings, by phone, or by digital/paper documentation. Participating GPs and therapists received the study protocol and a folder with patient information brochures and informed consent forms.

Patients. The inclusion period for patients was November 2014 to May 2015. Patients who consulted their physical therapist or GP for their back pain were asked to participate in the PRINS study. Other inclusion criteria were that the patient be 18 years or older; could speak, read, and write in Dutch; and had an email address. Patients were excluded if during the consultation the GP or therapist found red flags indicating a possible specific underlying pathology (eg, infection, fracture, cauda equina, tumor) responsible for the LBP.

Patients were given oral and written information about the procedure of data collection and the aim of the study. They were given an informed consent form. The patient signed the informed consent form and handed it back to the therapist or GP, who registered the patient online. The patient immediately received an email with a link to the baseline questionnaire. When necessary, a reminder was sent within a few days.

Treatment

The clinician was blinded to the results of the questionnaires, including the score on the SBT. The patients received usual care by their GP or physical therapist. We asked the clinicians to treat their patients according to their guideline. The guideline advises the GP to provide advice and, if necessary, analgesics to patients in the acute phase. In case of persisting pain, GPs can refer the patient to the physical therapist. Guideline recommendations for physical therapists differ based on the course of pain. In a normal course of pain, the therapist is advised to give reassurance and information to the patient. In case of an abnormal course of pain, the therapist should provide evidence- based interventions such as exercise therapy, mobilization, manipulation, and/or massage.[26,27]

Measurements

Baseline. At baseline (T0), patients filled out a questionnaire consisting of demographic variables (eg, age, sex) and the SBT. Furthermore, we measured the average pain in the past week using the 11-point Numeric Pain Rating Scale (NPRS),[28] ranging from 0 (no pain) to 10 (worst imaginable pain). Disability was operationalized using the RDQ,[29,30] consisting of 24 statements with a "yes" or "no" answer option. The total score ranges from 0 to 24, a higher score indicating more disability. We measured fear of movement/(re)injury using the TSK,[31] consisting of 17 statements with 4 answer options varying from "highly disagree" to "highly agree." The total score ranges from 17 to 68, a higher score indicating a higher level of kinesiophobia. To assess the level of catastrophizing, we used the PCS, which consists of 13 statements, each with a 5-point Likert scale ranging from "not at all" to "always."[32] The total score ranges from 0 to 52, a higher score indicating a higher level of catastrophizing. Finally we assessed quality of life using the EQ-5D[33] consisting of 6 questions. The first 5 questions have a 3-point Likert scale ranging from "no problems" to "severe problems," and the sixth question is a health status question ranging from "worst imaginable health" to "best imaginable health"; score ranges from 0 to 100.

Follow-up. Three days after inclusion (T1) a repeat questionnaire was sent in order to investigate the retest reliability of the SBT. It consisted of the SBT, the NPRS, and the General Perceived Effect (GPE) scale to measure recovery: "To what degree have you improved since filling out the baseline questionnaire?" The answer options range from "fully recovered" to "worse than ever" on a 7-point Likert scale. The time interval was considered long enough to reduce recall bias and short enough to prevent substantial improvement.[34] This repeat questionnaire was sent to patients who were included during the last 3 months of the inclusion period.

Three months after inclusion (T2), the patients received a follow-up questionnaire consisting of the GPE and RDQ. At the same time, we sent a questionnaire to the GP to ask about the number of visits, prescribed medication, referrals to physical therapists or medical professionals, and requested diagnostic imaging and blood tests. We sent a similar questionnaire to the therapist to ask about treatment data such as date of first and last treatment, number of treatments, questionnaires used, and the aim and means of treatment. All questionnaires were handled and stored through LimeSurvey 2.05 (LimeSurvey GmbH, Hamburg, Germany).

Statistical Analysis

First we analyzed the data to describe the characteristics of the GPs, physical therapists, and the patient population using frequencies, means, and standard deviations. The prevalence of the 3 risk profiles according to the SBT scores is reported.

