



## Original article

# Characteristics and health outcomes associated with activation for self-management in patients with non-specific low back pain: A cross-sectional study

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## ARTICLE INFO

## Keywords:

Non-specific low back pain  
Physiotherapy  
Self-management  
Self-efficacy

## ABSTRACT

**Background:** Research has shown that the course of non-specific low back pain (LBP) is influenced by, among other factors, patients' self-management abilities. Therefore, clinical guidelines recommend stimulation of self-management. Enhancing patients' self-management potentially can improve patients' health outcomes and reduce future healthcare costs for non-specific LBP.

**Objectives:** Which characteristics and health outcomes are associated with activation for self-management in patients with non-specific LBP?

**Design:** Cross-sectional study.

**Method:** Patients with non-specific LBP applying for primary care physiotherapy were asked to participate. Multivariable linear regression analysis was performed to analyze the multivariable relationship between activation for self-management (Patient Activation Measure, range 0–100) and a range of characteristics, e.g., age, gender, and health outcomes, e.g., self-efficacy, pain catastrophizing.

**Results:** The median activation for self-management score of the patients with non-specific LBP (N = 208) was 63.10 (IQR = 19.30) points. The multivariable linear regression analysis revealed that higher self-efficacy scores (B = 0.54), female gender (B = 3.64), and a middle educational level compared with a high educational level (B = −5.47) were associated with better activation for self-management in patients with non-specific LBP. The goodness-of-fit of the model was 17.24% (R<sup>2</sup> = 0.17).

**Conclusions:** Patients with better activation for self-management had better self-efficacy, had a higher educational level, and were more often female. However, given the explained variance better understanding of the factors that influence the complex construct of self-management behaviour in patients who are not doing well might be needed to identify possible barriers to engage in self-management.

## 1. Introduction

Low back pain (LBP) is the leading cause of disability, activity limitation, and work absence worldwide (Hurwitz et al., 2018).

Approximately 90% of all persons with LBP have non-specific LBP, meaning there is pain in the lumbosacral region, sometimes with radiating pain to the buttock or leg, without an identifiable pathophysiological cause (Staal et al., 2021). Approximately 75–90% of patients

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<https://doi.org/10.1016/j.msksp.2023.102830>

Received 21 November 2022; Received in revised form 16 June 2023; Accepted 14 July 2023

Available online 16 July 2023

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with non-specific LBP recover spontaneously within the first 4–6 weeks (Staal et al., 2021). However, approximately 70% of patients with non-specific LBP will experience recurring episodes within 12 months after recovery (da Silva et al., 2019). Research has shown that the course of non-specific LBP is influenced by, among other factors, patients' self-efficacy and psychological factors (Lee et al., 2015; Jackson et al., 2014). Therefore, clinical guidelines in the field of LBP recommend stimulation of self-management (Staal et al., 2021; de Campos, 2017).

Self-management is defined as the ability to manage one's symptoms, treatment, physical and psychological consequences, and lifestyle changes inherent to one's condition (Barlow et al., 2002). In other words, a person with adequate self-management abilities can make appropriate decisions and take actions to maintain and improve their own health status and will therefore probably have better health outcomes (Schulman-Green et al., 2016). Enhancing patients' self-management has the potential to both improve patients' health outcomes and reduce future healthcare costs for non-specific LBP (Greene et al., 2015).

Self-management is a complex and multifactorial construct. Studies have shown that increased self-efficacy, reduced pain catastrophizing, and reduced fear-avoidance beliefs in patients with chronic non-specific LBP are mediating factors among self-management, reduced pain and disability, and increased functional outcomes (Hurley et al., 2016). However, it is unclear how these constructs are precisely related to self-management. It is suggested that theoretical models such as the fear-avoidance model (Leeuw et al., 2007) and the social cognitive theory (Bandura et al., 1999) that explain how people might behave, might also be useable to explain how people self-manage (Hurley et al., 2016; Kongsted et al., 2021). However, these models do not explain self-management among patients with non-specific LBP as such, but merely explain behaviours that are linked to self-management. Therefore, to better understand the construct of self-management in patients with non-specific LBP, it is important to know which characteristics of patients with non-specific LBP are associated with better self-management. This information can help to better understand why some patients are better or worse in self-managing non-specific LBP. The research question of this study is “Which characteristics and health outcomes are associated with activation for self-management in patients with non-specific LBP?”

