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Will my shoulder pain get better? – secondary analysis of data from a multi-arm randomised controlled trial

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Abstract

Objective To determine whether higher level or improvements over time in pain self-efficacy (PSE) and expectations of intervention effectiveness lead to better outcomes and whether the intervention used to manage rotator cuff related shoulder pain (RCRSP) impacts PSE and expectations over time.

Design Secondary analysis of data from a randomised controlled trial.

Participants 123 individuals (48 [15] years old; 51% female) with RCRSP.

Interventions Participants randomised into one of three 12-weeks interventions (education; education and motor control exercises; education and strengthening exercises).

Main outcome measures *Quick*DASH and Western Ontario Rotator Cuff Index (WORC) were administered at baseline and 12 weeks. Pain self-efficacy was assessed at 0 and 6 weeks. Patients' expectations regarding intervention effectiveness were assessed before randomisation and after the first and the last intervention sessions. NparLD were used for the analyses. A time effect indicated a significant change in patients' expectations or PSE over time, while a resolution effect indicated a significant difference in patients' expectations or PSE between those whose symptoms resolved and those whose did not.

Results Patients' expectations (−3 to 3) increased over time (0.33/3 [0.19 to 0.77]). Overall expectations were higher for those who experienced symptom resolution based on the WORC (0.19/3 [0.05 to 0.33]). PSE increased over time (5.5/60 [3.6 to 7.4]). Overall PSE was higher for those who experienced symptom resolution based on the WORC (7.0 [3.9 to 10.1]) and the *Quick*DASH (4.9 [1.7 to 8.2]).

Conclusion Clinicians should consider monitoring PSE and patients' expectations as they are important indicators of outcome.

Contribution of the paper

- Irrespective of the intervention, we observed an improvement in patients' pain self-efficacy and expectations of intervention effectiveness over time.
- Participants with a higher baseline expectations of intervention effectiveness, who received a combination of education and motor control exercises, reported better outcomes, measured by the WORC, than those receiving education alone or a combination of education and strengthening exercises.
- Clinicians should consider monitoring pain self-efficacy and patients' expectations in individuals with RCRSP as they could be useful indicators of outcome and their clinical interventions could be tailored towards improving understanding of RCRSP and self-management.

Keywords: Pain self-efficacy; Patients' expectations; Rotator cuff; Shoulder; Outcome

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Introduction

Musculoskeletal disorders (MSKDs) are highly prevalent and, as a group of conditions, are associated with the largest number of years lived with disability [1]. Among MSKDs, shoulder disorders represents the third most prevalent MSKD [2]. Rotator cuff related shoulder pain (RCRSP), which constitutes nearly 70% of primary care shoulder pain consultations [3], is associated with decreased strength, reduced quality of life as well as increased levels of kinesiophobia and catastrophisation [4–8].

To help individuals diagnosed with RCRSP, health care professionals can rely on several interventions that have been shown to be effective, such as education, exercises, surgery, medication and injections [9–11]. Despite this, nearly a third of individuals do not report a significant improvement following their intervention, regardless of the intervention [12]. Many explanatory factors have been put forward to explain this lack of success [13,14].

Chester et al. found that higher levels of pain self-efficacy (PSE), defined as the confidence that one has to perform their activities and achieve their goals despite the presence of symptoms or pain, reduced the likelihood that pain and disability would persist over time [15]. In that study, patients' expectations of recovery following physiotherapy interventions was also highlighted as a possible predictive factor, where expectations were assessed by asking participants with RCRSP to rate how much they expected their shoulder problem to change as a result of physiotherapy treatment. Participants who expected full or much recovery following physiotherapy did better than those who expected only minimal or no recovery [15]. O'Malley et al. also highlighted the role of expectations as a predictor of RCRSP recovery [16]. They reported a difference in functional improvement greater than the minimum clinically important difference (MCID) between those with high outcome expectations and those with lower ones [16]. These findings are of great importance for the management of people with RCRSP. However, we still do not know whether the type of intervention received impacts self-efficacy and expectations over time and whether improvements over time in PSE and expectations following the intervention lead to better outcomes.