For the *construct validity* we first analyzed the characteristics across SBT risk profile to determine the discriminant

Table 1.
Specific Agreement[a]

	Follow-up (T1)			
Baseline (T0)		**Low**	**Medium**	**High**
	Low	7(A)	2(B)	0(C)
	Medium	1(D)	4(E)	0(F)
	High	0(G)	4(H)	1(1)

[a]"Low-risk" A/(A+(B+C+D+G)/2) = 7/8,5 = 82.4%.
"Medium-risk" E/(E+(B+H+D+F)/2) = 4/7.5 = 53.3%.
"High-risk" I/(I+(C+F+G+H)/2) = 1/3 = 33.3%.

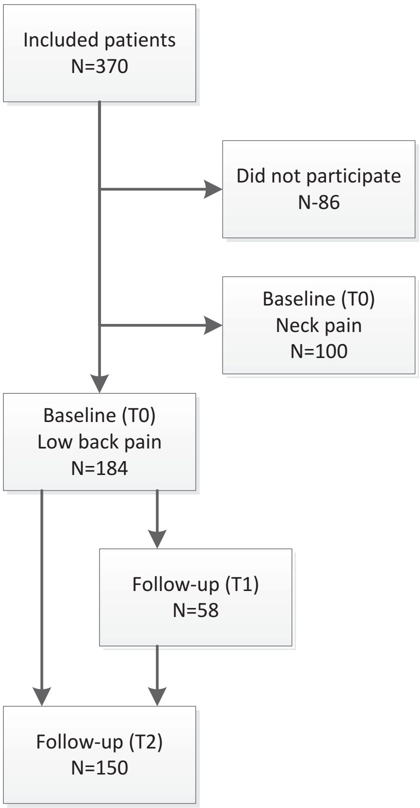

Figure 1.
Patient flow.

validity. Next, we calculated Pearson's correlation coefficient between specific items of the SBT and their respective reference questionnaires based on the comparability of the domains of measurement.[35,36] *A priori* we expected a moderate ($r \geq 0.3$, < 0.5) to high ($r \geq 0.5$) correlation between the SBT activity questions 3 and 4 with the RDQ, kinesiophobia question 5 with the TSK, catastrophizing questions 6, 7, and 8 with the PCS, and the bothersome question 9 with the NPRS. We expected a low correlation ($r < 0.3$) between questions 1 and 2 and the NPRS, as these focus on the location of the pain and not the intensity of pain.

We calculated the reproducibility (evaluating the agreement between 2 measurements) in the patient group that remained stable between baseline (T0) and T1. We asked the patients after 3 days to fill out the questionnaire a second time. Patients were considered stable when they scored "slightly improved," "no change," or "slightly worsened" on the GPE at second measurement. As there is some doubt in the literature whether the GPE actually can detect change, we combined the stable GPE score with a stable pain score, meaning the NPRS on T1 was plus or minus one point compared with baseline.[3] We calculated the quadratic weighted kappa and the specific agreement. The quadratic weighted kappa will be interpreted as ≤0 = poor agreement; .01–.20 = slight; .21–.40 = fair; .41–.60 = moderate; .61–.80 = substantial, and .81–1 = almost perfect agreement.[37] The specific agreement is calculated for each risk profile separately.[35] For example, patients who are "low-risk" on baseline and follow-up are calculated as a proportion of patients that were "low-risk" on either of the 2 measurements. In collaboration with Henrika de Vet we modified the specific agreement to fit a 3 × 3 table as shown in Table 1 because the original method is done in a 2 × 2 table.

We determined the predictive validity by reporting the relative risk ratio (RR) for "medium-risk" and "high-risk," both compared with "low-risk" in their ability to predict the outcome at 3 months. We defined persisting disability as an RDQ of ≥7, which is equal to the cutoff used in the original study, where it was the median of the baseline scores.[13] Persisting pain is defined as an NPRS above the baseline median, and recovery is defined as either "completely recovered" or "much improved" on the GPE.

