

## Observational Studies

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# Adding information on multisite and widespread pain to the STarT back screening tool when identifying low back pain patients at risk of worse prognosis

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### Abstract

**Objectives** – The STarT Back screening Tool (SBT) captures patients with low back pain (LBP) at risk of worse prognosis. However, the SBT does not include assessment of multisite and chronic widespread pain (MS-CWP). The aim was to study the differences in prognostic factors in patients with LBP classified according to SBT or SBT in combination with MS-CWP, and the 1-year outcome regarding visits to physiotherapist and sickness absence, in relation to risk scorings.

**Methods** – In this 1-year prospective study, adults (18–67 years) seeking care for LBP in primary care were classified into three prognostic risk groups (low, medium, high), using SBT only and using a combined screening tool (SBT and MS-CWP). Differences in prognostic factors at baseline, and outcome in terms of number of physiotherapist visits and

sickness absence the year after inclusion were compared for risk groups derived by the two methods.

**Results** – Eighty-four patients (61% women) were included in the study. According to SBT alone, 19 were classified as low risk, 48 as medium risk, and 17 as high risk. When using the combined screening tool, additionally seven patients from the medium risk group were classified as high risk. Patients classified as high risk by SBT only or by the combined screening tool showed similar statistically significant worse mental health, health status, kinesiophobia, physical function, and sleep, as compared to the low-risk group. There were no differences in visits to physiotherapist and sickness absence between the risk groups for neither of the tools.

**Conclusion** – The combined screening tool resulted in more patients being classified as high risk than with SBT alone. The three risk groups identified either by SBT alone or by the combined screening tool differed significantly on all investigated prognostic factors, suggesting that including MS-CWP to the SBT captures more patients at risk.

**Keywords:** low back pain, screening tool, primary care, multisite pain, chronic widespread pain

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### Abbreviations

CWP	chronic widespread pain
EQ-5D	EuroQol-5 domain
FABQ	fear-avoidance beliefs questionnaire
HAD-A and HAD-D	hospital anxiety and depression scale
KSQ	Karolinska sleep questionnaire
LBP	low back pain
MS-CWP	multisite chronic widespread pain
PA	physical activity
RMDQ	Roland-Morris disability questionnaire
SBT	subgroups for targeted treatment back screening tool

# 1 Introduction

The point prevalence of low back pain (LBP) is around 13% in Europe [1]. LBP is most often transitory, although recurring episodes are common [2]. LBP may contribute to substantial consequences for the individual with activity limitations, participation restrictions, costs due to medical care, and productivity loss [3,4], and LBP is one of the most common causes of disability globally [5]. Most commonly, LBP is non-specific, when no known disease, pathology, or anatomical structure can explain the onset of pain [3], and <10% of the cases are serious, caused by a specific pathophysiological mechanism [6]. Approximately 20% of those suffering from LBP develop chronic LBP (pain present for at least 3 months during the past year) [2,7].

In primary care, history-taking and physical examination triage the patient to the most appropriate management. If the LBP is not serious, non-pharmacological therapies are recommended as the first option in both acute and persistent non-specific LBP [8]. These guidelines include advice to stay active, information about the good prognosis, and the nature of LBP symptoms. The management of persistent LBP includes pain relief using an exercise programme, cognitive behavioural therapy, or multidisciplinary therapy [8–12].

Primary care has a huge mission in the management of patients with LBP, especially for those with recurrent episodes as they have worse prognosis and are more costly [2,13]. Thus, there is a need for strategies early in the management to screen for patients with a high risk of worse prognosis. To better understand an individual's risk, it is important to have knowledge of prognostic factors of worse prognosis from a biopsychosocial perspective. This includes old age, low general health, radiating pain, stress symptoms, depression, high pain intensity, heavy physical work demands, low physical function [14–17], previous sickness absence due to LBP, low education level [14], unemployment, low job satisfaction, low social support, kinesiophobia (fear-avoidance of movement), and catastrophising [15,16,18]. Further, having multisite pain, and to have another chronic pain condition are associated with worse prognosis of chronic LBP [18,19] and higher health care utilisation [20]. In the updated chronic widespread pain (CWP) criteria (WP2019), a total pain site score of  $\geq 7$  is associated with more severe clinical symptoms [21].