Our research team recently published a randomised controlled trial (RCT) comparing the effectiveness of three interventions for RCRSP: education, education and motor control exercises, education and strengthening exercises [17]. All three interventions led to statistically and clinically important improvements. While close to 80% of the 123 participants experienced statistically and clinically important improvements, a subset of participants did not. The main objectives of this secondary analysis of data were to determine whether the type of intervention received impacts self-efficacy and expectations over time and to explore whether higher level or improvements over time in self-efficacy and expectations lead to better outcomes. To our knowledge, there is currently no literature regarding this for individuals with any type of MSKD. Our hypotheses were that all three interventions would lead to an increase in PSE and expectations over time and that higher expectations and PSE would lead to greater symptom resolution. We believed that the motor control intervention would lead to the largest improvements in patients' expectations since this intervention is designed to quickly reduce patients' symptoms through simple and easy to perform symptom modification procedures.

Methods

Study design

This study involved secondary analysis of data from a single-blind, parallel-group randomised controlled trial of three physiotherapist-led interventions [17]. Each intervention lasted 12 weeks and patient-reported outcome measures of symptoms and functional limitations were administered at baseline and at the end of the intervention (12 weeks). PSE was assessed at 0 and 6 weeks (end of the education phase of the interventions), while patients' expectations regarding intervention effectiveness was assessed before randomisation to their group, after the first intervention session and after the last supervised intervention session (after about 8 weeks). Participants completed self-administered questionnaires on symptoms and PSE through an online-based platform (LimeSurvey), while patients' expectations of intervention effectiveness were collected by an independent research professional. The treating physiotherapist remained blind to all their questionnaire scores. Further information on this study is available in the published protocol[18] and in the article presenting results [17]. Trial is registered at ClinicalTrials.gov (NCT03892603). Ethical approval was obtained from the Research Ethics Committee of CIUSSS-CN (#2019-1762) and all participants provided written consent.

Population

One hundred and twenty-three adults presenting with RCRSP were recruited through the electronic mailing lists of students and employees of *Université Laval,* (> 50,000 individuals), Quebec, Canada. To be included, participants had to fulfill the following criteria: 1) 18–75 years of age, 2) symptoms > 3 months, 3) presence of a painful arc, 4) presence of a positive Neer sign or Hawkins Kennedy Test, and 5) presence of pain when resisting humeral external rotation or abduction, or positive Jobe Test. A positive cluster of criteria 3, 4 and 5 was used to confirm that their shoulder pain fell under the RCRSP umbrella diagnosis. Participants were excluded if they presented any of the following criteria: 1) clinical signs of massive rotator cuff tears (gross weakness in the absence of pain [positive lag sign]), 2) other shoulder disorders e.g., frozen shoulder,

severe osteoarthritis, fracture and dislocation, 3) symptomatic cervical spine pathology, 4) presence of significant co-morbidity e.g., neurological disorders, rheumatoid arthritis, 5) previous shoulder surgery, and 6) corticosteroid injection in the shoulder in the past 6 weeks.

Interventions

Education

Participants had two 30-minutes face-to-face education sessions with a physiotherapist. During the first one, they received oral and written advice and information related to the shoulder (anatomy and function), basic pain science, advice on pain management (night and day), activity modification (when to increase and decrease) and on the importance of physical activity, sleep, healthy eating habits and managing stress. They were also instructed to watch a series of 6 videos that addressed topics discussed during the initial session. For each video, participants had to highlight the key message they perceived and any questions they had after watching the video. Box 1 details the names and Internet URLs for the 6 videos. During the second session, the physiotherapist went over the content of the six videos and answered any remaining questions the participant may have had.