## 2. Methods

### 2.1. Design

A cross-sectional study was conducted to identify the characteristics and health outcomes that are associated with better activation for self-management in patients with non-specific LBP. Therefore, a multivariable linear regression analysis was performed using the baseline data from the e-Exercise LBP trial (ISRCTN 94074203) (Koppelaar et al., 2020). This study is reported in accordance to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (Multimedia Appendix 1: STROBE checklist) (von Elm et al., 2007).

### Ethics approval

The Medical Ethics Research Committee of the University Medical Centre Utrecht approved this study (18/085D). All patients gave written informed consent before data collection began.

### 2.2. Participants, therapists and centres

Patients with non-specific LBP, defined as pain in the lumbosacral region with or without radiating pain to the buttock or leg in the absence of an identifiable underlying pathophysiological cause (Staal et al., 2021), were recruited between July 2018 and December 2019 by 122 physiotherapists at 58 primary care physiotherapy practices in the

Netherlands. Patients had to be at least 18 years old, had to have mastery of the Dutch language in speech and writing, and had to provide written informed consent. Patients were excluded if there was a specific cause of LBP determined through medical imaging or a medical doctor, if there were serious comorbidities (e.g., malignancy, stroke), or if the patient was currently pregnant.

### 2.3. Outcome measure

*Patient activation for self-management* was assessed with the Dutch version of the short form of the Patient Activation Measure (PAM-13) (Rademakers et al., 2012). The PAM-13 assesses patient self-reported knowledge, skills, and confidence for the self-management of one's health or chronic condition. The PAM-13 is a questionnaire consisting of 13 items that are scored on a 4-point Likert scale, ranging from ‘totally disagree’ to ‘totally agree’, with an additional ‘not applicable’ option (Rademakers et al., 2012). The PAM-13 scores range from 0 to 100, with a higher score indicating better patient activation for self-management. The PAM-13 makes a distinction among four levels of patient activation associated with increasing self-management engagement. Based upon cut-off scores a patient can be divided into level 1 ( $\leq 47.0$  points), level 2 (47.1–55.1 points), level 3 (55.2–67 points) and level 4 ( $\geq 67.1$  points) (Hibbard et al., 2004). Level 1 includes the lowest activation score corresponding to a patient with low-self-management engagement. These patients do not take an active role in self-management and thus are considered passive recipients of care (Hibbard et al., 2005).

### 2.4. Determinants

Possible determinants of activation for self-management in patients with non-specific LBP were selected through a comprehensive literature review and included the following characteristics and health-related outcomes: average pain intensity in the past seven days, physical function, fear-avoidance beliefs, pain catastrophizing, self-efficacy, physical activity, age, gender and educational level (Lee et al., 2015; Hurley et al., 2016; Wertli et al., 2014; Mansell et al., 2013; Prompuk et al., 2018).