Different prognostic screening tools have been tested by clinicians to identify patients with LBP at risk of worse prognosis [22–24]. The STarT (Subgroups for Targeted Treatment) back screening tool (SBT), a validated easy-to-use tool for clinicians, has proven useful in identifying patients at risk. The SBT differentiates patients in low, medium, or high risk of worse prognosis, which can be used as support when

planning an appropriate level of treatment [22,25,26]. Low risk implies management with education and general advice to stay active, medium risk physiotherapy, and high risk a combination of physical therapy and cognitive behavioural therapy [22].

It is important to consider risk factors of worse prognosis in patients seeking primary care identify those at high risk of developing chronic conditions and deciding the correct evidence-based treatment level [8,12]. The SBT captures important prognostic risk factors [22,25–27] but has shown some limitations in identifying patients at high risk of chronic conditions [24,28]. Adding information on pain distribution from a pain mannequin to refine the screening further has shown a potential to better distinguish between medium and high risk in a general population [29], but has not yet been tested among patients seeking care for LBP in a clinical setting. Using both SBT and information on multisite CWP (MS-CWP) may improve early detection of patients at high risk of worse prognosis, that would otherwise be missed by the use of SBT alone [25,29]. Adding information of MS-CWP may also increase the possibility of identifying those patients who are at risk of high healthcare consumption, including more visits to physiotherapists and sickness absence.

The aim of this work is to study the differences in prognostic factors in patients with LBP classified according to SBT or SBT in combination with MS-CWP, and the 1-year outcome regarding visits to physiotherapist and sickness absence, in relation to risk scorings.

## 2 Method

### 2.1 Study design

This 1-year prospective study included patients seeking primary care for LBP in southwest Sweden during 2018–2019 at one of the five included primary health care units. After giving informed consent, the patients filled in a questionnaire. Data on the number of visits to a physiotherapist and sickness absence during the subsequent year after inclusion were recorded based on registered data. The study was approved by the Regional Ethical Review Board at Lund University in Sweden (Dnr 2016/325).

### 2.2 Patients

The study included patients seeking care for a new episode of LBP and were booked for an initial visit to a

physiotherapist. Inclusion criteria were seeking healthcare for LBP (acute, subacute, episodic, chronic), aged 18–67 years, and mastering the Swedish language. LBP was defined as pain, muscle tension, or stiffness localised below the costal margin and above the inferior gluteal folds, with or without leg pain [30]. Patients with pregnancy or having potentially serious disorders (malignancy, fracture, cauda equina, or hernias) were excluded.

## 2.3 Instruments

Two screening tools, SBT and MS-CWP, were used. The SBT differentiated three risk levels of worse prognosis for chronic pain and symptoms: low, medium, and high. The MS-CWP, differentiated two risk levels of worse prognosis for chronic pain and symptoms, if  $\geq 7$  painful regions were reported in addition to CWP or not. The questionnaire also included patient-reported outcome instruments of prognostic factors in addition to patient characteristics.

### 2.3.1 SBT

The SBT included nine questions concerning physical and psychosocial risk factors for worse prognosis [22,25]. Patients agree or disagree with the first eight questions. The last question used a Likert scale 1–5, not at all to extremely. The sum of the items was calculated, giving both a total score of risks and a subscale score of the psychosocial risks stratifying the patients to low, medium, or high risk of worse prognosis. The high-risk group included patients with scorings  $\geq 4$  on psychosocial risks. The medium risk group included patients with an overall score of  $\geq 4$ . A low risk is defined in those patients with an overall score of  $< 4$  [22,25]. The SBT has shown acceptable validity and reliability to identifying patients at risk of worse prognosis [26,31–33].

### 2.3.2 Screening for MS-CWP by pain mannequin

CWP was assessed by a key item: *Have you experienced pain lasting more than 3 months during the last 12 months?* followed by a mannequin with 18 predefined bodily regions in the musculoskeletal system [34]. CWP was defined according to the American College of Rheumatology 1990 criteria for fibromyalgia [35] as pain present in both the left and right side of the body, above and below the waist, and in the axial skeleton. In addition, the pain should have lasted for  $\geq 3$  months. If chronic pain was present, without fulfilling

the criteria for CWP [35], the patients were classified as having chronic regional pain. Patients who had not experienced pain lasting  $\geq 3$  months during the last year were categorised as no chronic pain.