Education combined with motor control exercises

In addition to the advice and education received by the education group, participants were given a 12-week motor control program. Each session started with different shoulder symptom modification procedures to alleviate symptoms during upper limb movements [19]. If a technique reduced pain, that technique was then used during elevation exercises in 3 planes (flexion, abduction, scaption) and incorporated into the participant's everyday functional movements [20]. Once participants had reached pain free execution, the program was progressed into re-education exercises involving the whole body and mirroring the different functions performed by the shoulder. Number of repetitions varied from one to three sets of 15 repetitions.

Education combined with strengthening exercises

In addition to the advice and education received by the education group, participants were given a 12-weeks progressive shoulder strengthening exercises program. Exercises targeted humeral internal/external rotators, abductors, and the scapular muscles. Number of repetitions was one set of the maximum number of repetitions until muscular fatigue. Load was 90% of 1 repetition maximum (RM), which is the weight with which the participant could only complete one repetition of the exercise. At each of the 6 intervention sessions, shoulder strength was reassessed, and the programme was progressed accordingly.

Outcomes

Predictive outcomes

Patients' expectations of intervention effectiveness: To measure patients' expectations of intervention effectiveness, we used a 7-point Likert scale. The Likert scale is a widely used instrument for measuring opinion, preferences and beliefs [21]. Participants were asked the following question: *What change in your shoulder pain do you expect following this physiotherapy intervention?,* and they had to answer using a 7-point Likert scale (−3: worse than ever; 0: unchanged; 3: completely resolved). They were asked this question at 3 timepoints: prior to randomisation, after the first intervention session, and after the last supervised

Box 1: Names and URLs of the videos included in the education part of the intervention.

Name: Rotator Cuff Shoulder Pain: Exercise is as effective as surgery
Account: Kinetic Labs
URL: https://www.youtube.com/watch?v=5bUf9VcYLmI

Name: Understanding pain
Account: HNEHealth
URL: https://www.youtube.com/watch?v=qEWc2XtaNwg

Name: What happens inside your body when you exercise?
Account: British Heart Foundation
URL: https://www.youtube.com/watch?v=wWGulLAa0O0

Name: 23 and 1/2 hours: What is the single best thing we can do for our health?
Account: DocMikeEvans
URL: https://www.youtube.com/watch?v=aUaInS6HIGo

Name: What's the Best Diet? Healthy Eating 101
Account: DocMikeEvans
URL: https://www.youtube.com/watch?v=fqhYBTg73fw

Name: 90:10 The Single Most Important Thing You Can Do For Your Stress
Account: DocMikeEvans
URL: https://www.youtube.com/watch?v=I6402QJp52M

intervention session with a physiotherapist (after about 8 weeks).

Pain self-efficacy: PSE was assessed at baseline and after 6 weeks, once the education part of the intervention had finished, using the Pain Self-Efficacy Questionnaire (PSEQ-10) [22,23]. The PSEQ-10 is a 10-item questionnaire which aims to measure respondents' confidence in their ability to achieve different activities despite their pain. Each item is rated on a 7-point Likert scale (0: not at all confident; 6: completely confident) with a maximum total questionnaire score of 60 points which indicates stronger self-efficacy beliefs. It has shown good content and structural validity as well as excellent test-retest reliability (ICC: 0.86) [24].

Treatment outcomes

To assess symptoms and functional limitations at the end of the intervention (12 weeks), we used two patient-reported outcome measures: the *Quick*DASH and the Western Ontario Rotator Cuff Index (WORC). The *Quick*DASH is a questionnaire assessing upper extremity disorders. It includes 11 items measuring physical disability and symptoms with a total score ranging from 0 (no disability) to 100 (most severe disability). It has excellent reliability, is sensitive to change, and has a minimal detectable change (MDC) and minimal clinically significant change (MCID) of approximately 11% [25]. The WORC is a rotator cuff-specific questionnaire consisting of 21 items divided into 5 categories: physical symptoms, sports/leisure, work, lifestyle and emotions. Its total score ranges from 0 (worst possible symptoms) to 100 (no symptoms). It has excellent fidelity, is sensitive to change, and has an MDC and MCID of 12% [26].