*Average pain intensity in the past seven days* was measured with an 11-point numeric rating scale (NRS), ranging from 0 (‘no pain’) to 10 (‘worst possible pain’) (Hjermstad et al., 2011). *Physical functioning* was assessed with the Oswestry Disability Index version 2.1a (ODI), ranging from 0 to 100, with a higher score indicating more functional disability (Van Hooff et al., 2015). *Fear-avoidance beliefs* were measured with the Dutch version of the Fear Avoidance Beliefs Questionnaire (FABQ), with a scoring range between 0 and 96 and a higher score indicating more fear-avoidance beliefs (George et al., 2010). *Pain catastrophizing* was measured with the Pain Catastrophizing Scale (PCS), with a score ranging from 0 to 52 and a higher score indicating more pain catastrophizing (Wheeler et al., 2019). *Self-efficacy* was measured with the General Self-Efficacy (GSE) scale, which has a range from 10 to 40, with a higher score indicating better self-efficacy (Scholz et al., 2002). *Physical activity* was objectively measured with the Activ8 (2M Engineering, Valkenswaard, The Netherlands) (Bussmann, 2013). Patients were instructed to wear the Activ8 on the upper leg (i.e., in a pocket or with a leg strap) for one consecutive week except when sleeping, showering, bathing, or swimming. Activ8 data were eligible if patients had worn the accelerometer for at least three days for 10 h or more per day. Per patient, the mean time spent in moderate to vigorous physical activity (MVPA) (all activities  $>3.0$  Metabolic Equivalents (Ainsworth et al., 1993)) in minutes per day was computed by summation and divided by the number of eligible wearing days. Additionally, several demographic characteristics were assessed, namely, *age* (years), *gender* (male/female), *height* (centimeters), *weight* (kilograms), *educational level* (low, middle, high) and *duration of LBP complaints* (1–6, 7–12, 13–52 and  $> 52$  weeks).

All determinants, except for physical activity, were self-reported by

the patient via an self-reported online questionnaire during a baseline appointment with the researcher. Measurement of physical activity started immediately after obtaining patients' written informed consent.

## 2.5. Data analysis

All analyses were performed using SPSS Statistics version 25.0 (IBM Corp., Armonk (NY), United States of America). Descriptive statistics were calculated to describe patient characteristics and health-related outcomes. Missing value analyses were performed by assuming the missing at random assumption. Multiple imputation was applied using 'Multivariate Imputation by Chained Equations' with Predictive Mean Matching for missing data in all outcomes. A total of 20 imputed datasets were generated, corresponding to the highest missing value percentage (Sullivan et al., 2015). After the imputation procedure, the data of the imputation sets were pooled to form one dataset for statistical analysis. Statistical power was based on the rule of thumb of 10–20 subjects per variable ( $n = 200$ ), considering the intention to include 10 determinants in the association model (Harrell, 2015).

Next, a linear regression was performed to show the univariable association of the determinants with activation for self-management. The analysis was not used as a selection method for candidate variables (Moons et al., 2006). Subsequently, multivariable linear regression analysis was performed to describe the multivariable relationship of the determinants with activation for self-management. The assumptions of linearity, normality of residuals, homoscedasticity and no multicollinearity were checked and approved. A  $p$ -value of  $<0.05$  was used to determine if there was a significant association. The explained variance ( $R^2$ ) of the multivariable model was used to indicate the goodness-of-fit (Harrell, 2015).

Finally, to compare the impact of the independent variables in the final model, the relative contributions of the individual model parameters were determined. The relative contributions were determined by multiplying the regression coefficients with a clinically meaningful difference of the independent variables. For the dependent variables gender and educational level, a meaningful difference was a change between groups (from 0 to 1). For the dependent variables age, pain intensity, physical functioning, self-efficacy, pain catastrophizing, fear-avoidance beliefs and physical activity, a meaningful difference was the interquartile range (Harrell, 2015).

## 3. Results

### 3.1. Response and patient characteristics

In total, 434 patients with non-specific LBP were approached by the researcher and were asked to participate in this study. A total of 208 of the patients who were willing to participate met the eligibility criteria and were included in this study. The patients were referred by 68 physiotherapists from 42 primary care physiotherapy practices. All patients provided written informed consent.