Limited content validity is indicated by the presence of more than 15% of the patients reaching either the floor (0/9 points) or ceiling effects (9/9 points) on the SBT.[34]

To measure the construct validity and reliability, a sample size of at least 50 persons is advised. [34]

Results

Patient Population

In total, 41 GPs and 70 physical therapists signed up to participate and 12 GPs and 33 physical therapists actually included patients. They included 370 patients, of whom 184 had LBP and 100 had neck pain for the parallel study; 86 patients did not fill out the baseline questionnaire and were excluded from the analysis. Loss to follow-up at 3 months was 34 (18%) (Figure 1). Patients who were lost to follow-up showed comparable baseline characteristics as the responders. Of the LBP patients, at baseline 96 (52%) patients were categorized as "low-risk," 70 (38%) as "medium-risk," and 18 (10%) as "high-risk" (Table 2). We found no differences between the groups concerning age, sex, or whether they were included by the GP or physical therapist.

Validity and Reproducibility

Construct validity. For each increase in the risk profile we found a corresponding increase in pain, disability, catastrophizing, and kinesiophobia (Table 3), showing that the SBT has good discriminant validity. Next we found a high correlation between SBT question 9 and the NPRS (r = 0.6), questions 3 and 4 with the RDQ, and question 8 with the PCS (all r = 0.5). We found a moderate correlation (r = 0.4) between question 5 and the TSK and questions 6 and 7 and the PCS (both r = 0.3). The correlation between questions 1 and 2 was absent to low

Table 2.
Baseline Characteristics of the Study Population[a]

	Study Population	UK Validation Sample
	(n = 184)	(n = 500)
Female	103 (56.0)	293 (58.6)
Age, y, mean (SD)	44.6 (14.6)	45 (9.7)
SBT risk profile		
Low	96 (52.2)	234 (47.4)
Medium	70 (38.0)	186 (37.7)
High	18 (9.8)	74 (15.0)
Episode duration		
<1 month	53 (28.8)	83 (16.9)
1 to 3 months	26 (14.1)	94 (19.1)
4 to 6 months	12 (6.5)	77 (15.7)
7 months to 3 years	36 (19.6)	125 (25.5)
>3 years	57 (31.0)	112 (22.8)
SBT score, mean (SD)	3.60 (2.0)	3.83 (2.3)
Pain intensity		
Mild (0–5)	63 (34.2)	325 (66.1)
Moderate (5–7)	88 (47.8)	113 (23.0)
Severe (8–10)	33 (17.9)	54 (10.1)
Disability (RDQ), mean (SD)	9.5 (5.9)	9.1 (5.9)
Referred leg pain	54 (29.3)	303 (60.6)
Comorbid pain in neck/shoulder	124 (67.4)	276 (55.2)
Very or extremely bothered by back	94 (51.1)	276 (55.2)
Fear (TSK), mean (SD)	34.8 (7.1)	39.5 (6.9)
Catastrophizing (PCS), mean (SD)	13.7 (10.3)	

[a] Values are numbers (percentage) unless otherwise indicated. SBT = STarT Back Tool (0–9), RDQ = Roland Disability Questionnaire (0–24), TSK = Tampa Scale of Kinesiophobia (17–68), PSC = Pain Catastrophizing Scale (0–42). Pain intensity is measured on a Numeric Pain Rating Scale (0–10). UK validation study performed by Hill in 2008.[13]

and scored $r = 0.28$ and $r = -0.05$, respectively (Table 4). The correlations are as were expected *a priori* and therefore we conclude that the construct validity is good.

Reproducibility. The average time between the first (T0) and second (T1) questionnaires was 6 days (range 3–10). In total, 58 patients completed the second questionnaire, of whom 19 patients were regarded as stable compared with baseline. The quadratic weighted kappa for the SBT of 0.65 (95% CI: 0.34–0.96) showed a substantial reproducibility. The low-risk group had a specific agreement of 82.4%, medium-risk of 53.3% and high-risk of 33.3%, showing an excellent to fair reproducibility.

