EVALUATION OF LONG-TERM HEALTH OUTCOMES IN PATIENTS WITH SUBACUTE AND PERSISTENT MUSCULOSKELETAL PAIN

A longitudinal study

ADINA KÖNIG

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Supervisor: Maria Sandborgh
Examiner: Thomas Overmeer
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ABSTRACT

**Background:** The present study evaluated changes in long-term health outcomes in patients with subacute and persistent musculoskeletal pain (MSP) treated in two conditions in primary healthcare settings. Investigated were also the relationships among these health outcomes.

**Methods:** Within a longitudinal design, pain-related disability, pain intensity, self-efficacy, catastrophic thinking and fear of movement of patients diagnosed with subacute and persistent musculoskeletal pain (n = 29) were assessed over five years. Non-parametric statistical analyses were applied.

**Results:** Significant changes were found between post-intervention and 5-year follow-up measurements of catastrophic thinking in the active implementation (AIS) group and between pre- and post-intervention measurements of pain intensity in the passive implementation (PIS) group. No change was found between the groups in PDI change scores between the post-intervention and the 5-year follow-up measurement. Self-efficacy at pre-intervention showed a strong significant negative correlation with the Pain Disability Index (PDI) at the 5-year follow-up in the AIS group, and the fear of movement at pre-intervention a significant moderate correlation. Self-efficacy at post-intervention presented a moderate significant correlation with PDI at the 5-year follow-up in both groups.

**Conclusion:** Few significant changes in the participants’ health outcomes within five years post-intervention were identified. Self-efficacy and fear of movement seem to play a significant role in the long-term development of pain-related disability. However, these results need to be interpreted cautiously, and further research is warranted regarding determinants of disability developments in patients with subacute and persistent MSP.

**Keywords:** Physiotherapy, Musculoskeletal pain, Primary healthcare, Behavioural medicine
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APPENDIX A: PARTICIPANTS’ QUESTIONNAIRE (SWEDISH)
1 BACKGROUND

1.1 Musculoskeletal pain: definition, epidemiological facts and impact

Musculoskeletal pain (MSP) is a common symptom experienced by individuals diagnosed with a musculoskeletal disorder. The term ‘musculoskeletal disorder’ broadly defines medical conditions affecting the spine and upper and lower extremities, including pain syndromes (Huisstede et al., 2007; Safiri et al., 2021). Pain can be classified after its duration. Acute pain is defined to last for less than 30 days (Cole, 2002), contrarily to persistent/chronic pain, which is defined as lasting or recurring pain for a duration longer than 3–6 months (Merskey & Bogduk, 1994). Subacute pain occurs in the phase between acute and persistent pain (Cole, 2002).

In 2017, there were estimated to be 1.3 billion people worldwide living with musculoskeletal conditions across all ages, making it a leading cause of disability (GBD, 2018). Here, low back pain comprised the greatest proportion of cases, followed by osteoarthritis and neck pain. These disorders are often associated with persistent MSP (World Health Organization [WHO], 2023). Persistent MSP can tremendously affect an individual’s quality of life regarding their working capability, activities of daily living and mental state as individuals deal with emotional distress, high financial, time and energy costs (Blyth et al., 2019; Lewis et al., 2021) and social stigmatisation of persistent pain (Ruddere & Craig, 2016; Slade et al., 2009). Within Europe, musculoskeletal disorders have been identified as the most common cause of sick leave and loss of productivity (Bevan, 2015), which causes an economic burden that is also presented globally (S. P. Cohen et al., 2021). Simultaneously, this puts a high burden on healthcare systems, for example, in primary healthcare, which is highly demanded by patients with persistent pain (Breivik et al., 2006). In this context, patients with acute or subacute pain are at risk of entering a chronic pain stage, which potentially increases the economic impact (Meyer et al., 2018).

I. Lin et al. (2020) see an urgent need to improve the quality of care in patients with musculoskeletal pain conditions. The authors describe an inefficient use of medical resources, including overuse of opioids and surgery and present 11 summarising recommendations for treating musculoskeletal pain conditions. These include, among others, screening for more severe conditions, assessing psychosocial factors, facilitating the return to work and providing patient education, including information about their condition and the management of physical activity and/or exercise. These recommendations coincide with the findings of a systematic overview, summarising effective treatment options for musculoskeletal pain in primary healthcare settings (Babatunde et al., 2017). The researchers conclude that interventions focusing on psychosocial factors and exercise showed medium to strong effects on function and pain, compared to pharmacological treatments showing short-
term pain benefits. Crofford (2015) advocates identifying and incorporating psychological factors in managing persistent MSP and suggests that treatment methods, such as cognitive-behavioural therapy, may have beneficial long-term effects on pain coping strategies.

Physiotherapists are generally involved in the treatment of individuals with persistent MSP within primary healthcare settings (Jordan et al., 2010; Speerin et al., 2014). Exercise promotion, patient empowerment and education are core concepts of physiotherapy treatment (Semmons, 2019). The overall aim is to increase the patient’s physical functioning, which involves thoroughly analysing the factors that influence the disability.

1.2 Physiotherapy with a behavioural medicine approach in patients with MSP in primary healthcare

As movement is at the core of physiotherapy, the discipline works towards improving functional movement abilities across different patients and age groups in various health conditions (World Confederation for Physical Therapy, 2019). Physiotherapists focus on health promotion and prevention through individually tailored treatments and providing information about the importance of physical activity and exercise. McGrane et al. (2015) see physiotherapists in an ideal position to initiate changes in physical activity behaviours based on their systematic review results, investigating the effectiveness of motivational interventions within physiotherapy across different chronic lifestyle-related diseases.

Keefe et al. (2018) support psychologically informed pain management in primary healthcare physiotherapy in treating patients with persistent MSP. It addresses behavioural factors regarding the progress of chronicity and treatment of pain-related disability. The term ‘behaviour’ is defined as a person’s actions, reactions, emotions and beliefs (Martin & Pear, 2019). A behavioural medicine approach has been established within physiotherapy education over the past two decades (Elvén et al., 2021; Sandborgh et al., 2020) and shows growth in research. It comprises the knowledge about the interaction between biomedical, social, environmental and psychological processes to describe an individual’s health and disease-related behaviours and roots in the biopsychosocial model (Dekker et al., 2017; International Society of Behavioural Medicine, n.d.). This model considers psychological, social, cultural and biological factors in describing an individual’s state of health (Engel, 1977). Physiotherapy with a behavioural medicine approach incorporates various techniques, psychological concepts, frameworks and theories to understand human behaviour. These include, among others, Social Cognitive Theory (SCT) and the fear-avoidance model, both frequently applied and studied in treating persistent MSP.

In SCT, the three components of personal cognitive, behavioural and environmental factors form a triad, determining an individual’s behaviour (Bandura, 1986). The theory explains the dynamic relationship between an individual and their environment and helps to understand possible behavioural and social changes (Kelder et al., 2015). The principle of reciprocal determinism stands for the mutual interplay between the individual personal, environmental and behavioural factors, including self-regulating skills and personal beliefs, and the physical and social environment (Bandura, 1986). SCT is applied in different research fields to
promote health by inventing and evaluating theory-based interventions using its different concepts (Kelder et al., 2015).