The mean age of the patients was 47.68 (SD 14.32) years, and a total of 102 (49.0%) patients were female. The majority of the patients had LBP complaints for 1–6 weeks (41.4%). The median PAM-13 score for activation for self-management was 63.10 (interquartile range (IQR) 19.30) points and the majority of the patients (45.2%) was classified as level 3 (i.e., 55.2–67 points). The median score for physical functioning was 18.00 (IQR 20.00) points and the median LBP intensity in the past seven days was 6.00 (IQR 3.00) points. The patients' median scores on fear avoidance beliefs, pain catastrophizing and self-efficacy were 23.00 (IQR 16.50), 8.00 (IQR 11.00), and 32.68 (IQR 4.11), respectively. An detailed overview of the characteristics and health-related outcomes of the patients is presented in Table 1. In 35 patients (16.8%), there were missing data for one or more variables.

**Table 1**

Overview of the characteristics and health outcomes of the included patients ( $N = 208$ ).

Characteristic	Value
Age (years), mean (SD)	47.68 (14.32)
<b>Gender, n (%)</b>	
Female	102 (49.0)
Male	106 (51.0)
Height (centimeters), mean (SD)	175.59 (9.84)
Weight (kilograms), mean (SD)	80.42 (15.59)
BMI (kg/m <sup>2</sup> ), mean (SD)	26.05 (4.49)
<b>Marital status, n (%)</b>	
Unmarried	43 (20.7)
Married/living together	142 (68.3)
Widow(-er)	7 (3.4)
Divorced	16 (7.7)
<b>Educational level, n (%)</b>	
Low	35 (16.8)
Medium	69 (33.2)
High	104 (50.0)
<b>Duration of LBP complaints, n (%)</b>	
1–6 weeks	86 (41.4)
7–12 weeks	30 (14.4)
13–52 weeks	18 (8.7)
>52 weeks	74 (35.6)
<b>Activation for self-management (PAM-13), median (IQR)</b>	<b>63.10 (19.30)</b>
Level 1 ( $\leq 47.0$ points), n (%)	16 (7.7)
Level 2 (47.1–55.1 points), n (%)	43 (20.7)
Level 3 (55.2–67 points), n (%)	94 (45.2)
Level 4 ( $\geq 67.1$ points), n (%)	55 (26.4)
Average pain intensity in the past seven days (NRS), median (IQR)	6.00 (3.00)
Physical activity (MVPA in min/d), median (IQR)	73.49 (38.95)
Physical function (ODI), median (IQR)	18.00 (20.00)
Fear-avoidance beliefs (FABQ), median (IQR)	23.00 (16.50)
Pain catastrophizing (PCS), median (IQR)	8.00 (11.00)
Self-efficacy (GSE), mean (SD)	32.68 (4.11)

**Abbreviations:** SD (Standard Deviation), BMI (body mass index), LBP (Low Back Pain), PAM (Patient Activation Measure), IQR (Interquartile Range), NRS (Numeric Rating Scale), MVPA (Moderate to Vigorous Physical Activity), ODI (Oswestry Disability Index), FABQ (Fear-Avoidance Beliefs Questionnaire), PCS (Pain Catastrophizing Scale), GSE (General Self-Efficacy Scale).

**Table 2**

Linear regression analyses – univariable associations of the determinants with patient activation for self-management ( $N = 208$ ).

Independent variables	Unstandardized regression coefficients	SE	P-value
Age (years)	−0.05	0.06	0.39
<b>Gender</b>			
Female vs. male	3.71	1.72	0.03*
<b>Educational level</b>			
Low vs. high	−5.01	2.37	0.04*
Middle vs. high	−7.19	1.89	<0.01*
Pain intensity (NRS)	−0.79	0.43	0.07
Physical function (ODI)	−0.09	0.06	0.14
Self-efficacy (GSE)	0.73	0.21	<0.01*
Fear-avoidance beliefs (FABQ)	−0.17	0.05	<0.01*
Pain catastrophizing (PCS)	−0.28	0.10	<0.01*
Physical activity (MVPA in min/d)	−0.03	0.03	0.50

**Abbreviations:** NRS (Numeric Rating Scale), ODI (Oswestry Disability Index), GSE (General Self-Efficacy Scale), FABQ (Fear-Avoidance Beliefs Questionnaire), PCS (Pain Catastrophizing Scale), MVPA (Moderate to Vigorous Physical Activity).