For our analyses, participants were dichotomised into 2 subgroups according to whether their symptoms had resolved or not. To do this, we used the *Quick*DASH score from the 12-weeks follow-up. If patients presented a score between 0 (no disability) and 11 (clinically meaningful threshold [i.e., MCID]), their symptoms were considered resolved. Conversely, if their score was greater than 11, their symptoms were considered unresolved. We also conducted analyses with the WORC because, unlike the *Quick*DASH, it is specific to rotator cuff disorders and could represent a more appropriate outcome measure to assess the variety of symptoms associated with RCRSP. We applied the same dichotomisation process. At the 12-weeks follow-up, symptoms of participants with a score between 100 (no symptoms) and 88 (clinically meaningful threshold [i.e., MCID]) were considered resolved. Conversely, the symptoms of those with a score below 88 were considered unresolved. We chose this method of dichotomisation for two reasons. First, there is no clear gold standard in the literature to define symptom resolution. Also, although individuals with an improvement greater than the MCID may be considered to have experienced a clinically significant improvement, they still present symptoms if their total score is greater than the MCID value, thus their symptoms cannot be considered resolved.

Statistical analyses

Baseline characteristics and outcome measures results were summarized using means and standard deviations or frequency and percentage, as appropriate. Nonparametric analyses of longitudinal data (NparLD) [27] (R Software) were used to assess, respectively, the effect of patients' expectations (3 Time X 3 Intervention X 2 Resolution) and PSE (2 Time X 3 Intervention X 2 Resolution) on symptom resolution. We used NparLD package of R since it is distribution-free and maybe the only ANOVA that can manage a change of the types of distribution over time [27]. In addition, we used this type of analysis since it allowed us to consider our predictive variables (expectations, PSE) change over time as well as between-group differences based on intervention received. Analyses were conducted using data from the *Quick*DASH and the WORC separately. Alpha level was set at 0.05. During data analysis, we looked at time, program, and resolution effects as well as the possible interactions between those three components. Time effect indicates a significant change in patients' expectations or PSE over time, regardless of the group (intervention). Program effect indicates a significant difference in patients' expectations or PSE between all three intervention groups. Resolution effect indicates a significant difference in overall patients' expectations or PSE between those considered to have had symptom resolution and those still experiencing symptoms. Interactions are the extent to which an observed effect is different based on the presence of another factor. A resolution-by-program interaction would indicate that the resolution effect was different based on the intervention received.

Results

Participants' baseline characteristics are presented in Table 1**,** while mean scores for the main outcome measures are presented in Tables 2 and 3. Participants in our sample were 48 (15) years old, with 51% of them being female and they reported a median pain duration of 24 months. Analyses regarding patients' expectations (Figs. 1 and 2) showed a statistically significant increase of expectations over time (0.33/3 [0.19 to 0.47]). There were no statistically significant differences between programs in terms of overall expectations (motor control vs education: 0.13/3 [−0.08 to 0.34]; strengthening vs education: 0.16/3 [−0.04 to 0.37]; and strengthening vs motor control: 0.03/3 [−0.18 to 0.24]. Overall expectations were significantly higher for those who experienced symptom resolution based on the WORC (0.19/3 [0.05 to 0.33]) but were not when considering symptom resolution based on the *Quick*DASH (0.06/3 [−0.08 to 0.20]). Furthermore, regarding the results based

Table 1
Baseline participants characteristics (n = 123).