Predictive validity. In total, 150 patients completed the T2 questionnaire, of whom 76 were regarded as low-risk at baseline, 58 as medium-risk, and 16 as high-risk. In all 3 risk profiles a decrease in NPRS and RDQ scores over time was seen. The number of patients with a decrease that met the threshold (RDQ < 7) was highest in the medium-risk group (Table 5). Persisting pain is set as NPRS ≥ 6. The RRs for medium-risk at 3 months compared with low-risk were 1.8 (95% CI: 1.0–3.1) for persisting disability, 1.6 (95% CI: 0.9–3.0) for persisting pain, and 1.0 (95% CI: 0.7–1.3) for recovery. For high-risk compared with the low-risk group, the RRs were 2.7 (95% CI: 1.4–4.9) for persisting disability, 3.4 (95% CI: 2.3–6.8) for persisting pain, and 0.6 (95% CI: 0.3–1.2) for perceived recovery. An RR of 3.4 means that patients with high risk had 3.4 times higher chance for persisting LBP compared with patients with low risk. Some confidence intervals include 1 (= equal risks), making it statistically insignificant.

Content validity. We analyzed 184 baseline questionnaires concerning the SBT in determining floor and ceiling effects. Nine patients (4.9%) scored zero and 2 patients (1.1%) scored 9 points, implying that no floor or ceiling effects were present and therefore the SBT showed a good content validity.

Discussion

Main Findings

The SBT is a formative model aiming to give a prognosis on poor disability. The construct validity showed correlations as *a priori* were expected between SBT items with their respective reference questionnaires (NPRS, RDQ, TSK, and PSC). The retest reliability is moderate to good, and the RR demonstrates an increased chance for persisting disability and pain with an increase of the risk profile. An expert committee found the questions to be relevant and 20 patients used the SBT and comprehended all questions. Furthermore the absences of floor and ceiling effects confirmed a good content validity.

Interpretation of Findings

The specific agreement, as a measurement to determine the reproducibility, shows a fairly accurate intra-observer consistency for patients with a low-risk score. The accuracy decreases as the risk profile increases. This might be due to the relatively low number of patients in this high-risk category. Also, in high-risk patients multiple psychosocial factors are present, which can be influenced during therapy by addressing an active health behavior and the unlikeliness of a serious underlying condition.[38] The latter is probably less of influence as the questionnaire at baseline is given after the first treatment during which the psychosocial factors and the active health behavior are likely to have been addressed. Patients might have been influenced by this information

Table 3.
Characteristics of Patients in the Risk Profiles[a]

	Low Risk	Medium Risk	High Risk
SBT, *N* (%)	96 (52.2)	70 (38.0)	18 (9.8)
RDQ	6.5 (4.9)	11.8 (5.1)	16.7 (3.1)
NPRS	5.2 (1.8)	6.5 (1.5)	7.2 (1.6)
TSK	32.4 (5.9)	35.4 (6.6)	44.6 (6.2)
PCS	10.0 (7.9)	15.0 (9.5)	28.6 (10.6)

[a] Values are mean scores (SD) unless otherwise indicated. SBT = STarT Back Tool (0–9), RDQ = Roland Disability Questionnaire (0–24), NPRS = Numeric Pain Rating Scale (0–10), TSK = Tampa Scale of Kinesiophobia (17–68), PSC = Pain Catastrophizing Scale (0–52).

