Chula Med J Vol. 66 No. 4 October - December 2022;391-396 DOI : 10.14456/clmj.2022.47

Original article

Reliability of the Thai version of the modified STarT Back Screening Tool in individuals with neck pain

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Backgrounds: The modified STarT Back Screening Tool in Thai version (mSBST-TH) for individuals with neck pain (NP) was adapted from the STarT Back Screening Tool in Thai version (SBST-TH) for individuals with low back pain (LBP) to classify individuals with NP into low, medium, and high risk for chronicity. Owing to a lot of individuals with NP in Thailand. It would be beneficial if the mSBST-TH was available to help primary care management in Thai individuals with NP. However, the reliability of this tool has not been investigated.
Objective: The aim of this cross-sectional study was to investigate the reliability of the mSBST-TH for individuals with NP.
Methods: A total of 261 subjects (aged 20 - 70 years) with NP in Phitsanulok Province completed the mSBST-TH for evaluating the internal consistency. The test-retest reliability was assessed by 50 subjects who completed the mSBST-TH twice, with an interval of two days.
Results: The test-retest reliability of the mSBST-TH was 0.81 (95% confidence interval [CI]: 0.69 - 0.88) for the total score and 0.70 (95% CI, 0.53 - 0.82) for the psychosocial subscore. The internal consistency was 0.73 for the total score (range 0.68 - 0.74). The standard error of measurement (SEM) was 0.564 (total score) and 0.559 (psychosocial subscore). Lastly, the minimal detectable change of the mSBST-TH total score was 1.563.
Conclusion: The mSBST-TH is a reliable tool to classify individuals with NP, with acceptable test-retest reliability and internal consistency.

Keywords: STarT back screening tool, neck pain, reliability.

Neck pain (NP) is an essential health problem among the general population, affecting 288.7 million people globally.[1] Although NP conditions can be recovered fully within one year, recurrent symptoms and chronicity have been commonly shown.[2, 3] This leads to international socioeconomic burden (e.g., work absenteeism and lost productivity).[2] In the US, the cost of managing low back pain (LBP) and NP is around $487 - $950 per patient per year.[4] In Thailand, following LBP, NP is reported as the second most common musculoskeletal problem.[5] Moreover, both physical (e.g., pain and disability) and psychosocial problems (e.g., pain catastrophizing and fear avoidance) could be found in individuals with NP.[6] Therefore, these perspectives should be considered for managing individuals with NP.

Stratified treatment has been commonly developed to maximize clinical efficiency and cost-effectiveness based on the burden of LBP patients and their effects on socioeconomic burden. The STarT Back Screening Tool (SBST) is a known tool to classify patients into subgroups.[7] Originally, the SBST was developed as a self-report screening tool to enhance the UK practitioners' performance in terms of classifying patients into low, medium, and high-risk groups for chronicity.[8] It consists of nine items, focusing on both physical (items 1- 4) and psychosocial (items 5 - 9) problems.[7] The SBST can lead to providing appropriate optimal treatment for individuals at each risk group (e.g., education and advice for the low-risk group).[7, 8] The findings can save the cost of managing LBP per patient by almost £675 for socioeconomic burden and approximately £34.39 for healthcare services.[8] It would be advantageous if the mSBST could be used for individuals with NP.

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Received: March 29, 2021
Revised: April 21, 2021
Accepted: May 18, 2021

The modified SBST (mSBST) has been modified from SBST for individuals with LBP to use in individuals with NP by Bier JD, *et al*. [9, 10], because in the Netherlands, the SBST cannot be used suitably for LBP and NP. The findings indicated that the mSBST was a good content valid and adequately reliable tool.[10] In Thailand, the SBST has been translated into Thai for LBP management, with acceptable validity and reliability.[11] Also, it was translated and cross-cultural adapted in Thai patients with NP. Unfortunately, reliability study is not investigated. Therefore, the purpose of this study was to examine the reliability of the mSBST-TH consists of internal consistency, test-retest reliability, standard error of measurement (SEM), and minimal detectable change (MDC) in order to provide evidence of the mSBST for future research and clinical settings. We hope that the mSBST could be used to manage Thai patients with NP and declined socioeconomic burden owing to NP in Thailand.

Materials and methods

This cross-sectional study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline for reporting outcomes and the study protocol has been approved by the Institutional Review Board of Naresuan University (NU-IRB P10031/63), and registered with Thai Clinical Trials Registry (no. TCTR20200505007).