The fear-avoidance model in chronic MSP explains how an individual can develop a fear of movement, also kinesiophobia (Luque-Suarez et al., 2019), after an unpleasant experience connected to pain (Vlaeyen & Linton, 2000). With the onset of pain after the injury, and depending on the interpretation of it, catastrophising thoughts may arise, leading to pain-related fear and eventually the avoidance of a behaviour to prevent the particular unpleasant experience. The author connects the development of such avoidance behaviours to respondent and operant conditioning (Vlaeyen, 2015). A first neutral stimulus is paired with a, for example, harmful stimulus which then evokes a defensive conditioned response (respondent conditioning). Vlaeyen (2015) describes it as an essential mechanism for predicting potential harm. Operant conditioning involves learning about the consequences of one’s behaviour, depending on the stimulus received, and plays a role in controlling potentially harmful stimuli.

Considering patients’ behaviours within physiotherapy practice has come to the attention of several researchers, where patient education is crucial in the physiotherapeutic treatment of patients with persistent MSP. It includes providing information about bodily functions, such as explaining pain origin and development to address a patient’s health beliefs (Fullen et al., 2023). It can positively influence attitudes towards pain, catastrophising thoughts and fear avoidance behaviours in patients with persistent MSP (Watson et al., 2019). Fullen et al. (2023) further highlight self-management skills as essential to address. In chronic conditions, self-management includes actively participating in and showing responsibility for the healthcare process and developing coping abilities with unpleasant experiences, such as emotional distress (van de Velde et al., 2019). The cognitive variable of self-efficacy is stated to enhance self-management skills (Lorig & Holman, 2003).

Research has been conducted in primary healthcare settings where patients with subacute, recurrent and persistent MSP received either physical exercise therapy or a tailored behavioural medicine intervention, both provided by physiotherapists (Åsenlöf et al., 2005). In contrast to the physical exercise therapy intervention, the tailored behavioural medicine treatment included training physiotherapists to support achieving a defined behavioural goal and conducting functional behavioural analyses to determine the patient's behavioural, cognitive and physical skills required to reach the goal. The physiotherapist’s clinical behaviour was influenced through active and passive teaching methods, forming prerequisites for treating individuals with persistent MSP. Active and passive implementation supports of a behavioural medicine approach were studied by Fritz et al. (2020) to explore the change in physiotherapists’ clinical behaviour.

1.2.1 Physiotherapist’s clinical behaviour

Essentially, a healthcare professional’s clinical behaviour encompasses the beliefs, knowledge, motivation and actions within the practice setting (Eccles et al., 2005). It is influenced by different variables such as the environment, personal attitudes or attributes. To exemplify within physiotherapy research, Gardner et al. (2017) see a relationship between
clinical practice and the treatment orientation in physiotherapists treating patients with chronic low back pain. Additionally, the investigators identify the physiotherapists’ expressed lack of confidence in addressing factors that follow a biopsychosocial treatment orientation, which is considered the favoured orientation in patients with chronic low back pain (Kamper et al., 2014). Regarding the treatment of patients with MSP generally, addressing psychosocial factors such as the patient’s beliefs about pain, self-efficacy or contextual factors are found to be important (Åsenlöf et al., 2005).

Within implementation research, efforts have been made to enhance the abilities of physiotherapists to apply a behavioural medicine approach. After implementing a behavioural medicine approach facilitation intervention, Fritz et al. (2019) discuss a lack of time, emotional support and self-regulating skills like motivation to hinder the maintenance of clinical behaviours. Fritz et al. (2020) further evaluated the clinical behaviour of physiotherapists in a quasi-experimental design, comparing an active implementation support (AIS) with a passive implementation support (PIS) of a behavioural medicine approach. The AIS group received information in the form of lectures and written content about a behavioural medicine approach as well as the opportunity for outreach visits by the facilitator, peer coaching, analysing own video recordings, individual goal setting and self-monitoring. The PIS group received the same lectures and written content about a behavioural medicine approach, which they were encouraged to read. Next to a significant increase in observed clinical actions in the experimental group at post-intervention, changes after three-, six- and 12-month follow-ups were not sustained, and no changes regarding beliefs and observed clinical actions were found in the control group. Because applying a behavioural medicine approach can be versatile and underpinned by various theoretical backgrounds, Fritz et al. (2021) stress the importance of looking at outcomes of clinical behaviour modifications together with patient health outcomes. These have been rarely evaluated when rehabilitation professions, such as physiotherapists, are in focus of clinical behaviour change (Jones et al., 2015).

1.3 Pain-related disability and associated factors

‘Disability’ is an umbrella term for bodily impairments and the limitations in activities and participation referring to the interaction between the individual and its contextual factors (WHO, 2001). ‘Activity’ refers to individual functioning in executing a task or action, whereas ‘participation’ describes an individual’s involvement in life situations from a societal perspective. These concepts are described by the International Classification of Functioning, Disability and Health (ICF) which is used to systematically analyse health-related components (WHO, 2001). It is oriented towards the biopsychosocial model, where psychological factors describe an individual’s thoughts and beliefs, and social factors include the external environment like the general social, family and work life (Mescouto et al., 2022). It demonstrates that multiple factors come into play in explaining an individual’s health condition. Sometimes, these factors are interdependent and challenging to be addressed singly, meaning that, for example, being unemployed due to chronic low back pain can cause
mental distress and catastrophising thoughts (Grotle et al., 2010), which justifies a multidimensional assessment (Mescouto et al., 2022).

The degree of disability due to pain can be individually rated by how impaired one feels in the functioning and performance of daily activities (C.-W. C. Lin et al., 2011). Several researchers identify a person’s cognitive, social functioning and beliefs around their perception of persistent MSP to be strongly linked to the persistence and occurrence of pain symptoms as well as the perceived disability (Caneiro et al., 2021; Vargas-Prada & Coggon, 2015; Vranceanu et al., 2009). Grotle et al. (2010) and Pincus et al. (2002) describe a predicting value of psychological and social factors in the development of persistent MSP in the lower back. Cognitive measurements such as catastrophising thinking, fear of movement and self-efficacy have come to the attention in treating persistent MSP concerning pain intensity and pain-related disability.

Self-efficacy, a major concept of SCT, is defined by Bandura (1991) as one’s confidence in the ability to perform a particular behaviour and is part of the personal cognitive factors. Depending on one’s perceived self-efficacy, the choice either falls in favour or against the engagement in a particular activity (Bandura, 1978). In the treatment of persistent MSP, self-efficacy has been identified as a prognostic and mediating factor in patients’ health outcomes. A high level of self-efficacy has been associated with improved physical functioning, overall participation in physical activity, work and health status and decreased pain intensity and disability in patients with persistent MSP, which is presented in a systematic review by Martinez-Calderon et al. (2018). The authors view self-efficacy as an important outcome measure in people with persistent MSP and encourage clinicians to assess patients’ self-efficacy levels to individualise care. They further recommend future studies to investigate the prognostic potential of self-efficacy and how it is influenced by therapeutic treatment. These suggestions align with the conclusions by Hayward and Stynes (2021), who systematically reviewed studies focusing on the role of self-efficacy in individuals with persistent MSP participating in pain management programmes. The researchers point out the importance of measuring self-efficacy prior to the enrolment of such programmes and using standardised self-efficacy measures in practice.

The fear of movement is also considered to have a predictive value in the development of persistent MSP (Luque-Suarez et al., 2019). The authors systematically reviewed 63 articles and found strong evidence for an association between fear of movement and pain intensity and disability. The meta-analysis by Kroska (2016) showed a positive association between fear-avoidance and pain intensity in patients with chronic pain. The author further states the importance of considering cultural beliefs and different instruments to measure pain in order to understand the association. Luque-Suarez et al. (2019) recommend further research to explore the impact of demographic and biopsychosocial variables on the treatment of individuals with persistent MSP, aiming to tailor and resultingly improve the treatment outcomes.