A further distinction was made for classification of MS-CWP in accordance with the revised WP2019 CWP criteria, fulfilled if  $\geq 7$  painful regions were reported [21], in addition to CWP. This additional criterion including  $\geq 7$  painful regions has previously been seen to be associated with worse pain prognosis [36].

### 2.3.3 Principles of the combined screening tools

In the combined screening tool, patients classified as high or low risk by SBT alone remained in their classification regardless of their score of MS-CWP. However, when patients were classified as medium risk by the SBT, information on MS-CWP were added to further distinguish between high and medium risk. If the patient reported MS-CWP in combination with medium risk on SBT alone, the patient was re-classified from medium to high risk.

### 2.3.4 Prognostic factors at baseline

Mental health was assessed by the hospital anxiety (HAD-A) and depression (HAD-D) scales. The two scales range scores between 0 and 21 (no distress to maximum distress) [37]. Health status was assessed by EuroQol-5 domain questionnaire-3L (EQ5D) 0–1 (no health to full health) [38]. Kinesiophobia for physical activity (PA) and work affects the pain experience was assessed by the fear-avoidance beliefs questionnaire (FABQ). The FABQ-PA scores between 0 and 24, and the FABQ-work between 0 and 42 (no fear to high fear and avoidance behaviour) [39]. Low back pain in relation to physical function or disability was assessed by the Roland-Morris disability questionnaire (RMDQ), with a score of 0–24 (no disability to maximum disability) [40]. Sleep disturbance was assessed by Karolinska sleep questionnaire (KSQ). The score ranged between 5 (no problems with sleep) and 25 (severe problems with sleep) [41].

### 2.3.5 Outcome data from the year following baseline

Registered data on visits to a physiotherapist (categorized into  $\leq 6$  or  $> 6$  visits) and sickness absence were assessed for 1 year starting from the date of inclusion. Sickness absences were obtained from the Swedish Social Insurance Agency. When sickness absence exceeds 14 consecutive days, the

individual is entitled to sickness benefits, thus the registry only contains data when it exceeds 14 days. In this study, sickness absence was defined as present if at least one period of sickness absence was registered in the year after inclusion. Sickness absence was dichotomised into present (yes) or not present (no).

## 2.4 Statistical analyses

The data were not normally distributed, thus non-parametric methods were used. Median values and min-max values are presented.

Differences regarding the prognostic factors between low, medium, and high-risk groups were made using the Kruskal Wallis test, and Pearson's chi-square test or Fisher's exact test were used for categorical variables. The analyses were made when using both the SBT classification alone and the combined screening.

Differences between those who remained in the medium risk group using the combined tools, and those who were re-classified to high risk when combining the screening tools were analysed using a Mann-Whitney U test. In all analyses, a  $p$ -value of  $<0.05$  was considered significant. All analyses were made using SPSS, version 24.0 statistical package.

## 3 Results

In all, 95 patients (58 women [61%] and 37 men [39%]) were enrolled in the study. Out of these, 84 (88%) responded to all items in the SBT and on the pain mannequin, which was a condition that had to be fulfilled to enter the analysis. A majority (75%) had sought care for LBP previously (Table 1). When classifying the patients according to the SBT alone, 19 (23%) were considered as low risk, 48 (57%) as medium risk, and 17 (20%) as high risk. Within the high-risk group, 35% reported no chronic pain, 29% reported chronic regional pain, 12% reported non-multisite CWP, and 24% reported MS-CWP.

When classifying according to SBT, there were statistically significant differences in prognostic factors; anxiety, depression, health status, kinesiophobia PA and work, physical function, and sleep disturbances between the three groups (Table 2), with worse scores when classified to a higher risk group. There was no difference in age or sex between the three risk groups.