Participants

This study recruited subjects from August to December 2020. Two hundred and sixty-one subjects with NP grade I-III [12] (aged 20 - 70 years) in Phitsanulok Province, could speak, read, write, and understand Thai were included based on the COSMIN checklist.[13] The subjects were briefed on the data collection protocol and they were given an information sheet and a consent form ahead of time, so they could ask questions, confirm their eligibility, and provide written consent. Prior to recruitment, each subject was requested to sign an informed consent form. Potential participants were screened using a physical therapist. The exclusion criteria were a specific underlying or major structural pathology such as, history of spinal surgery, spinal myelopathy, vertebral fracture, tumors, systemic diseases with a possible effect on the musculoskeletal system, and clinically cognitive impairment.

Instruments

Modified STarT Back Screening Tool in Thai version (mSBST-TH)

The mSBST is a simple screening tool with nine items (eight items as agree/disagree questions, and last item as a five-point Likert scale).[10] Physical factors are evaluated in items 1 - 4, and psychosocial factors are evaluated in items 5 - 9. Individuals with a total score of 3 or less were categorized as low-risk group. Individuals with a total score of 4 but a psychosocial subscore of 3 or less were categorized as medium-risk group. Individuals with a psychosocial subscore of 4 or more were classified into the high-risk group.[10]

Statistical analysis

Descriptive statistics were used to calculate subjects' demographic and clinical characteristics, consist of age, gender, education level, symptom duration, mSBST-TH score, and reference standard questionnaire scores. The reliability was calculated using the SPSS statistical package (version 17). Data were expressed as mean, standard deviation (SD), and standard error of the mean (SEM). $P < 0.05$ were considered as statistical significant.

Internal consistency

Cronbach's coefficient was used to assess the internal consistency of the mSBST-TH and each of its items. Acceptable internal consistency is demonstrated by a Cronbach's value greater than 0.7.[14]

Test-retest reliability and agreement

The intraclass correlation coefficient ($ICC_{(3,1)}$) was used to evaluate the test-retest reliability of the mSBST-TH in 50 subjects. The subjects were asked to complete the mSBST-TH twice, with a two-day interval to avoid any memories of previous responses and variations in clinical conditions.[15] The ICC was interpreted as follows: 0 = no reliability; < 0.5 = unacceptable; 0.5 – < 0.6 = poor; 0.6 – < 0.7 = questionable; 0.7 – < 0.8 = acceptable; 0.8 – < 0.9 = good; ≥ 0.9 = excellent; and, 1 = perfect reliability.[16] The standard error of measurement (SEM) and minimal detectable change (MDC) were evaluated by the following equations: SEM = standard deviation of all test scores × $\sqrt{1 - ICC}$ and MDC = 1.96 × $\sqrt{2}$ × *SEM*, respectively.[17]

Results

A total of 261 individuals with NP (115 males and 146 females) participated in this study. The subjects' demographic and clinical characteristics are presented in Table 1.

Internal consistency

The mSBST-TH total score had a Cronbach's alpha coefficient of 0.73, indicating acceptable internal consistency.[14] The internal consistency (item by item) is shown in Table 2.

Test-retest reliability

The reliability for the mSBST-TH total score and psychosocial subscore was good and acceptable reliability with ICC, 0.81 (95% confidence interval [CI], 0.69 – 0.88) and 0.70 (95% CI, 0.53 – 0.82), respectively.[16] Table 3 presents the mean, standard deviation, and ICC for the two testing sessions.

Agreement

The total score and psychosocial subscore of the mSBST-TH had a SEM of 0.564 and 0.559, respectively. MDC were found to be 1.563 and 1.549, respectively. Table 3 shows agreement of the mSBST-TH.

Table 1. Demographic and clinical characteristics of the subjects (n = 261).

Variables	n (%)	Mean ± SD
Age (year)		37.1 ± 13.6
Genders		
Male	115 (44.1)	
Female	146 (55.9)	
Education		
Primary school	23 (8.8)	
High school	127 (48.6)	
Bachelor's degree	79 (30.3)	
Master's degree	25 (9.6)	
Doctoral degree	2 (0.8)	
Others	5 (1.9)	
Duration of neck pain		
< 4 weeks	49 (18.8)	
≥ 4 weeks, < 3 months	26 (10.0)	
≥ 3 months	186 (71.2)	
mSBST-TH		
Total score (0 - 9)		3.3 ± 2.4
Subscore (0 - 4)		1.9 ± 1.5
mSBST-TH risk profile		
Low	162 (62.1)	
Medium	50 (19.1)	
High	49 (18.8)	

SD = Standard Deviation; mSBST-TH = modified STarT Back Screening Tool in Thai version

Table 2. The internal consistency of the mSBST-TH (n = 261).