Catastrophising is defined as a tendency to have repeating negative thoughts in response to anticipating or actually experiencing pain (Sullivan et al., 2001). This psychological determinant plays an essential role in developing persistent pain (Wertli et al., 2014) and its
perpetuation (Kroska, 2016). The systematic review by Martinez-Calderon et al. (2019) identified a high degree of pain catastrophising with increased pain intensity and disability in the patient group.

Pain intensity is associated with several cognitive behavioural factors, as mentioned above. It is not considered a predictor in different disability measures, as reported in the systematic review by Tseli et al. (2019). Denison et al. (2004) conclude that pain-related beliefs are more important to address by healthcare professionals than pain intensity in patients with MSP. However, Shaygan et al. (2019) point out the mediating effect of cognitive factors and beliefs on pain intensity, decreasing disability. The systematic review by Andersen et al. (2014) summarises the evidence for a positive association between chronic pain and disability.

The above-explained factors show to influence the severity of an individual’s disability, which at the same time affects physical activities in everyday life. Tseli et al. (2019) see an unambiguous relationship between emotional distress, cognitive behavioural factors, which include self-efficacy beliefs, fear-avoidance and catastrophising, and the physical functioning of patients diagnosed with persistent MSP. The authors of the meta-analysis advocate a multidisciplinary rehabilitation of individuals with persistent MSP and further advancement of prediction models to understand better what factors influence persistent MSP development.

### 1.3.1 Development of pain-related disability and associated factors in patients with MSP in primary healthcare

Sandborgh et al. (2008) aimed to evaluate the predictive validity of a screening instrument where patients with subacute and persistent pain were classified into groups of “low disability” and “high disability”. The researchers identified factors like pain intensity, self-efficacy, fear of movement and catastrophic thinking to reliably predict changes in disability after eight months, with self-efficacy being a strong predictor compared to the other predictors. Participants having high pain-related disability at baseline present increased pain-related disability scores, unchanged pain intensity and worsened functional ability after eight months. In conclusion, the authors identify individual ‘disability-profiles’, which would have demanded tailored treatment.

Åsenlöf et al. (2005) analysed the short-term effects (at post-intervention and 3-month follow-up) after two patient groups (with subacute and persistent MSP) received either physical exercise therapy or a tailored behavioural medicine intervention. Both groups showed improvements in all variables, including pain-related disability, pain measures, self-efficacy and fear of movement, with a greater reduction in pain-related disability, pain intensity and fear of movement in the intervention group. With an attrition rate of 47%, the measured short-term effects were sustained in both groups after two years, where the intervention group showed a greater reduction in pain-related disability (Åsenlöf et al., 2009). Another evaluation of a long-term follow-up presented no significant difference in changes in the primary outcome measure of pain-related disability, when comparing post-intervention and 10-year follow-up measurements (Emilson et al., 2017). However, the
authors point out the difficulty in conducting long-term follow-ups due to, e.g. dropouts and raise awareness of the cautious interpretation of such results and questioning data validity.

Fritz et al. (2021) studied the difference in health outcomes of patients with subacute and persistent MSP treated by physiotherapists who had participated in either an active or passive implementation support of a behavioural medicine approach. The health outcomes included pain-related disability, pain intensity, self-efficacy, fear of movement and catastrophic thinking. These were evaluated over two years, including five measurement points at pre-, post-intervention, six months, one year and two years after the intervention. The authors reported a non-significant difference between the groups, although significant improvements in all health outcomes in both groups.

1.4 Problem formulation

The degree of pain-related disability in a person experiencing subacute or persistent MSP is influenced by different individual factors. It includes cognitive measurements, such as the confidence in the ability to perform a daily task or a fear of not engaging in it, which influence to which extent an individual feels capable in the participation in everyday life activities. Physiotherapy with a behavioural medicine approach requires a patient’s attitudes, thoughts and contextual factors to be asked for and assessed, shaping physiotherapists’ practice and clinical behaviour. Interventions intending to influence and improve a physiotherapist’s clinical behaviour aim to benefit the patients’ treatment. However, patients’ health outcomes have seldom been evaluated in relation to physiotherapists’ clinical behaviour change, in particular, the evaluation of long-term health outcomes. Moreover, it is worthwhile to investigate the development of disability measurements, such as pain-related disability and associated cognitive measurements, and their relationship with each other, as persistent pain is defined as lasting or recurring and subacute pain is a possible precursor of persistent pain. It raises the question of how health outcomes in patients with subacute and persistent MSP develop and their associations with each other, following treatment that targets the clinical behaviour of physiotherapists by facilitating a behavioural medicine approach intervention.

2 AIM

The present study aims to explore the development and relationships regarding pain-related disability as the primary outcome and associated factors, including self-efficacy, fear of movement, catastrophic thinking and pain intensity, over five years in patients with subacute and persistent MSP treated in two conditions in primary healthcare settings.
2.1 Research questions

1. How do pain-related disability and associated factors develop over time for the AIS and PIS group, respectively?
   a) Between pre- and post-intervention?
   b) Between post-intervention and the five-year follow-up?

2. What is the difference between the AIS and PIS group:
   a) Regarding the change of pain-related disability, considering the measurements at pre-intervention and post-intervention?
   b) Regarding the change of pain-related disability, considering the measurement at post-intervention and the 5-year follow-up?

3. What is the association between pain-related disability and associated factors in the AIS and PIS group, respectively:
   a) Regarding associated factors at pre-intervention and pain-related disability at the 5-year follow-up?
   b) Regarding associated factors at post-intervention and pain-related disability at the 5-year follow-up?

3 METHODS

3.1 Design

A longitudinal and explorative design was chosen to study different health outcomes in patients with subacute and persistent MSP following a previously conducted implementation study.

3.2 Participants and setting

All participating patients were recruited through physiotherapists, who followed an implementation intervention and are working in primary healthcare settings of three different counties in the middle of Sweden. Physiotherapy treatment can be accessed directly in Sweden without a physician’s referral. Fifteen participating physiotherapists in the AIS group and nine in the PIS group were asked to recruit patients, with a maximum of 15 patients per physiotherapist. The following exclusion criteria were set for the patient recruitment: participants could not be diagnosed with a systemic disease, malignity or serious spinal pathology, depression, neurological disease, an injury that severely affects activity capacity or osteoarthritis awaiting surgery. Participants were blinded when assigned to the AIS (intervention group) or PIS (comparison group) group. From now on, the patient groups will be referred to as AIS and PIS group. The AIS group was treated by physiotherapists, who received active implementation support for a behavioural medicine
approach. The patients in the PIS groups received treatment from physiotherapists, who received passive implementation support for a behavioural medicine approach. There were no significant differences between the physiotherapist groups at baseline. However, the physiotherapists receiving active implementation support showed a significant increase in observed clinical actions at post-intervention, whereas the comparison group showed no change. Nevertheless, the changes after three-, six- and 12-month follow-ups were not sustained. The complete implementation process is outlined by Fritz et al. (2020). After the initial patient recruitment, follow-up measurements of the health outcomes were carried out before and after the treatment period, at six months, one year, one and a half years, two years and five years. There was no significant difference between the patient groups regarding their characteristics at pre-intervention (Fritz et al., 2021). In the present work, participants were included if they filled out the questionnaire at pre-, post-intervention, after six months, two years and five years. To strive for a balanced data set with the largest sample size and fewest missing values, the one- and one-and-a-half-year follow-ups were excluded. Figure 1 illustrates the participant recruitment. A total of 29 patients was included, which equals a response rate of 21.8% concerning the pre-intervention measurement and 53.7% concerning the two-year follow-up. Table 1 presents the participants’ characteristics.