When using the combined screening tool, seven of the patients in the medium risk group (classified by SBT alone),

**Table 1:** Characteristics of the patients included in the study

	All N = 84	Women N = 49	Men N = 35
<b>Age; Median (min-max)</b>	42 (19–67)	41 (19–67)	44 (19–66)
<b>Education; n (%)</b>			
Primary school	7 (9)	4 (8)	3 (10)
Secondary school	40 (51)	23 (48)	17 (57)
University	28 (36)	20 (42)	8 (27)
Other	3 (4)	1 (2)	2 (7)
<b>Previously sought care for LBP; n (%)</b>			
No	20 (25)	11 (22)	9 (28)
Yes	61 (75)	38 (78)	23 (72)
<b>If yes, how long ago? n (%)</b>			
<3 months ago	23 (35)	13 (33)	10 (38)
3–6 months ago	4 (6)	3 (8)	1 (4)
6–12 months ago	9 (14)	6 (15)	3 (12)
12–24 months ago	10 (15)	5 (13)	5 (19)
>24 months ago	19 (29)	12 (31)	7 (27)

who reported MS-CWP, were re-classified to the high-risk group of worse prognosis.

The three risk groups, as identified when using the combined screening tool, showed a similar pattern in their scorings of prognostic factors; sex, age, anxiety, depression, health status, kinesiophobia PA and work, physical function, and sleep disturbance as when using SBT alone for classification (Table 2).

### 3.1 Visits to physiotherapist and sickness absence the year following baseline

There was no significant difference between the three groups when classifying by SBT regarding number of visits to a physiotherapist in the year following baseline. However, the pattern of proportions within each group indicates a smaller proportion with  $>6$  visits within the low-risk group compared to the medium- and high-risk groups. Even if the difference did not reach statistical significance, a trend towards a larger proportion among the medium risk group being absent from work due to sickness ( $>14$  consecutive days) during the year following baseline were seen (Table 3).

When using the combined screening tool, there was no significant difference between the three groups regarding number of visits to a physiotherapist. However, the pattern of proportions within each group indicates a higher proportion of patients in the high-risk group with  $>6$  visits to the physiotherapist in the year following baseline than in the medium- and low-risk group. However, the difference was not statistically significant. There was a difference in

**Table 2:** Distribution of prognostic factors in the three risk groups according to SBT alone and when using the combined screening tool,  $n = 84$ 

	Low risk	Medium risk	High risk	<i>p</i> -value
<b>SBT</b>				
<i>N</i> (%)	19 (23)	48 (57)	17 (20)	
Women; <i>n</i> (%)	11 (58)	31 (65)	7 (41)	0.243
Age (years)	38 (20–65)	43 (19–67)	38 (19–65)	0.644
Anxiety (0–21) <sup>a</sup>	2.0 (0.0–16.3)	6.0 (0.0–19.0)	10.0 (5.0–17.0)	0.001
Depression (0–21) <sup>a</sup>	1.5 (0.0–13.0)	4.0 (0.0–20.0)	8.0 (2.0–15.0)	0.003
Health, status (0–1) <sup>b</sup>	0.73 (0.26–0.80)	0.62 (–0.11–1.0)	0.41 (–0.24–1.0)	0.001
Kinesiophobia PA (0–24) <sup>a</sup>	8.5 (0.0–16.0)	14.0 (0.0–24.0)	16.5 (1.0–23.0)	0.002
Kinesiophobia work (0–42) <sup>a</sup>	9.5 (0.0–27.0)	17.0 (0.0–42.0)	26.0 (0.0–36.0)	0.001
Physical function (0–24) <sup>a</sup>	7.0 (1.0–14.0)	13.0 (4.0–22.0)	14.0 (8.0–19.0)	<0.001
Sleep disturbance (5–25) <sup>a</sup>	12.5 (6.0–20.0)	15.0 (6.0–28.0)	19.0 (10.0–30.0)	0.007
<b>Combined screening tool</b>				
<i>N</i> (%)	19 (23)	41 (49)	24 (28)	
Women; <i>n</i> (%)	11 (58)	25 (61)	13 (54)	0.882
Age (years)	38.0 (20.0–65.0)	42.0 (19.0–67.0)	41.5 (19.0–65.0)	0.877
Anxiety (0–21) <sup>a</sup>	2.0 (0.0–16.3)	5.5 (0.0–19.0)	11.0 (5.0–19.0)	<0.001
Depression (0–21) <sup>a</sup>	1.5 (0.0–13.0)	2.0 (0.0–12.0)	8.5 (2.0–20.0)	<0.001
Health status (0–1) <sup>b</sup>	0.73 (0.26–0.80)	0.67 (–0.11–1.00)	0.22 (–0.24–1.00)	<0.001
Kinesiophobia PA (0–24) <sup>a</sup>	8.5 (0.0–16.0)	14.0 (0.0–24.0)	16.0 (1.0–23.0)	0.003
Kinesiophobia work (0–42) <sup>a</sup>	9.5 (0.0–27.0)	16.5 (3.0–42.0)	25.0 (0.0–37.0)	0.001
Physical function (0–24) <sup>a</sup>	7.00 (1.0–14.0)	13.0 (4.0–22.0)	13.5 (8.0–20.0)	<0.001
Sleep disturbance (5–25) <sup>a</sup>	12.5 (6.0–20.0)	15.0 (6.0–28.0)	23.0 (10.0–30.0)	<0.001