Table 4.
Pearson's Correlation Between the STarT Back Tool and Reference Questionnaires[a]

SBT and Reference		Correlation		
	A priori	*r*		Expected
Q1 – NPRS	*r* < 0.30	0.28	Low	Yes
Q2 – NPRS	*r* < 0.30	−0.05	Low	Yes
Q3 – RDQ	*r* ≥ 0.30	0.48	Moderate	Yes
Q4 – RDQ	*r* ≥ 0.30	0.49	Moderate	Yes
Q5 – TSK	*r* ≥ 0.30	0.38	Moderate	Yes
Q6 – PCS	*r* ≥ 0.30	0.34	Moderate	Yes
Q7 – PCS	*r* ≥ 0.30	0.28	Low	No
Q8 – PCS	*r* ≥ 0.30	0.46	Moderate	Yes
Q9 – NPRS	*r* ≥ 0.30	0.63	High	Yes

[a] *r* = Pearsons correlation, NPRS = Numeric Pain Rating Scale, RDQ = Roland Disability Questionnaire, TSK = Tampa Scale of Kinesiophobia, PCS = Pain Catastrophizing Scale.

during the primary consultation and therefore shifted from the high-risk to the medium-risk group before completing the baseline questionnaire. A previous study suggests that assignment to a risk category following a short delay may more successfully predict final outcomes than when administered during initial assessment.[39]

For the reproducibility analysis the conditions (time, pain, perceived recovery) were set *a priori* to ensure stable patients. Due to the natural course of the pain, patients might be recovering between both measurements, shifting to a lower risk profile and explaining the higher score in the low-risk group. The kappa is influenced by a skewed distribution due to the large proportion of patients with low risk. Nevertheless the kappa shows that the SBT is able to distinguish sufficiently between risk groups.[35] Within the reproducibility analysis we found that 4 out of the 5 patients shifted from high risk to medium risk within the first week. These patients had only one consultation in this period and therefore might have been susceptible to change.

We used RRs to calculate the additional high risk and medium risk compared with low risk. Predicting persisting disability gave the best results, in accordance with the developers' aim. Poor disability is defined as an RDQ score of 7 or more, like the original study and other comparable studies.[13,15–18,38] In interpreting the predictive value it has to be taken into account that clinicians applied "usual care." There was no standardized or stratified therapy protocol for the clinicians to use. We asked the GP or physical therapist to follow the national guidelines, but recent studies show that guidelines are often not followed by the clinician or the patient.[40,41] The clinician was free to apply his/her usual care and adjust therapy in the way that seemed fit.

The confidence intervals of the medium risk and high risk for persisting pain and disability show some overlap, which might suggest a lack of independence but may also be the result of a lack of power. Furthermore, it has to be taken into account that clinicians applied "usual care" and not the advised approach, possibly influencing the outcome, which might explain the overlap.

Findings in the Context of Other Literature

When comparing our results with the results from the UK study, we have to keep in mind that the health care system is different between the countries. Despite these differences, we included, in line with the UK study, all LBP patients disregarding duration of complaints or previously provided health care. In contrast to the UK study, in our study not all patients were seen by their GP, as the therapist also included and treated patients via direct access.

The distribution in risk profiles in our study was well comparable with the distribution in the UK study.[13] All other cohorts all had a shift toward high-risk at the expense of low-risk.[16–19,21] For each increase in risk profile we found an increase in pain, PCS and TSK, this discriminant validity is also found in other studies.[42–44] Other validation studies, such as the Finnish, German, French, and Persian, followed the same method as the initial UK study by using the AUC to determine the validity, thus making it easier to compare.[16,18] In our study we refrained from using the AUC because we chose not to dichotomize the scores of the questionnaires. We used Pearson's correlation coefficient, giving us the correlation information needed, although this made it more difficult to compare our results to other studies. We compared individual questions with their reference questionnaire; the UK study

Table 5.
Three-month follow-up results[a]

	Persisting Pain		Persisting Disability		Recovery	
	NPRS	**RR (95% CI)**	**RDQ**	**RR (95% CI)**	**GPE**	**RR (95% CI)**
Low risk	3.14 (2.38)		3.67 (5.09)		2.28 (0.89)	
Medium risk	3.38 (2.64)	1.59 (0.85–2.96)	5.34 (5.79)	1.80 (1.04–3.11)	2.53 (1.17)	0.96 (0.72–1.29)
High risk	5.13 (2.68)	3.39 (2.31–6.76)	9.19 (7.54)	2.67 (1.44–4.93)	2.56 (0.96)	0.63 (0.33–1.22)

[a] Values are mean scores (SD) unless otherwise indicated. NPRS = Numeric Pain Rating Scale (0–10), RDQ = Roland Disability Questionnaire (0–24), GPE = General Perceived Effects (1–7).

used the total SBT score or the psychosocial subscale to calculate the AUC.