\* Characteristics significantly associated with activation for self-management in patients with non-specific LBP at  $P$ -value  $<0.05$ .

### 3.2. Identifying variables associated with activation for self-management

Results of the univariable linear regression analyses are shown in Table 2 and of the multivariable linear regression analysis in Table 3. The multivariable linear regression analysis revealed that patient activation for self-management was associated with higher self-efficacy scores ( $B = 0.54$ ), female gender ( $B = 3.64$ ), and a middle educational level compared with a high educational level ( $B = -5.47$ ). A low educational level compared with a high educational level was not significantly associated with patient activation for self-management ( $P = 0.31$ ). Age, pain intensity, physical functioning, physical activity, fear-avoidance beliefs and pain catastrophizing were also not significantly associated with patient activation for self-management. The explained variance ( $R^2$ ) in patient activation for self-management of the full multivariable linear model, i.e., goodness-of-fit, was 0.17 (i.e., 17.2%).

The relative contribution of the significantly associated independent variables revealed that a meaningful difference in self-efficacy (i.e., IQR = 5.75) provided a difference of 3.11 points for the patient activation for self-management score, the difference between women and men provided a difference of 3.64 for the patient activation for self-management score, and the distinction between patients with a high educational level and those with a middle education level provided a difference of  $-5.47$  points for the patient activation for self-management score.

## 4. Discussion

This study aimed to identify characteristics and health-related outcomes associated with patient activation for self-management in the non-specific LBP population. Among patients with non-specific LBP, a better self-efficacy, a higher educational level, and the female gender were associated with better activation for self-management. The goodness-of-fit of the multivariable linear regression model explained only 17.2% of the variance in self-management activation, which means that 82.8% remains unexplained.

The findings of this study highlight that patients' activation for self-management is not substantially influenced by the identified

determinants that were carefully selected from the literature in the field (Lee et al., 2015; Hurley et al., 2016; Wertli et al., 2014; Mansell et al., 2013; Prompuk et al., 2018). Although we studied several patient characteristics and health-related outcomes based upon a comprehensive literature review, the goodness-of-fit of our multivariable model only explained 17% of the variance in patient activation for self-management. A major explanation for this might be the inclusion of a relatively well-functioning cohort of patients with non-specific LBP who have chosen for physiotherapy treatment for their non-specific LBP (Koppelaar et al., 2021). Patients in this cohort are on average relatively young and well educated, have relatively high levels of self-efficacy and activation for self-management, and are not particularly disabled. Probably, this is due to the type of research for which patients were included (Koppelaar et al., 2020). In addition, the scores of determinants that could negatively influence patients' activation for self-management and stimulate the development of persistent disabling non-specific LBP, i.e., fear avoidance beliefs, pain intensity and pain catastrophizing (Hill et al., 2008), are relatively low. As a result, the included sample might not be a good representation of all patients with non-specific LBP. A closer examination of determinants that influence patients' activation for self-management in patients with non-specific LBP who are not doing well might be needed to help to clarify the 82.8% of unexplained variance in patients' activation for self-management and to identify possible barriers to engage in self-management.

Despite these specific characteristics of the participants in our cohort, the activation for self-management score of the patients with non-specific LBP in this study (median = 63.10) is not higher when compared to the activation for self-management scores of patients with a chronic disease or disability. According to the PAM-13 scores, patients are actually taking action, including maintaining lifestyle changes, knowing how to prevent further problems, and handling symptoms on their own (Hibbard et al., 2004). In a Dutch cohort of patients with a chronic disease or disability, the mean score of patient activation for self-management measured with the PAM-13 was 61.3<sup>16</sup>. In another example of a cohort of patients with osteoarthritis in Australia, the mean score of self-management measured with the PAM-13 was 60.5<sup>34</sup>. In addition, the proportion of patients in this study that had a low activation for self-management (PAM-13 level 1–2 (Hibbard et al., 2004)) is also comparable to the proportion of patients that has a low activation for self-management in other patient populations with a chronic disease or disability (Rademakers et al., 2012; Eyles et al., 2020).