	Participants who did not experience symptom resolution based on *Quick*DASH (n = 66)	Participants who experienced symptom resolution based on *Quick*DASH (n = 57)
Demographics		
Female gender	38 (58%)	25 (44%)
Age (years), mean (SD)	50 (15)	46 (16)
BMI (Kg/m^2), mean (SD)	27 (5)	26 (5)
Dominant arm (right)	61 (92%)	50 (88%)
Symptoms related to the shoulder		
Symptomatic arm (right)	39 (59%)	37 (65%)
Duration of symptoms(months), median (IQR)	51 (24)	42 (28)
Outcome measures		
*Quick*DASH (0-100), mean (SD)	37.3 (15.5)	30.5 (14.4)
WORC (0-100), mean (SD)	47.9 (18.6)	55.8 (16.5)

*Values are the number (percentage) unless otherwise indicated.
SD: Standard deviation; BMI: Body Mass Index; IQR: Interquartile range; *Quick*DASH: Abbreviated Version of the Disability of Arm, Shoulder and Hand Questionnaire; WORC: Western Ontario Rotator Cuff Index Questionnaire

Table 2
Mean (SD) scores of main outcome measures for symptom resolution based on *Quick*DASH.

	Participants who did not experience symptom resolution				Participants who experienced symptom resolution				Total Sample (n = 123)
	Education (n = 23)	Motor control (n = 19)	Strengthening (n = 24)	Total (n = 66)	Education (n = 18)	Motor control (n = 22)	Strengthening (n = 17)	Total (n = 57)	
Pain self-efficacy at baseline	43.5 (10.3)	47.8 (9.5)	45.1 (9.2)	45.2 (9.5)	52.7 (5.1)	48.6 (8.1)	47.2 (11.1)	49.5 (8.2)	47.0 (9.1)
Pain self-efficacy at 6 weeks	47.6 (10.2)	52.7 (6.4)	51.3 (6.6)	50.2 (8.2)	56.0 (4.5)	55.8 (3.0)	55.8 (5.7)	55.9 (4.1)	52.5 (7.3)
Expectations before randomisation	1.70 (0.70)	1.63 (0.83)	1.92 (0.58)	1.76 (0.70)	1.67 (0.69)	1.86 (0.56)	1.88 (0.70)	1.81 (0.64)	1.78 (0.67)
Expectations after first intervention	1.96 (0.64)	2.00 (0.75)	2.25 (0.53)	2.08 (0.64)	1.83 (0.99)	2.27 (0.70)	2.12 (0.70)	2.09 (0.81)	2.08 (0.72)
Expectations after last intervention	2.09 (0.67)	1.95 (0.78)	2.13 (0.45)	2.06 (0.63)	2.11 (0.58)	2.36 (0.49)	2.00 (0.61)	2.18 (0.57)	2.11 (0.60)

Pain self-efficacy scores range from 0 to 60; Expectations scores range from −3 to 3

Table 3
Mean (SD) scores of main outcome measures for symptom resolution based on *WORC*.

	Participants who did not experience symptom resolution				Participants who experienced symptom resolution				Total Sample (n = 123)
	Education (n = 19)	Motor control (n = 12)	Strengthening (n = 19)	Total (n = 50)	Education (n = 22)	Motor control (n = 29)	Strengthening (n = 22)	Total (n = 73)	
Pain self-efficacy at baseline	43.7 (11.1)	46.0 (12.8)	40.9 (7.6)	43.0 (9.9)	51.3 (5.8)	48.9 (7.4)	49.7 (9.4)	49.7 (7.6)	47.0 (9.1)
Pain self-efficacy at 6 weeks	47.4 (10.7)	50.7 (8.1)	48.6 (5.0)	48.3 (8.4)	55.3 (4.6)	55.3 (3.8)	55.7 (6.0)	55.4 (4.7)	52.5 (7.3)
Expectations before randomisation	1.79 (0.71)	1.50 (0.80)	1.84 (0.60)	1.74 (0.69)	1.59 (0.67)	1.86 (0.64)	1.96 (0.65)	1.81 (0.66)	1.78 (0.67)
Expectations after first intervention	1.84 (0.77)	1.67 (0.65)	2.21 (0.54)	1.94 (0.68)	1.96 (0.84)	2.35 (0.67)	2.18 (0.66)	2.18 (0.73)	2.08 (0.72)
Expectations after last intervention	2.05 (0.62)	1.75 (0.62)	2.00 (0.47)	1.96 (0.57)	2.14 (0.64)	2.35 (0.61)	2.14 (0.56)	2.22 (0.61)	2.11 (0.60)