The quadratic weighted kappa for the retest reliability in our study is lower than the one in the UK study (0.79 for the stable patients), but comparable to the German version (0.67).[13,18] This might be due to our small sample size of 19 compared with 295 and 410 in the previously mentioned studies. Our data are also more skewed toward low-risk as a result of a higher percentage of patients in this group, which influences the kappa. Besides using the quadratic weighted kappa, we also calculated the specific agreement.[35] No other studies used this measurement, therefore we can't compare results. Our findings are in accordance with all other studies that evaluated translations of the SBT to be a reliable and valid instrument.[13,15,16,18,19]

Strengths and Limitations

The strength of this study is that we successfully translated the SBT into Dutch and determined the construct validity, reproducibility, predictive validity, and content validity. The advised minimum sample size was met for the validity section. A limitation is that we had a relatively small sample size for the retest reliability study. Also we were not able to compare patients between physical therapist and GP, as we did not have enough patients in both groups. Another limitation is that for practical reasons the patient filled out the baseline questionnaire after receiving the first treatment/consultation. The questionnaire is intended to be filled in before the first consultation/treatment because the patient might change its cognition and therefore influence the results.

Clinical and/or Research Implications

The STarT Back tool has been translated and validated for use in Dutch primary care. It can be used to, in an early stage, predict persisting disability. More important is that it can be used to match the patient to the advised treatment. Further research is needed to determine if this stratified care leads to a faster recovery and in its turn leads to lower health care consumption and lower costs. To further determine the predictive validity, future studies might include a non-intervention (natural course) group.

Conclusion

The SBT has been successfully translated into Dutch and according to the psychometric analysis has shown to be a sufficiently valid and reliable instrument.

Author Contributions and Acknowledgments

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The authors thank all of the general practitioners and physical therapists who included patients for this study. Special thanks go to Nynke Wildervanck for her contribution and to Steven Constandse, Guido Iken, Joost van Broekhoven, and Frans van der Kooij for their extra efforts to reach the needed sample size.

Ethics Approval

The study was approved by the Medical Ethics Committee of Erasmus University, Rotterdam, the Netherlands (MEC-2014-256). For this study, only the data of the patients with LBP of the PRINS-cohort were used.

Funding Support

This study was undertaken with financial support of the CZ Healthcare Insurance Company and the Dutch Arthritis Association.

Disclosures and Presentations

The authors declare no conflicts of interest.

DOI: 10.1093/ptj/pzx023

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Appendix

Dutch Version of the STarT Back Tool.

A. The Keele STarT Back Screening Tool

Patient name: ________________________________ Date: _____________

Thinking about the **last 2 weeks** tick your response to the following questions:

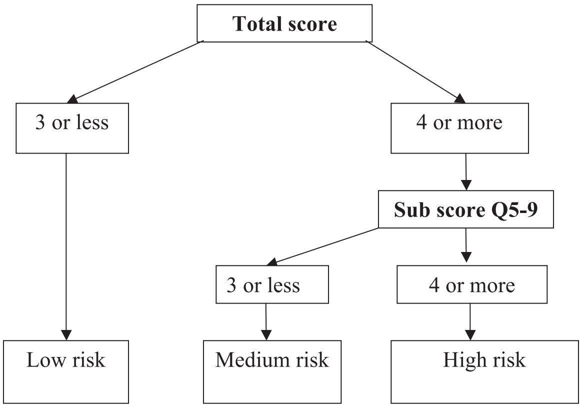
		Disagree	Agree
		0	1
1	My back pain has **spread down my leg(s)** at some time in the last 2 weeks.	□	□
2	I have had pain in the **shoulder** or **neck** at some time in the last 2 weeks.	□	□
3	I have only **walked short distances** because of my back pain.	□	□
4	In the last 2 weeks, I have **dressed more slowly** than usual because of back pain.	□	□
5	It's not really safe for a person with a condition like mine to be physically active.	□	□
6	**Worrying thoughts** have been going through my mind a lot of the time.	□	□
7	I feel that **my back pain is terrible** and **it's never going to get any better**.	□	□
8	In general I have **not enjoyed** all the things I used to enjoy.	□	□