![Flowchart](image)

**Figure 1: Flowchart of participants recruitment after two-year follow-up**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>AIS group (n = 14)</th>
<th>PIS group (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain duration</strong> (n, %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subacute (&lt; 12 weeks)</td>
<td>n = 1 (7.14%)</td>
<td>n = 4 (26.60%)</td>
</tr>
<tr>
<td>Persistent (&gt; 12 weeks)</td>
<td>n = 13 (92.86%)</td>
<td>n = 11 (73.40%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women (n = 12)</td>
<td>Women (n = 13)</td>
<td></td>
</tr>
<tr>
<td>Men (n = 2)</td>
<td>Men (n = 2)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong> (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>53.1 (10.0)</td>
<td>47.9 (10.2)</td>
</tr>
</tbody>
</table>
3.3 Data collection

The first questionnaire was handed to the patients by the physiotherapists before the patients received the therapeutic intervention, and the follow-up questionnaire (Appendix A) was sent out via mail. The questionnaire is in Swedish and consists of multiple sub-questionnaires through which the patients’ answers regarding the different health outcomes were captured and will be described in the following.

The participants’ pain-related disability was measured through the Pain Disability Index (PDI), designed to measure how much individuals feel inhibited in daily activities due to chronic pain (Pollard, 1981). The questionnaire comprises seven questions about responsibilities in home and family, social and life supporting activities, occupation, recreation, sexual behaviour and self-care (Chibnall & Tait, 1994). Each question is answered on an 11-graded numeric rating scale (NRS) from 0-10, 0 meaning “no disability” and 10 “total disability”, letting the total score range from 0-70. The PDI is reported to be a valid and reliable instrument measuring pain-related disability (Grönblad et al., 1994; Soer et al., 2013) and presents good internal consistency in the Swedish version in several conducted studies (α = 0.80 - 0.89) (Denison et al., 2004; Fritz et al., 2021; Sandborgh et al., 2007, 2008).

The perceived pain intensity was measured with an 11-graded NRS, ranging from 0-10 (Haefeli & Elfering, 2006), asking participants about their perceived pain of the last week. 0 stands for “no pain” and 10 for “worst imaginable pain”. The 11-graded NRS is valid and reliable in assessing adult self-reported pain intensity(Castarlenas et al., 2017).

The Functional Self-efficacy Scale (SES) measured the participants’ self-efficacy, which contains 20 questions asking about the ability to perform activities of daily living, such as going shopping or doing laundry (Altmaier et al., 1993). The total score ranges from 0-200, with each question consisting of an 11-graded NRS from 0-10, 0 meaning “not confident at all” and 10 “very confident”. The SES is identified as a reliable and valid instrument in measuring self-efficacy (Bunketorp et al., 2005; Miles et al., 2011).

To measure the tendency of catastrophic thinking, the subscale of catastrophic thinking from the Coping Strategies Questionnaire (CSQ) was used (Rosenstiel & Keefe, 1983). The participants rate their agreement to six statements on an NRS from 0 to 6 about possible thoughts and actions when in pain. 0 stands for “never think or do that”, and 6 ”always think and do that”. The total index ranges from 0 to 36, with a higher score indicating stronger catastrophic thinking concerning pain. The subscale of catastrophic thinking from the Swedish CSQ is reported as valid and reliable (Burckhardt & Henriksson, 2001).

The fear of movement was measured with the 11-item Tampa Scale of Kinesiophobia (TSK-11), which consists of 11 statements about pain experiences (Woby et al., 2005). Here, respondents rate their agreement from 1 to 4, 1 meaning “strongly disagree” and 4 “strongly agree”. The instrument’s total index ranges from 11 to 44, where a higher score indicates higher fear of movement. The Swedish version of the TSK-11 is a valid and reliable instrument for measuring the fear of movement (Larsson et al., 2014).
3.4 Procedure

The patients’ data until the two-year follow-up measurement was collected and evaluated as part of the study by Fritz et al. (2021). The five-year follow-up measurements are evaluated by the author of this master’s thesis.

After implementation support targeting the physiotherapists’ clinical behaviour, the physiotherapists started recruiting patients in November 2016. The first data collection of the patients’ health outcomes occurred at the primary healthcare ward. Participants were asked for their interest and consent to participate in follow-up questionnaires. All patients, who responded to the follow-up questionnaires, received the same questionnaire after five years, which was answered by 31 patients.

3.5 Data management and analyses

The data analyses were carried out with IBM SPSS Statistics version 28.0 (Windows) where the significance level was set to $p \leq 0.05$.

Two participants were excluded from the initial 31 participants who answered the 5-year follow-up questionnaire. Before the exclusion, each participant was screened to see if all follow-up questionnaires were answered. To reduce exclusion within the small sample, the following imputation method was applied: a missing value was replaced with the previous value within a measured variable e.g., if a participant is missing the PDI value for the second measurement point, the participants’ score from the first measurement point was inserted. This data imputation method seemed adequate for the described sample as it is of small size, which hampers a missing value prediction or inserting the most frequent value. This imputation was performed for nine participants, altogether 26 scores and the data set, which excluded the follow-up measurements from one and one and a half year. If the previous value of a variable to be inserted was missing, the participant was excluded, which was the case for two participants.

To answer the first research question, the non-parametric Wilcoxon signed-rank test was performed to calculate the difference between two dependent groups, in this case for the AIS and PIS group respectively. Non-parametric tests were used because the data was ordinal and did not show a normal distribution, indicated by the Shapiro-Wilk test and visual inspection of the Q-Q plots and histograms, except for two variables at two measurement points. This rejects one assumption of performing parametric tests, which require a normal data distribution (Field, 2018, Chapter 6). For each group, two Wilcoxon signed-rank tests were performed as the aim was to identify the change in all variables between the pre- and post-measurements and between the post- and the five-year follow-up measurements. This was proceeded in pairs, equalling five pairs for five variables for each performed test. The effect size calculation was performed using the following formula, taking the $z$-value as output from the Wilcoxon signed-rank test and the total number of observations/pairs (Coolican, 2014, Chapter 17): $r = z/\sqrt{N}$. The effect size $r$ was interpreted as: 0.1 as small effect size, 0.3 as medium effect size and 0.5 as large effect size (J. Cohen, 1988, Chapter 3). Additionally, the
development of all variables was graphically illustrated through boxplots, which were plotted with R.

In answering both sub-questions of study question two, new variables were computed by subtracting the post-intervention PDI score from the pre-intervention score and the PDI score at the 5-year follow-up from the post-intervention PDI score. This was performed for each participant within each group. The non-parametric Mann-Whitney U test was then performed to test the difference between the AIS and PIS group in PDI change scores. The new variables were set as the test variable, and the AIS and PIS group were grouped, respectively.