Pain self-efficacy scores range from 0 to 60; Expectations scores range from −3 to 3

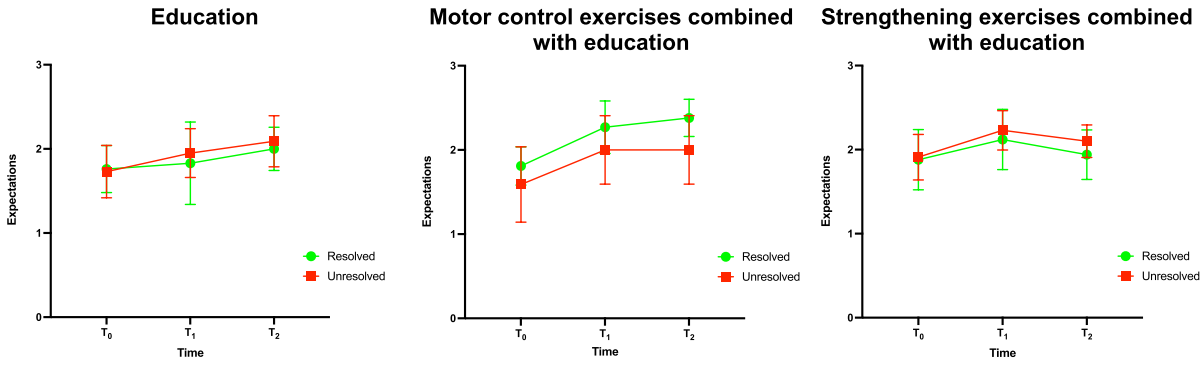

Fig. 1. Patients' expectations over time between those who experienced symptom resolution and those who did not based on *Quick*DASH presented as mean (95% CI) (T_0: Before randomisation; T_1: After first intervention; T_2: After last intervention).

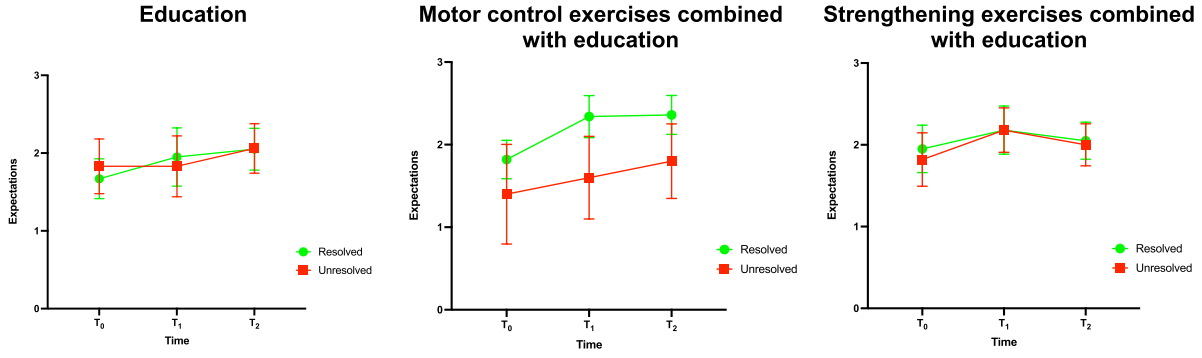

Fig. 2. Patients' expectations over time between those who experienced symptom resolution and those who did not based on WORC presented as mean (95% CI) (T_0: Before randomisation; T_1: After first intervention; T_2: After last intervention).