Median and min-max presented for continuous variables, number, and percentage for categorical. Differences analysed by Kruskal-Wallis test when continuous variables, Pearson's chi square test when categorical. <sup>a</sup>Higher score indicates worse problems; <sup>b</sup>Lower score indicates worse problems. The combined screening tool using SBT, information of multisite (>7 painful regions), and chronic widespread pain.

proportion with sickness absence between the three groups, where a higher proportion within the medium risk group were absent from work due to sickness (>14 consecutive days) during the year following baseline (Table 3).

The seven patients who were re-classified from medium to high risk when using the combined screening tool scored significantly worse anxiety, depression, health status, and sleep disturbance than the 41 patients who remained in

**Table 3:** Distribution of number of visits to a physiotherapist and sickness absence in the year following baseline, in the three risk groups, when classified according to the SBT alone, and when using the combined screening tool respectively,  $n = 84$ 

	Low risk	Medium risk	High risk	<i>P</i> -value
<b>SBT</b>				
<i>N</i>	19	48	17	
<b>Visits to physiotherapist; <i>n</i> (%)</b>				0.919
≤6	14 (74)	33 (69)	11 (69)	
>6	5 (26)	15 (31)	5 (31)	
<b>Sickness absence; <i>n</i> (%)</b>				0.058
No	16 (84)	27 (56)	13 (76)	
Yes	3 (16)	21 (44)	4 (24)	
<b>Combined screening tool</b>				
<i>N</i>	19	41	24	
<b>Visits to physiotherapist; <i>n</i> (%)</b>				0.577
≤6	14 (74)	30 (73)	14 (61)	
>6	5 (26)	11 (27)	9 (39)	
<b>Sickness absence; <i>n</i> (%)</b>				0.047
No	16 (84)	22 (54)	18 (75)	
Yes	3 (16)	19 (46)	6 (25)	

Differences by Pearson's chi square. The combined screening tool using SBT, information of MS (>7 painful regions) and CWP.

the medium risk group. However, no differences were seen in kinesiophobia PA and work, or physical function. A majority of those who were re-classified when using the combined screening had >6 visits to a physiotherapist during the year following baseline; however, the difference was not statistically significant (Table 4).

## 4 Discussion

In this 1-year prospective study, we compared the easy-to-use SBT with a combined screening tool including information on MS-CWP in addition to the SBT. The combined screening tool classified more patients as high risk of worse prognosis, than if using SBT alone. The risk groups identified with the combined screening tool showed similar differences in health-related characteristics as when using the SBT alone regarding anxiety and depression, health status, kinesiophobia, physical function, and sleep disturbance. Results of both methods – SBT alone or SBT in combination with MS-CWP – indicate a higher proportion of patients with sickness absence in the medium risk groups. However, the differences when using the SBT alone did not quite reach statistical significance.

The risk group categorisation generated from the SBT has been suggested to be used for standardised triage and

decision-making of further treatment. The SBT has been shown to be efficient in referring the patients to management with education and general advice to stay active (low risk); physiotherapy to address symptoms and physical function (medium risk); or a combination of physiotherapy and cognitive behavioural therapy (high risk) [25,42]. Using the SBT in primary care to triage patients with LBP has also been shown to be efficient in reducing symptoms related to physical function (assessed by RMDQ), as compared to treatment as usual in a control group [42], although contrasting results have been reported [43].