Items	Cronbach's α if item deleted
1	0.699
2	0.725
3	0.700
4	0.740
5	0.722
6	0.709
7	0.680
8	0.689
9	0.701

Table 3. Test-retest reliability, SEM, and MDC of the mSBST-TH (n = 50).

	Mean ± SD		ICC (95% CI) *P* - value	SEM	MDC
	First test	Second test			
mSBST-TH total score	3.0 ± 2.4	3.2 ± 1.9	0.81 (0.69 - 0.88) < 0.001*	0.564	1.563
Psychosocial subscore	1.8 ± 1.5	2.1 ± 1.2	0.70 (0.53 - 0.82) < 0.001*	0.559	1.549

* Statistical significance $P < 0.05$. SD = standard deviation; ICC = intraclass correlation coefficient; CI = confidence interval; SEM = standard error of measurement; MDC = minimal detectable change; mSBST-TH = modified STarT Back Screening tool in Thai version

Discussion

This study aimed to evaluate the reliability of the mSBST-TH consists of internal consistency, test-retest reliability, SEM, and MDC. The findings suggested the mSBST-TH had acceptable reliability in Thai individuals with NP.

The Cronbach's alpha coefficient of the mSBST-TH for the total score was 0.73, demonstrating acceptable internal consistency and representing the consistent concept of the mSBST-TH. The acceptable internal consistency of the mSBST-TH might come from adapting from the SBST-TH, which was translated and cross-cultural adapted according to standardized guidelines.[18] Additionally, the SBST-TH has demonstrated satisfactory validity and reliability.[10] Furthermore, the sample size > 100 subjects according to the COSMIN Study Design Checklist may lead to a good result of internal consistency.[13] Unfortunately, the internal consistency of the mSBST for individuals with NP has not been investigated in previous studies.[10] However, our finding was similar to the SBST (LBP version), such as the original English (0.79),[7] Persian (0.83),[19] and Japanese (0.75)[20] versions. Furthermore, the Cronbach's alpha coefficient of the mSBST-TH for each of its items ranged from 0.680 to 0.740, and the difference values between each item ≤ 0.1 represented that all items are relevant.[14] Unfortunately, the previous studies of the mSBST for individuals with NP was not assessed the Cronbach's alpha coefficient for item by item.[10] However, similar finding was found in the SBST-TH (LBP version).[11]

The ICC of the mSBST-TH for total score and psychosocial subscore were 0.81 and 0.70, respectively, indicating good and acceptable test-retest reliability.[16] That might come from suitable time interval and sample size ≥ 50 subjects based on the COSMIN Study Design Checklist, might result in a good reliability.[13] Unfortunately, our results of the test-retest reliability cannot be compared with the previous study of the mSBST for individuals with NP due to the differences in statistical analysis (quadratic-weighted kappa and specific agreement used).[10] However, our results were similar to that of the SBST (LBP versions), such as the original English (ICC for the total score = 0.79, subscore = 0.76)[7] and Finnish (total score = 0.78) versions.[21] This study chose the interval time of two days to minimize changes in the patient's health status and recall bias, while the original English and Finnish versions used interval time as 14 days and one to seven days, respectively.[7, 21] However, the ICC of this analysis is lower than the Chinese version (0.933), which used a 24 to 48 hours interval time.[22] A long-time interval could cause a change in the patient's health status, interfering with the test-retest, whereas a short time interval could cause recall bias.

The agreement of mSBST-TH was evaluated by the SEM and MDC. The SEM of the mSBST-TH (total score) was 0.564 and 0.559 for the psychosocial subscore, representing individuals' true scores may be higher or lower than the SEM. Currently, the SEM has been calculated only Thai (LBP version)[11] and Brazilian[23] versions which were 0.74 and 1.9, respectively. The SEM of this study are close to the Thai and lower than the Brazilian versions. This might be due to our study and the SBST-TH (LBP version) were using the same interval time (two days),[11] while the Brazilian version used two to seven days.[23] The MDC of the mSBST-TH was 1.563 and

1.549 for the total score and psychosocial subscore, respectively. A score equal or higher than the MDC values means that the patient has improved rather than a measuring error. Unfortunately, the MDC was determined only the SBST-TH (LBP version), with 2.04 for the total score and 1.60 for the subscore.[11]

Conclusion

The results of this study presented acceptable internal consistency and test-retest reliability of the mSBST-TH. Therefore, the mSBST-TH can be used in both research and clinical settings to classify Thai individuals with NP into subgroups: low, moderate, and high risk for chronicity.

Acknowledgements

The authors would like to thank all subjects for participating in this study.

Conflict of interest

The authors, hereby, declare no conflict of interest.

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