9 Overall, how **bothersome** has your back pain been in the **last 2 weeks**?

Not at all	Slightly	Moderately	Very much	Extremely
□	□	□	□	□
0	0	0	1	1

Total score (all 9): __________________ **Sub Score (Q5-9):**______________

The STarT Back Tool Scoring System



B. The STarT Back Screening Tool: Dutch Version

Rugscreenings Instrument

Auteur:

✓ *M van Hooff, W van Lankveld, P Anderson, A Apeldoorn, F van Hartingsveld, R Ostelo (2011)*

✓ *Oorspronkelijke versie:* Jonathan Hill et al[1] (http://www.keele.ac.uk/sbst/)

Naam: ______________________________ Datum: ____________

Antwoord u alstublieft ieder onderdeel. Kruis bij ieder onderdeel het vakje aan dat op u van toepassing is. Soms is het moeilijk om tussen twee vakjes te kiezen, kruis dan het vakje aan dat uw probleem het beste beschrijft. Kruis niet meer dan één vakje per onderdeel aan!

Denk bij het beantwoorden van de volgende vragen telkens aan de situatie **in de laatste 2 weken.**

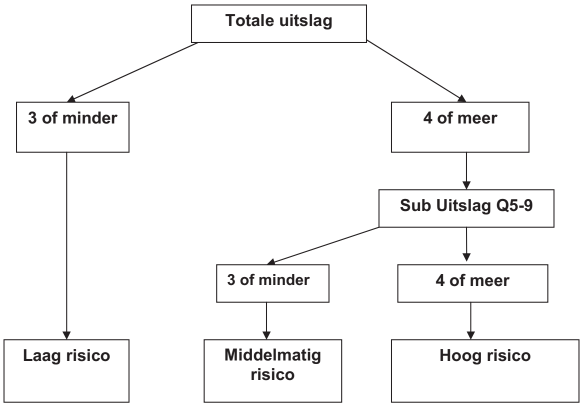
		Oneens	**Eens**
		0	1
1	In de laatste 2 weken **straalde** mijn rugpijn wel eens **uit naar één of beide benen.**	□	□
2	In de laatste 2 weken heb ik wel eens pijn in mijn **schouder** of **nek** gehad.	□	□
3	Vanwege mijn rugpijn **liep** ik alleen **korte afstanden**.	□	□
4	In de laatste 2 weken **kleedde ik me trager** dan gewoonlijk **aan** vanwege mijn rugpijn.	□	□
5	Voor iemand in mijn toestand is het echt niet veilig om lichamelijk actief te zijn.	□	□
6	**Ongeruste gedachten** gingen vaak door mijn hoofd.	□	□
7	Ik vind dat mijn **rugpijn verschrikkelijk** is en ik geloof dat **het nooit meer beter zal worden**.	□	□
8	Over het geheel genomen heb ik **niet genoten** van alle dingen waar ik vroeger wel van genoot.	□	□

9 Over het geheel genomen, hoe hinderlijk was uw rugpijn in de laatste 2 weken?

In het geheel niet	Een beetje	Matig	Erg	Extreem
□	□	□	□	□
0	0	0	1	1

Totale uitslag (alle 9) : ________________ Sub Uitslag (Q5-9):____________

The STarT Back Tool Scoren van Systeem



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