Correlation analyses were performed to answer both subquestions of study question three. Four separate analyses were carried out as the aim was to look at the relationship between associated factors at pre-intervention and the PDI at the 5-year follow-up as well as the associated factors at post-intervention and the PDI at the 5-year follow-up for the AIS and PIS group respectively. All variables were included in a Spearman’s correlation, a non-parametric correlation test. The size of the correlation coefficient, Spearman’s rho (ρ), was interpreted as follows:

<table>
<thead>
<tr>
<th>Size of correlation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00–0.10</td>
<td>Negligible correlation</td>
</tr>
<tr>
<td>0.10–0.39</td>
<td>Weak correlation</td>
</tr>
<tr>
<td>0.40–0.69</td>
<td>Moderate correlation</td>
</tr>
<tr>
<td>0.70–0.89</td>
<td>Strong correlation</td>
</tr>
<tr>
<td>0.90–1.00</td>
<td>Very strong correlation</td>
</tr>
</tbody>
</table>

Table 2: Interpretation of the Spearman’s rho correlation coefficient according to Schober et al. (2018)

3.6 Ethical considerations

The present master’s thesis follows the principles of the Helsinki Declaration, which outlines the ethics of protecting participants’ welfare in medical research (World Medical Association, 2013). The recruitment of the physiotherapists and the patients until all follow-ups was ethically approved and reviewed by the Swedish Regional Ethical Review Board, Uppsala (Dnr 2015/385). All participants received written and oral information about the study, where participation was voluntary and could be withdrawn without consequences. Prior to enrolment, their written consent was obtained. The collected data was coded to anonymise participants’ names and stored safely to guarantee no public access.
4 RESULTS

4.1 Development of PDI and associated factors

In the following, the development of the PDI and associated factors in each group is reported with reference to the respective boxplot. The median scores at pre-, post-intervention and the 5-year follow-up for all variables in the AIS and PIS group and the p-values resulting from the Wilcoxon signed-rank tests are presented in Table 3.

The development of the PDI in the AIS group is illustrated in Figure 2. Here, the Median value shows a slight decrease from the pre-intervention (M1) to the post-intervention (M2) measurement, with decreased variability in scores at M2, meaning fewer observations within the interquartile range (IQR). A Wilcoxon signed-rank test revealed no significant differences between the M1 and M2. From M2 to the 5-year follow-up measurement (M5), the Median value slightly increases, with further decreased variability in scores at M5. M2 and M5 both have one outlier each. The Wilcoxon signed-rank test also showed no significant difference between M2 and M5.

Regarding the PDI for the PIS group, the boxplot in Figure 2 demonstrates a decreased Median and score variability in M2, compared to M1, with two outliers at M1 and one at M2. The Wilcoxon signed-rank test showed no significant difference between M1 and M2. From M2 to M5, the Median value decreases further to zero, and the group shows comparable score variability with M2. Two outliers were detected at M5. No significant difference was found between PDI measurements at M2 and M5.

For the development of the measured pain intensity in the AIS group, Figure 3 presents a decrease in the Median value and an increase in the size of the IQR at M2 compared to M1. This difference between M1 and M2 was tested to be non-significant with the Wilcoxon signed-rank test. Regarding the change between M2 and M5, the pain intensity scores have
greater variability and a further decreased Median at M5, as presented in Figure 3. Also, no significant difference was found between M2 and M5.

In the PIS group, the boxplot in Figure 3 shows a decrease in the Median value with a downshift in score variability from M1 to M2. A significant difference was found in pain intensity between M1 and M2. The Median score significantly decreased, as shown in Table 3, \( z = -2.692, p = 0.007 \), which equals a medium effect size of \( r = 0.491 \). After five years, the pain intensity scores at M5 show a minimal decrease in the Median and increased variability compared to M2, see Figure 3. The difference between M2 and M5 was also found to be non-significant.

![Figure 3: Boxplot showing the measured pain intensity in the AIS and PIS group at pre-, post-intervention and at half-year, 2-year and 5-year follow-up](image)

In self-efficacy (SE) for the AIS group, the boxplot in Figure 4 shows a similar Median value between M1 and M2 with increased variability in scores in M2 with one outlier. The Wilcoxon signed-rank test revealed no significant difference between the Median values in M1 and M2. In M2 and M5, the Median value and variability are comparable, see Figure 3. No significance was also found in SE between M2 and M5.

For SE in the PIS group, Figure 4 shows an increase from M1 to M2 in scores and similar IQR size between the measurement points. Two outliers were detected at M1. The Wilcoxon signed-rank test found no significance between M1 and M2. From M2 to M5, the boxplot in Figure 4 also presents a minimal increase in scores and a decrease in score variability with three outliers compared to M2. The Wilcoxon signed-rank test also revealed no significant difference between M2 and M5 in SE scores.
In the variable catastrophic thinking for the AIS group, the boxplot in Figure 5 shows a similar Median between M1 and M2 with greater score variability in M1. A non-significant difference was found between M1 and M2 with the Wilcoxon signed-rank test. Between M2 and M5, a decrease in score variability and the Median is presented in Figure 5, with one outlier at M5. The Wilcoxon signed-rank test exposed a significant decrease in Median scores, $z = -2.382$, $p = 0.017$, which equals a medium effect size of $r = 0.450$.

Regarding the PIS group, Figure 5 shows a slight decrease in the Median for M2 and a comparable variability in scores between M1 and M2. The difference between M1 and M2 in catastrophic thinking was tested as non-significant. At the five-year follow-up, the Median and score variability decreased further, and one outlier was detected at M5. The Wilcoxon signed-rank test showed a non-significant difference between M2 and M5.

Figure 5: Boxplot showing the measured catastrophic thinking (C) in the AIS and PIS group at pre-, post-intervention and at half-year, 2-year and 5-year follow-up
In the measured fear of movement for the AIS group, the Boxplot in Figure 6 reveals equally large medians for the measurement points M1 and M2. The IQR is comparable in size. One outlier is presented at M2. The Wilcoxon signed-rank test showed a non-significant difference between M1 and M2. Between M2 and M5, Figure 6 shows a decreased Median at M5 with one outlier and comparable score variability with M2. No significant difference was also found between M2 and M5.

Regarding the scores in fear of movement for the PIS group, the Median decreased minimally from M1 to M2, and the score variability at both measurement points was comparable, as presented in Figure 6. The Wilcoxon signed-rank test identified no significant change between M1 and M2. There were two outliers at M1. Regarding the development between M2 and M5, the boxplot in Figure 6 shows a slight decrease in the Median and the score variability, with two detected outliers at M5. The Wilcoxon signed-rank also revealed no significance between M2 and M5.

*Figure 6: Boxplot showing the measured fear of movement (FoM) in the AIS and PIS group at pre-, post-intervention and at half-year, 2-year and 5-year follow-up*
Table 3: Median scores of the health outcomes at pre-, post-intervention and the 5-year follow-up for the AIS and PIS group with p-values from the Wilcoxon signed-rank tests

<table>
<thead>
<tr>
<th>AIS group</th>
<th>PDI and associated factors</th>
<th>Median</th>
<th>p-value</th>
<th>M1 – M2</th>
<th>M2 – M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDI</td>
<td></td>
<td>M1</td>
<td>M2</td>
<td>M5</td>
<td></td>
</tr>
<tr>
<td>Pain intensity</td>
<td></td>
<td>11.00</td>
<td>8.50</td>
<td>9.50</td>
<td>0.674</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td>6.50</td>
<td>5.00</td>
<td>3.00</td>
<td>0.155</td>
</tr>
<tr>
<td>Catastrophising thinking</td>
<td></td>
<td>184.50</td>
<td>186.50</td>
<td>184.50</td>
<td>0.638</td>
</tr>
<tr>
<td>Fear of movement</td>
<td></td>
<td>9.00</td>
<td>8.50</td>
<td>1.00</td>
<td>0.398</td>
</tr>
<tr>
<td>PIS group</td>
<td></td>
<td>M1</td>
<td>M2</td>
<td>M5</td>
<td></td>
</tr>
<tr>
<td>PDI</td>
<td></td>
<td>9.00</td>
<td>3.00</td>
<td>0.00</td>
<td>0.064</td>
</tr>
<tr>
<td>Pain intensity</td>
<td></td>
<td>6.00</td>
<td>3.00</td>
<td>2.00</td>
<td>0.007</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td>177.00</td>
<td>189.00</td>
<td>198.00</td>
<td>0.100</td>
</tr>
<tr>
<td>Catastrophising thinking</td>
<td></td>
<td>4.00</td>
<td>2.00</td>
<td>0.00</td>
<td>0.182</td>
</tr>
<tr>
<td>Fear of movement</td>
<td></td>
<td>20.00</td>
<td>18.00</td>
<td>13.00</td>
<td>0.131</td>
</tr>
</tbody>
</table>