Previous studies have described several factors that influence patient activation for self-management. These studies showed that female patients, with a better self-efficacy, less pain catastrophizing, less fear-avoidance beliefs, and a higher educational level had better self-management activation (Lee et al., 2015; Mansell et al., 2013; Kawi, 2014). Furthermore, a previous study investigated the mean PAM-13 scores for different subgroups in the general population and found that female patients, a relatively younger age, a higher educational level, and a better self-reported health had higher PAM-13 scores (Hibbard et al., 2005). However, all previous studies used univariate analyses. Since patients' self-management is a complex construct, multivariable analyses are essential to understand how self-management is influenced by multiple determinants at the same time. It might be remarkable that less pain-catastrophizing and less fear-avoidance beliefs were not significantly associated with activation for self-management among patients with non-specific LBP in the multivariable linear regression analysis. A possible explanation might be the relationship between pain-catastrophizing and fear-avoidance beliefs on the one side, and pain, disability and functional outcomes on the other side. According to the fear-avoidance beliefs model, pain catastrophizing plays an important role in the formation of fear-avoidance beliefs, and those beliefs can consequently influence outcomes like pain or disability, and how this is coped with by the patient (Hurley et al., 2016; Leeuw et al., 2007). However, how patients actually behave when

**Table 3**

Linear regression analyses – multivariable associations of the determinants with patient activation for self-management (N = 208).

Independent variables	Unstandardized regression coefficients	SE	P-value	Relative contribution
Intercept	56.97	8.45	–	–
Age (years)	–0.09	0.58	0.13	–2.03
<b>Gender</b>				
Female vs. Male	3.64	1.66	0.03*	3.64
<b>Educational Level</b>				
Low vs. High	–2.42	2.38	0.31	–2.42
Middle vs. High	–5.47	1.87	<0.01*	–5.47
Pain intensity (NRS)	–0.10	0.48	0.83	–0.30
Physical function (ODI)	<0.01	0.07	0.95	0.09
Self-efficacy (GSE)	0.54	0.21	<0.01*	3.11
Fear-avoidance beliefs (FABQ)	–0.08	0.06	0.21	–1.29
Pain catastrophizing (PCS)	–0.17	0.11	0.10	–1.87
Physical activity (MVPA in min/d)	–0.03	0.02	0.30	–0.97
Explained variance of the model	$R^2 = 0.17$			

**Abbreviations:** NRS (Numeric Rating Scale), ODI (Oswestry Disability Index), GSE (General Self-Efficacy Scale), FABQ (Fear Avoidance Beliefs Questionnaire), PCS (Pain Catastrophizing Scale), MVPA (Moderate to Vigorous Physical Activity).

\* Characteristics significantly associated with activation for self-management in patients with non-specific LBP at P-value <0.05.

experiencing pain might not be the same as patients' activation for self-management, i.e., possessing the knowledge, skills, and confidence to manage their health and health care (Hibbard et al., 2004).

## 5. Strengths and limitations

The strength of this study is that we tried to get a better understanding of the concept self-management in patients with non-specific LBP. Within the new proposed definition of health, a shift towards supporting patient's ability to self-manage their complaints has started. However, up to date, little is known about associated factors with self-management in non-specific LBP.