on the WORC, there was a resolution-by-program interaction ($p = 0.039$) which indicates that the resolution effect observed was different depending on the program (i.e. intervention received by the participants); with post-hoc analyses showing a statistically significant greater resolution effect ($p = 0.022$) for the motor control group (0.55/3 [0.28 to 0.81]) compared to the two other groups (education: 0.00/3 [−0.26 to 0.26]; strengthening: 0.07/3 [−0.14 to 0.29]. Analyses regarding PSE (Figs. 3 and 4) showed a statistically significant increase in PSE over time (5.5/60 [3.6 to 7.4]). There were no statistically significant differences between programs in terms of overall PSE (motor control vs education: 2.2/60 [−2.8 to 7.3]; strengthening vs education: 0.2/60 [−4.6 to 5.1]; and

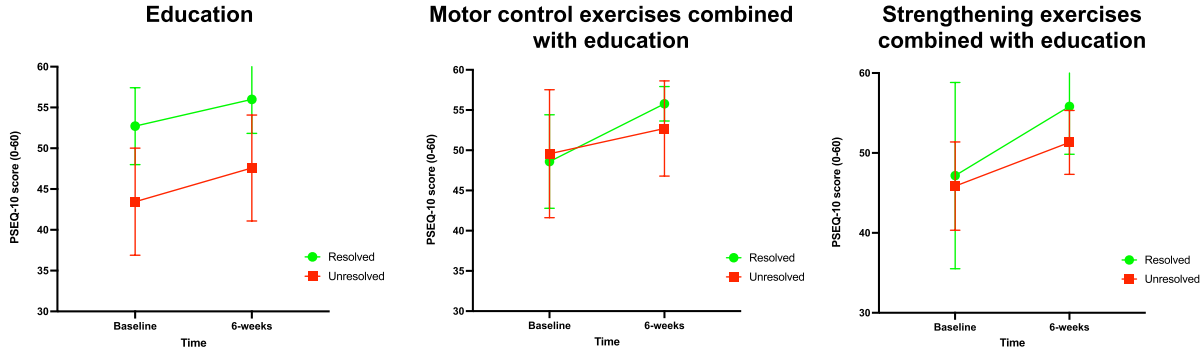

Fig. 3. Patients' pain self-efficacy over time between those who experienced symptom resolution and those who did not based on *Quick*DASH presented as mean (95% CI).

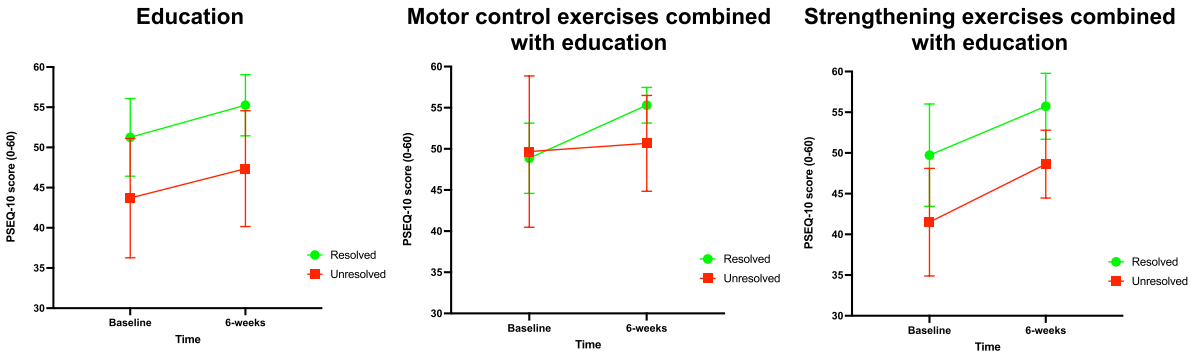

Fig. 4. Patients' pain self-efficacy over time between those who experienced symptom resolution and those who did not based on WORC presented as mean (95% CI).

strengthening vs motor control: −2.0/60 [−7.0 to 3.0]. Overall PSE was significantly higher for those who experienced symptom resolution based on the WORC (7.0/60 [3.9 to 10.1]) and the *Quick*DASH (4.9/60 [1.7 to 8.2]). There were no interactions.