4.2 Differences in PDI change scores

The Mann-Whitney U test showed no significant difference between the AIS and PIS group regarding the change in PDI scores between pre- and post-intervention, \( z = -0.874, p = 0.382 \). The AIS group showed a mean rank of 13.57 and the PIS group a mean rank of 16.33. The following Mann-Whitney U test also revealed no significant difference in the change in PDI scores between post-intervention and 5 years, \( p = 0.676 \) (2-tailed). Here, the AIS group showed a mean rank of 14.32 and the PIS group a mean rank of 15.63.
4.3 Correlations between PDI and associated factors

In the AIS group, the correlation analysis revealed the following correlations between associated factors at pre-intervention and the PDI at the 5-year follow-up: a significant strong and negative correlation was found between self-efficacy and the PDI and a significant moderate correlation between fear of movement and the PDI at the 5-year follow-up. Pain intensity and catastrophic thinking correlated moderately with the PDI at the 5-year follow-up. Regarding the correlation between associated factors at post-intervention and the PDI at the 5-year follow-up, self-efficacy has a significant moderate negative correlation with the PDI, fear of movement and pain intensity both show a moderate correlation and catastrophic thinking a weak correlation. The correlation coefficients and p-values for all associated factors for the AIS and PIS group are presented in Table 3.

About the PIS group, the correlations between the associated factors measured at pre-intervention and the PDI at the 5-year follow-up were non-significant. Fear of movement and catastrophic thinking both show a negligible correlation with the PDI, self-efficacy a weak correlation and pain intensity a moderate negative correlation. For the correlation between associated factors at post-intervention and the PDI at the 5-year follow-up, self-efficacy has a significant moderate negative correlation with the PDI, catastrophic thinking and fear of movement a weak correlation and pain intensity no correlation.

Table 4: Correlation between associated factors at pre-/post-intervention and PDI at the 5-year follow-up for the AIS and PIS group

<table>
<thead>
<tr>
<th>Associated factors at pre- and post-intervention</th>
<th>AIS group (n = 14)</th>
<th>PIS group (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spearman’s rho (ρ)</td>
<td>p-value</td>
</tr>
<tr>
<td>Pain intensity (pre)</td>
<td>.505</td>
<td>.066</td>
</tr>
<tr>
<td>Self-efficacy (pre)</td>
<td>-.860**</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Catastrophic thinking (pre)</td>
<td>.507</td>
<td>.064</td>
</tr>
<tr>
<td>Fear of movement (pre)</td>
<td>.662**</td>
<td>.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain intensity (post)</td>
<td>.409</td>
<td>.147</td>
</tr>
<tr>
<td>Self-efficacy (post)</td>
<td>-.539*</td>
<td>.047</td>
</tr>
<tr>
<td>Catastrophic thinking (post)</td>
<td>.313</td>
<td>.275</td>
</tr>
<tr>
<td>Fear of movement (post)</td>
<td>.444</td>
<td>.112</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
5 DISCUSSION

5.1 Summary of results
For this particular sample of participants with subacute and persistent MSP, significant changes were found between post-intervention and 5-year follow-up measurements of catastrophic thinking in the AIS group and between pre- and post-intervention measurements of pain intensity in the PIS group. There was no difference between both groups regarding the change in pain-related disability between the post-intervention and the 5-year follow-up measurement. In the AIS group, self-efficacy at pre-intervention showed a strong significant negative correlation with PDI at the 5-year follow-up, and the fear of movement at pre-intervention had a significant moderate correlation. Self-efficacy at post-intervention had a moderate significant correlation with PDI at the 5-year follow-up in the AIS and PIS group.

5.2 Results discussion
This thesis evaluated the development and relationships of health outcomes over five years in patients with subacute and persistent MSP treated in two conditions in primary healthcare settings. What was known in the beginning is that Fritz et al. (2021) identified no significant differences between the AIS and PIS group in PDI and associated factors over two years. Therefore, the aim of the present study was approached exploratively, as no hypotheses were predetermined and tested, with a focus on the evaluation of the health outcomes after five years.

The non-significant difference between the AIS and PIS group, as identified in the study by Fritz et al. (2021), can partly be confirmed by the results of this study, where there was no significant difference between the groups regarding the change in PDI over five years. Fritz et al. (2021) revealed a significant improvement in all health outcomes up to two years post-intervention. The sample in this study showed one significant change in catastrophic thinking for the AIS group, considering the post-intervention and 5-year follow-up measurements. Generally, the presented results must be interpreted cautiously due to varying reasons, which will be highlighted throughout the discussion. First, it has to be pointed out, that the sample in this study and in Fritz et al. (2021) vastly differed in size, making it more difficult to detect changes within a relatively small sample.

A possible explanation for a non-significant change in patients’ health outcomes could be the non-sustainment of the physiotherapists’ clinical behaviour after the received implementation support. Fritz et al. (2020) demonstrated that physiotherapists receiving active implementation support showed a significant increase in observed clinical actions at post-intervention, which nevertheless did not sustain at the three-, six- and 12-month follow-ups. The physiotherapists receiving the passive implementation support showed no change in clinical behaviour. In addition, the implementation intervention for the physiotherapists was
completed in the end of 2016, which means that about six years have passed until the five-year follow-up measurement of the patients were collected. Within this whole time, it was not guaranteed that a patient would be treated by the same physiotherapist who received the intervention, nor receiving physiotherapy treatment at all. The small and non-sustained effect of the implementation support and the considerable time that passed until the patients’ health outcomes measurements indicate that the results are only, to a small or no degree, attributed to the intervention.

The present study partly confirms the prognostic value of PDI-associated factors in pain-related disability, as claimed by several researchers. Martinez-Calderon et al. (2018) highlighted the close relationship between a high level of self-efficacy and reduced disability, among other health outcomes, in patients with persistent MSP. However, as one result, the authors state that their systematic review shows low evidence for a prognostic influence of self-efficacy in persistent MSP and suggest studies with longitudinal designs to investigate this relationship further. In this study, self-efficacy shows significant moderate to strong negative correlations with the PDI at the 5-year follow-up, which confirms the close relationship between the factors. However, Bandura (1991) defines self-efficacy as one concept among others as part of the personal cognitive factors. Together with the behavioural and environmental factors, these factors form the triad defined in SCT, which explains the dynamic of an individual’s behaviour (Bandura, 1986). Therefore, attention should also be given to other factors influencing the course of treatment in patients with persistent MSP, such as demographic factors (Luque-Suarez et al., 2019). The authors name the fear of movement to have a predictive value in the development of persistent MSP. In this study, the variable fear of movement at pre-intervention showed one significant moderate correlation with the PDI at the 5-year follow-up and a weak to moderate correlation at post-intervention. With the fear-avoidance model, which explains the development of a fear of moving as a drastic response to an unpleasant, painful experience (Vlaeyen & Linton, 2000), it stands to reason that fear of movement may increase perceived disability. Vlaeyen and Linton (2000) describe pain-related fear as a potent predictor of disability, however, referred to results from mainly cross-sectional studies. Vlaeyen (2015) discusses that it is less the intensity of pain-related fear predicting disability than the increasing number of stimuli that can evoke a conditioned response. However, the author states that further experimental and longitudinal research is needed to identify the causal relationships of this assumption. Regarding the associated factor of catastrophic thinking, this study found no correlations with the PDI at the 5-year follow-up. Martinez-Calderon et al. (2019) identified that increased pain catastrophising at baseline predicts increased disability over time, referring to longitudinal studies included in the systematic review. However, the studies’ follow-up measurements range from one month to twelve months, a short follow-up period compared to five years. To touch upon the associated factor of pain intensity, this study presented moderate positive correlations and even one moderate negative correlation of pain intensity with the PDI. This shows an inconsistency, which should be interpreted cautiously, however, partly aligns with the conclusion by Tseli et al. (2019) that pain intensity is not considered a predictor of disability. It is rather viewed to be mediated by cognitive factors, which in turn influence disability (Shaygan et al., 2019).
5.3 Methods discussion