Another strength is the responsible and efficient use of research resources by using the baseline data of an existing study (Koppenaal et al., 2020). This baseline data helped us to explore the multivariable relationship between activation for self-management and pain intensity, physical function, fear-avoidance beliefs, pain catastrophizing, self-efficacy, physical activity, age, gender and educational level in patients with non-specific LBP applying for primary care physiotherapy. Even though the cross-sectional design ensures that no conclusions can be drawn on the causal relationship between these determinants and patient activation for self-management, the results help to inform the design of future studies. On the contrary, by using existing data, the variable selection was limited to the variables that were already included in the e-Exercise LBP study (Koppenaal et al., 2020). Therefore, we recommend for future studies to include relevant disease-related and non-disease-related outcome measures related to self-management in patients with non-specific LBP, such as motivation, social support, cognitive abilities, and health literacy (Devan et al., 2018; Mutubuki et al., 2022). This recommendation is also supported by the current narrative on self-management among patients with musculoskeletal pain, which states that self-management is influenced by pain beliefs, emotional and coping responses, social context, and physical and lifestyle factors (Caneiro et al., 2020). In addition, the sample size of the e-Exercise LBP study influenced the number of determinants that could be included in the association model (Harrell, 2015).

Finally, the use of self-reported online questionnaires to collect the data might be considered another limitation of this study. Self-reported questionnaires are a possible source of "social desirability" and/or "recall bias" which might introduce misclassification of patients'

activation for self-management. As a result, found associations might be biased. However, self-reported questionnaires are the best we currently have for measuring patients' activation for self-management and several of the health-related determinants.

Future longitudinal studies are needed to investigate whether the identified determinants for patient activation for self-management are helpful to recognise people with a potentially lower degree of activation for self-management and to identify possible barriers to engage in self-management. However, future studies should also evaluate the importance of other factors, such as motivation, social support, cognitive abilities, and health literacy with regard to patient activation for self-management. Another recommendation is to further explore the relationship between educational level and patient activation for self-management. In this study we found a nonlinear relationship between the level of education and self-management, which we cannot explain based on the available data (Kawi, 2014; Berkman et al., 2011). Since group sizes between educational levels differ, we recommend to power on this in future research. In addition, as mentioned previously, educational level might be a proxy measure for other social factors which were not evaluated in this study (Karran et al., 2020). Finally, future studies should focus on unravel the causal relationship between these factors and patient activation for self-management. Understanding these causal relationships might help physiotherapists to better understand the construct of patient activation for self-management and identify patients at risk of inadequate self-management behaviour. As a result treatment can be personalized and individually tailored in a more effective way.

This study increases the understanding of what determinants are associated with activation for self-management in a relatively well-functioning cohort of patients with non-specific LBP who have consented for physiotherapy treatment for their non-specific LBP. Patients with better activation for self-management had better self-efficacy, had a higher educational level, and were more often female. However, given the explained variance better understanding of the factors that influence the complex construct of self-management behaviour in patients who are not doing well might be needed to identify possible barriers to engage in self-management.

## Declaration of competing interest

None declared.

## Funding

This study was co-funded by the Taskforce for Applied Research SIA (RAAK.PRO02.063), part of the Dutch Research Council (NWO). The funder had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.msksp.2023.102830>.

## Multimedia Appendix 1. STROBE checklist

	Item No.	Recommendation	Page No.
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	4
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5–6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	7

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	Item No.	Recommendation	Page No.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8–9
Data sources/measurement	8 <sup>a</sup>	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8–9
Bias	9	Describe any efforts to address potential sources of bias	8–9
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9–10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses	9–10 N/A 9–10 N/A N/A
Results			
Participants	13 <sup>a</sup>	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	11 N/A N/A
Descriptive data	14 <sup>a</sup>	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest	11, Table 1 11
Outcome data	15 <sup>a</sup>	<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	11, Table 1
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	12–14, Tables 2 and 3 12–14, Tables 2 and 3 N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17–19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15–17
Generalisability	21	Discuss the generalisability (external validity) of the study results	15–19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	20

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

<sup>a</sup> Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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