Screening with risk stratification is important to better utilise health care resources, including physiotherapy. Early identification of risk could be used as guidance when making decisions for treatment. Both the patient and society benefit from that resources are tailored to the needs. Baseline data on the prognostic health-related factors anxiety, depression, health status, kinesiophobia PA and work, physical function, and sleep disturbance were used to assess risk for worse prognosis in this study. Both when using SBT alone, and when using the combined screening tool, the scores on the health-related factors showed a pattern that followed the risk classification – patients classified as having low risk for worse prognosis scored better health, medium risk slightly worse health, and high risk scored worst health. However, this study indicates that the combined screening tool seems to classify more patients as high risk, and that the

**Table 4:** Distribution of prognostic factors, number of visits to a physiotherapist and sickness absence during the year following baseline in the seven patients who were re-classified to the “high risk” group when using the combined screening tool vs the 41 patients who stayed in the “medium risk” group,  $n = 48$

	Medium risk according to SBT alone ( $n = 41$ )	Transferred to high risk according to combined tool ( $n = 7$ )	<i>P</i> -value
<b>Baseline</b>			
Anxiety (0–21) <sup>a</sup>	5.5 (0.0–19.0)	12.0 (9.0–19.0)	0.004
Depression (0–21) <sup>a</sup>	2.0 (0.0–12.0)	10.0 (4.0–20.0)	0.003
Health status (0–1) <sup>b</sup>	0.67 (–0.11–1.00)	0.22 (0.09–0.73)	0.049
Kinesiophobia PA (0–24) <sup>a</sup>	14.0 (0.0–24.0)	12.0 (8.0–19.0)	0.895
Kinesiophobia work (0–42) <sup>a</sup>	16.5 (3.0–42.0)	18.0 (0.0–37.0)	0.727
Physical function (0–24) <sup>a</sup>	13.0 (4.0–22.0)	12.0 (9.0–20.0)	0.921
Sleep disturbance (5–25) <sup>a</sup>	15.0 (6.0–28.0)	25.0 (11.0–27.0)	0.039
<b>1-year follow-up</b>			
Visits to physiotherapist; $n$ (%)			0.183
≤6	30 (73)	3 (43)	
>6	11 (27)	4 (57)	
Sickness absence; $n$ (%)			0.445
No	22 (54)	5 (71)	
Yes	19 (46)	2 (29)	

Median and min-max presented for continuous variables, number and percentage for categorical. Differences analysed by Mann-Whitney U-test when continuous; by Fisher’s exact test when categorical. <sup>a</sup>Higher score indicates worse problems; <sup>b</sup>Lower score indicates worse problems. The combined screening tool using SBT, information of MS (>7 painful regions) and CWP.

reclassified patients report worse health outcomes (anxiety, depression, health status, and sleep) than the patients who remained in the medium risk group. The high proportion of patients classified as medium risk (57% for SBT alone and 49% for the combined screening tool) is in line with previous studies that used the SBT in patients with LBP in primary care [25,42,44].

The relevance of adding information on pain distribution is in line with a previous study that found CWP as a predictor for high health care utilisation [20]. The current study used the ACR 1990 criteria for fibromyalgia according to which pain should be present in both the left and right side of the body, above and below the waist, and in the axial skeleton [35]. In 2020 a new definition of CWP was suggested, where painful sites should be present in at least four regions (regions are divided by [1] left and [2] right shoulder girdle, upper arm, lower arm, [3] left and [4] right hip, upper leg, and lower leg, and [5] axial skeleton), and that the total number of pain sites should be  $\geq 7$  [21]. This new definition is similar to the definition of MS-CWP used in the current study, aside from that the new definition (WP2019) includes pain present at four instead of three regions of the body [21,35].

In this study, only 20% of the LBP patients were categorized as high risk according to the SBT. A recent Danish study among LBP patients in primary care settings investigated the SBT as a predictor of physical function (defined by RMDQ), and identified 32% as high risk [45]. The Danish study included patients with LBP of any duration who had not sought care for LBP within the last 3 months, with or without radiating pain. The patients were older than the patients in our study, and scored worse on RMDQ [45]. In a recent Norwegian study, however, 0% of the LBP patients included in the study were classed as high risk, according to the SBT [44]. In a British study in a primary care setting, 28% of the patients were classified as high risk [42]. The diverse proportion of patients allocated to the high-risk group may partly be explained by differences related to the triage. In the current study, the patients were triaged by physiotherapists. Other studies have included patients triaged by general practitioners [42,46].