As this thesis aimed to explore the development of health outcomes in patients with subacute and persistent MSP, a longitudinal design was chosen. The design is adequate because it allows to evaluate relationships in risk factors for disability as well as measured treatment outcomes over different periods (Caruana et al., 2015). This helps to comprehensively understand a change over time in a sample of a particular patient group. Challenges of conducting longitudinal studies, which relate to the present study, are the risk of an attrition bias, threatening the representativeness of the results (Caruana et al., 2015), and also a possible cohort effect, meaning that the initially recruited group differed from the group at the 5-year follow-up. Both challenges make the generalizability of the results to comparable population samples problematic. Further, in this longitudinal design, the patient intervention was not followed up on or took place in an uncontrolled setting, leaving room for confounding variables. These include, for example, being treated by a different physiotherapist or changing life circumstances (deterioration of the health condition, becoming injured, etc.). Increasing pain through injury, for example, could have influenced the scores in pain intensity, leading to an increased group Median score and being an outlier.

Regarding the measurements of participants’ health outcomes, various instruments were used in the present study. The PDI serves as an instrument to measure pain-related disability generally. Participants rate their perceived disability in everyday situations in seven categories on numeric rating scales with 11 different options. In contrast, a Visual Analogue Scale (VAS) with no numeric rating and two extreme end points theoretically has unlimited answer options (Haefeli & Elfering, 2006). The VAS, however, complicates the quantification of respondents’ disability ratings compared to a NRS. Regarding the measurement of pain intensity, participants were asked to rate their average perceived pain of the last week on an 11-graded NRS. This method may be hampered by the difficulty of summarising or recalling how strong the pain was perceived, which potentially could have biased the results in pain intensity measurements. Numeric rating scales were also used in measuring self-efficacy, catastrophic thinking and fear of movement. The SES consists of 20 items covering relevant activities of daily living. As these items are similar to the items in the PDI, this could explain why the measurements from the SES show several moderate to strong correlations with the PDI.

The present study includes outcome measurements in pain and disability next to psychological factors like self-efficacy, fear of movement and catastrophic thinking. However, social factors contributing to a biopsychosocial approach have merely been examined as part of the PDI, summarised in the categories of responsibilities in home and family, social and life supporting activities, occupation and recreation. In contrast to that, Mescouto et al. (2022) question the assessment of only biological (e.g. pain measurements) and psychosocial outcomes (e.g. beliefs, family and work situation) and argue for the use of qualitative research to grasp the complexity of living with chronic MSP.

Regarding the data collection procedure, the patients were first asked for their interest in participation and then for written and verbal consent. For the treatment process, it is noteworthy that both the AIS and PIS groups received physiotherapy treatment within the
clinical setting, specifically at primary healthcare centres. This aspect is viewed as a strength on the one hand, as this natural setting of the clinical environment provides an authentic context, assessing the actual outcomes of the interventions. On the other hand, the treatment process is not controlled, leaving room for confounding variables as mentioned before.

On the subject of data management, the simple imputation method of replacing a missing value by carrying the last value forward ensured retaining the majority of participants of the relatively small sample. It has to be pointed out that this imputation method was carried out with the data set, which excluded the follow-up measurements from one and one and a half year. This means that a missing value at the 2-year follow-up would be replaced with the previous value from the 6-month follow-up, which is strongly criticised by Lachin (2016) as there is a considerable time interval between measurements, possibly estimating an unreliable, missing value. This could mean that the true values of the patient’s health outcomes are not reflected in the results, leading to false conclusions. Instead, an imputation method, where the missing value is replaced with the calculated Median of all measured values of the variable, could have been considered.

Relating to the data analyses, the utilisation of non-parametric tests, specifically the Wilcoxon signed-rank test and the Mann-Whitney U test, was indicated due to the small sample size and non-normal distribution of the data. This choice aligns with recommendations made by different authors for such circumstances (Fagerland, 2012; Field, 2018, Chapter 7; Kellar & Kelvin, 2013, Chapter 6). However, using non-parametric tests presents a trade-off in statistical power, where a Type-II-error is more likely (Field, 2018, Chapter 7), meaning that there is a greater risk that the presented results do not reflect the true development of patients’ health outcomes. Regarding a difference calculation between groups, as it was performed to answer research question two, an ANOVA (Analysis of Variance) was ruled out caused by the unfulfilled assumption of having a normal data distribution within each group (Field, 2018, Chapter 6). Instead, the difference in PDI scores was calculated as new variables between which the significance in difference was calculated with the Mann-Whitney U test. Boxplots were chosen to illustrate the variables’ development throughout all measurement points graphically. Noteworthy here is the detected ceiling effect in the measurements of self-efficacy and the floor effect in the PDI for the PIS group. A ceiling effect mean, scores cluster near the maximum possible value and a floor effect the opposite, scores clustering near the minimum possible value (Garin, 2014). There are different reasons why these effects can occur. This includes the measuring instruments’ psychometric properties of reliability and responsiveness (Garin, 2014). These play a role in the ability to measure a defined variable and the changes of it. Another reason for the ceiling and floor effect can be the small sample size, where variance in scores is reduced. This can likely be the case in the present study, as the SES and PDI are identified as reliable instruments.

In terms of exploring relationships between the primary outcome measure of pain-related disability and associated factors, an alternative methodological approach could have been building a regression model. This was also ruled out due to the small sample and non-normal distribution of the data, which can hamper the strength of a regression model (Field, 2018, Chapter 9). Instead, the Spearman’s rho correlation coefficient was reported together with
the significance of the correlation between the factors. The Spearman’s rho correlation coefficient served as a non-parametric statistic as the assumptions for parametric tests were not fulfilled.

5.4 Ethical discussion
The present thesis evaluated data whose collection was ethically approved. The participants’ consent in participation was obtained, and their data was kept anonymised and under safe circumstances.

It must be specified that this study’s author worked independently from the researcher who collected the presented data. This may be viewed critically as the research aim was not formulated prior to data collection, and the research process could have been marked by picking specific results. Therefore, it is crucial to be transparent about the argumentation of the problem formulation and the choice and application of the methods to make the research process comprehensible. For example, thorough research was conducted in the background to guide the research problem and aim formulation. According to Resnik (2005, Chapter 4), honesty is the most important ethical rule to follow in the realm of science. Dishonesty does not guide the pursuit of knowledge and solving problems.

5.5 Clinical implications and further research
Exploring long-term health outcomes in chronic conditions holds considerable importance, which however is challenging to perform. It yields valuable insights directly relevant to clinical practice, where especially persistent MSP becomes a growing issue. Central to understanding this health condition is the interplay of biopsychosocial factors, which influence the development of disability. Following a behavioural medicine approach in physiotherapy plays a pivotal role in addressing these factors to enhance patient outcomes.

Further research should focus on how to promote self-management skills in patients with subacute and persistent MSP, which can contribute to an individual’s increased ability and confidence to participate in individual life situations. These interventions should be guided by the principle of personalisation, considering the individual circumstances of a patient to tailor the treatment.