The results indicate that neither the SBT nor the combined screening tool captures patients at risk for frequent visits to the physiotherapist the following year. The results further indicate that neither the SBT nor the combined screening tool capture patients at risk for sickness absence the year following the initial visit to the primary care. The findings that a larger proportion among the medium risk group had been absent from work due to sickness ( $>14$  consecutive days) during the year following baseline was unexpected. We expected a higher proportion in the high-risk group to have sickness absence. When interpreting

these results, one should however consider a few aspects. Approximately three out of four patients included in this study had sought care for their LBP previously, and one out of three had sought care within the last 3 months. Further, regarding sickness absence, we included all registered sickness absences, regardless of diagnosis. The two most common causes for registered sickness absence are mental ill health and musculoskeletal disorders – two disorders that commonly coexist [17]. Furthermore, ongoing sickness absence among the patients at the time of inclusion in the study was not considered. Altogether these aspects may, at least partly, explain the unexpected differences in sickness absence between the risk groups.

In a previous study [29], we found that the combined screening tool had the potential to identify more patients at risk of worse prognosis than when using the SBT alone. However, in that study, patients with LBP were recruited from the general population, rather than patients seeking primary care for LBP [29]. This study adds knowledge on the value of using the combined tool in a healthcare setting, including patients seeking treatment for LBP. In addition, this study includes information on number of visits to a physiotherapist and sickness absence the year following inclusion and categorisation.

In a recently published review of studies examining primary care for LBP when using SBT, the contrasting trial results were highlighted. Some studies had found the approach to be effective, while others found no benefits. The diversity in trial results were discussed in relation to challenges in implementing stratified care (as recommended by the SBT) into clinical practice, and challenges in changing professional practice [43]. Lack of time has been suggested as one potential barrier for using the SBT as intended in primary care [43,47,48]. In the light of this, one need to consider the extra time and effort that the combined screening tool would imply, in relation to using SBT and future studies should investigate physiotherapists' experiences of using the combined screening tool in primary care. Further, future studies should investigate if the classification (low-, medium- and high-risk) when using the combined tool, in comparison to the SBT, is as effective (regarding treatment outcome) when used for triage to different managements of the patients.

## 5 Strengths and limitations

A strength of this study is that it was conducted in a clinical setting under real-life circumstances. Another strength of this study is that patients were recruited from five different

primary healthcare providers representing different socio-economic profile areas. This strategy for recruitment aimed to capture patients that were representative of the general Swedish population. However, only 95 patients were recruited during the year, suggesting that a large proportion of the total number of patients seeking care for LBP were not invited to participate in the study even if they met the inclusion criteria. Unfortunately, no data on patients lost to recruitment due to the self-selection among the physiotherapists are available. Performing practice-based research in general practices is challenging and the risk for selection bias has been problematised in a Danish study [49]. We therefore had a limited sample of patients, and the statistical power to detect group differences was low. Furthermore, there is no information available on whether all visits to the physiotherapists targeted the LBP problem in question.

## 6 Conclusion

The combined screening tool including both the SBT and information on pain distribution (MS-CWP) classified more patients as high risk of worse prognosis than using SBT alone. The combined screening tool identified patients with worse health-related outcomes to the same degree as the SBT alone. The combined screening could be used to capture patients at risk of worse prognosis in a clinical setting. Although the combined screening tool may capture patients at high risk for worse prognosis, the effect when using the tool for triage to a matching treatment, as well as the value of adding a screening tool in the clinical examinations performed by physiotherapists, needs to be further investigated.

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**Research ethics:** The study was approved by the Regional Ethical Review Board of Lund University, Sweden (entry no. 2016/325). All methods were carried out in accordance with relevant guidelines and regulations.

**Informed consent:** Before filling in the questionnaires, patients received oral and written information about the study and written informed consent was collected.

**Author contributions:** The authors have accepted responsibility for the entire content of this manuscript and

approved its submission. All authors (K.A., S.B., and E.H.) designed and performed the study, analysed the data and revised and approved the final manuscript. K.A. and E.H. drafted the manuscript. All authors read and approved the final manuscript.

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**Artificial intelligence/Machine learning tools:** Not applicable.

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