This study included patients with subacute and persistent MSP, two sample characteristics which are worthwhile to be viewed separately in future studies to, for example, better understand how subacute pain evolves and becomes persistent. Even within the time spectrum of persistent MSP, there could be a difference in patients having MSP for more than six months or several years.
6 CONCLUSION

The participants diagnosed with subacute or persistent MSP in the present study show few significant changes in health outcomes within five years after being treated by physiotherapists, who followed two different implementation supports of a behavioural medicine approach. The investigated relationships between pain-related disability and associated factors indicate that self-efficacy and fear of movement play a significant role in the long-term development of disability. However, these results need to be interpreted cautiously and investigated further, as the small sample size impedes the possibility of drawing sure conclusions about the development and relationships of long-term health outcomes and presumed associated factors. The present findings could not fully confirm the underlying tenets of Social Cognitive Theory and the fear-avoidance model, which should be further studied in this area of physiotherapy treatment.
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APPENDIX A: PARTICIPANTS’ QUESTIONNAIRE (SWEDISH)
(Pain Disability Index)

Frågor om i vilken grad smärtan påverkar aktivitetsområden i ditt dagliga liv


0 betyder inga hinder alls, och 10 innebär att alla de aktiviteter som du vanligen skulle engagera dig i har blivit helt hindrade av din smärta.

1. **Ansvar för hemmet och familjen.** Aktiviteter som har att göra med hemmet och familjen. De innefattar sysslor och uppgifter som du gör hemma, t.ex. trädgårdsarbete, och ärenden eller tjänster för andra familjemedlemmar, t.ex. att köra barnen till skolan.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>8</th>
<th>9</th>
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</tbody>
</table>

2. **Rekreation.** Hobbies, sport, idrott och andra liknande fritidsaktiviteter.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
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</tbody>
</table>

3. **Social aktivitet.** Aktiviteter med vänner och bekanta utanför familjen, t.ex. fester, teater, konsert, att gå ut och äta, och liknande.

<table>
<thead>
<tr>
<th>0</th>
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</tr>
</tbody>
</table>
4. **Sysselsättning.** Aktiviteter som är en del av eller som direkt har att göra med ens arbete. Även oavlönat arbete, t.ex. föreningsarbete, räknas in här.

<table>
<thead>
<tr>
<th></th>
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</tbody>
</table>

5. **Sexualliv.** Frekvens och kvalitet i sexuallivet.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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</tbody>
</table>

6. **Personlig aktivitet.** Aktiviteter som innefattar det man behöver göra för att vara oberoende i det dagliga livet, t.ex. dusha, köra bil, klä på sig, etc.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>4</th>
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</tr>
</tbody>
</table>

7. **Livsuppehållande aktivitet.** Grundläggande livsuppehållande handlingar, såsom att äta, sova och andas.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<tbody>
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<td></td>
</tr>
</tbody>
</table>
(Pain intensity)

Skatta din genomsnittliga smärtintensitet under den senaste veckan?

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingen smärta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Värsta tänkbara smärta</td>
</tr>
</tbody>
</table>

(Catastrophic thinking)

Här följer frågor om dina tankar kring smärtan


<table>
<thead>
<tr>
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<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrig</td>
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<tr>
<td>Ibland</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alltid</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0 betyder att du aldrig tänker eller gör så.

3 betyder att du tänker eller gör så ibland.

6 betyder att du alltid tänker eller gör så.

| 12 | Det är fruktansvärt, det känns som om det aldrig kommer att bli bättre. |
| 37 | Det är hemskt och jag upplever att smärtan överväldigar mig. |
| 26 | Jag känner det som om livet inte är värt att leva. |
| 38 | Jag oroar mig ständigt över om smärtan någonsin ska försvinna. |
| 02 | Det känns som om jag inte står ut längre. |
| 18 | Det känns som om jag inte kan fortsätta så här. |
### Fear of movement

Nedan följer olika erfarenheter som andra patienter delgivit oss. Var vänlig och ringa in lämplig siffra från 1-4 för varje påstående. Läs varje påstående och besvara varje påstående så gott Du kan.

<table>
<thead>
<tr>
<th>Påstående</th>
<th>1 Håller inte alls med</th>
<th>2</th>
<th>3</th>
<th>4 Håller med helt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jag är rädd för att jag kan skada mig själv om jag tränar.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Om jag försökte träna så skulle min smärta öka.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Min kropp sänder mig att jag har någon allvarlig åkomma.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Människor tar inte mitt medicinska tillstånd tillräckligt allvarligt.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Min skada har försvagat mitt kroppsliga för resten av mitt liv.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Smärta beror alltid på kroppslig skada.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Att vara försiktig med onödiga rörelser är det bästa jag kan göra för att förhindra att smärtan förvärras.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Jag skulle inte ha så här ont om det inte var något farligt på gång i min kropp.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Smärten sänder mig när jag skall sluta träna, så att jag inte skadar mig själv.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Jag kan inte göra samma saker som andra eftersom det är för stor risk att bli skadad.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Ingen ska behöva träna när hon eller han har ont.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Self-efficacy

**Frågor om hur säker Du är på Din förmåga att genomföra aktiviteter trots smärta**

Människor som har ont, kan vara osäkra på sin förmåga att klara av vanliga dagliga sysslor och aktiviteter. Vi är intresserade av att få veta hur säker Du är på Din förmåga att kunna genomföra ett antal dagliga aktiviteter. Här nedanför finns tjugo vardagliga aktiviteter beskrivna.
Ringa in den siffra på skalan efter varje påstående som bäst beskriver hur säker Du är på Din förmåga att genomföra aktiviteten trots smärta. Om Din förmåga varierar från dag till dag, ringa in den siffra som beskriver hur det vanligen är. 0 betyder att Du inte alls är säker på Din förmåga att genomföra aktiviteten, och 10 betyder att Du är mycket säker på Din förmåga att genomföra aktiviteten.

Hur säker är Du på Din förmåga att:

<table>
<thead>
<tr>
<th>Aktivitet</th>
<th>0 1 2 3 4 5 6 7 8 9 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta ut soporna</td>
<td></td>
</tr>
<tr>
<td>Koncentrera dig på något</td>
<td></td>
</tr>
<tr>
<td>Gå och handla</td>
<td></td>
</tr>
<tr>
<td>Spela sällskapsspel</td>
<td></td>
</tr>
<tr>
<td>Skotta snö</td>
<td></td>
</tr>
<tr>
<td>Köra bil</td>
<td></td>
</tr>
<tr>
<td>Åta på en restaurant</td>
<td></td>
</tr>
<tr>
<td>Titta på TV</td>
<td></td>
</tr>
<tr>
<td>Träffa vänner</td>
<td></td>
</tr>
<tr>
<td>Arbeta med bilen</td>
<td></td>
</tr>
<tr>
<td>Kratta löv</td>
<td></td>
</tr>
<tr>
<td>Skriva brev</td>
<td></td>
</tr>
<tr>
<td>Tvätta</td>
<td></td>
</tr>
<tr>
<td>Laga sådant som går sönder i bostaden</td>
<td></td>
</tr>
<tr>
<td>Gå på bio</td>
<td></td>
</tr>
<tr>
<td>Tvätta bilen</td>
<td></td>
</tr>
<tr>
<td>Cykla</td>
<td></td>
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<tr>
<td>Åka på semester</td>
<td></td>
</tr>
<tr>
<td>Ta en promenad</td>
<td></td>
</tr>
<tr>
<td>Träffa släktingar</td>
<td></td>
</tr>
</tbody>
</table>