Discussion

This is the first study to explore whether improvements over time in self-efficacy and expectations following rehabilitation interventions lead to better outcomes and whether the type of intervention received impacts self-efficacy and expectations over time. Previous studies have identified baseline levels of patients' expectations and PSE as predictors of shoulder pain resolution [15,16]. Another study also highlighted that PSE does not moderate the effectiveness of passive interventions with outcome [28].

In our study, individuals in the motor control group who experienced symptom resolution based on WORC score had higher levels of expectations overall. A possible explanation is that the basis of the motor control interventions was a symptom modification procedure intended to identify movement corrections that aimed to instantly reduce symptoms during painful arm elevation [19]. If symptom reduction was successful, participants immediately moved their arm with less pain. Psychologically and behaviourally, participants experiencing short term benefits from treatment may become more observant of other improvements in their symptoms [29], which may in turn increase longer term expectations of recovery. However, it is also important to consider that this effect was not observed when considering symptom resolution based on *Quick*DASH score. Interpretation of results therefore requires caution. One possible explanation for this discrepancy between both outcome measures is that the WORC may discriminate symptom resolution differently than the *Quick*DASH since it is a rotator cuff specific outcome measure.

Irrespective of the intervention, we observed an improvement in patients' expectations of intervention effectiveness and self-efficacy over time. While this could be a result of natural symptom resolution, it could also be explained by contextual factors related to physiotherapy management [30]. Participants took part in this RCT on a voluntary basis and may therefore have had a favorable bias toward the project and expectations of intervention effectiveness. In addition, patient education, including an explanation of pain neuroscience, was a central component in all three groups. Both increased knowledge of their condition and the confidence in its content, given its delivery from an experienced health professional may have increased their expectations of intervention effectiveness and self-efficacy because of the confidence they had in the advice given by a health professional [31]. Based on their qualitative study of patients' experience with RCRSP, Cridland et al. concluded that patients believe that adequate education is important in the management of their condition and that it is best delivered by a trusted source, such as a healthcare professional [31]. In addition, the education component, included in all three groups, may also have contributed to the increase in self-efficacy through one of Bandura's four sources of self-efficacy: verbal persuasion [32,33]. Since the target of the motor control intervention was for the participant to move their arm with reduced symptoms following the feedback provided to them, one could also hypothesize that this intervention may have integrated some component of another one of Bandura's sources of self-efficacy: mastery experience [32,33]. Regardless of whether any biomechanical change happened, this positive experience may have contributed to reinforcing their self-efficacy.

Results from our study also highlighted that individuals who experienced symptom resolution had higher overall levels of PSE, irrespective of the intervention to which they had been assigned. This is similar to the results obtained by Chester et al., where baseline levels of PSE were a good

predictor of outcome in individuals with shoulder pain [15]. PSE also improved over time for all three groups. One possible reason for this improvement is the education intervention all participants received. It was geared towards increasing their understanding of their shoulder pain and the biological and psychosocial drivers of their pain. It also aimed to increase their ability to self-manage their symptoms and their activities. This improved understanding of their condition might have allowed them to better cope with their pain throughout their daily life [31,34]. Relevant results regarding the effect of patient education on PSE were obtained in a non-randomised clinical trial conducted by Rondon-Ramos, within a sample of individuals with chronic MSK pain [35]. Those who received pain neuroscience education combined with usual care demonstrated a significant increase in PSE at the 4-weeks and 4-months follow-ups compared to those who only received usual care, where usual care was described as a combination of manual therapy and exercises [35].

Finally, our analyses did not reveal that improvements over time in patients' expectations or PSE led to better outcomes since there were no time-by-resolution interaction. This interaction would have indicated that whether symptoms resolve or not is different based on how one of our predictive outcomes (patients' expectations or PSE) evolve over time.

The current study presents some limitations. First, our sample size was limited for this type of analysis which may have reduced the power of our analyses and prevented us from conducting gender-specific analyses, especially when considering the limited number of participants in some subgroups. Also, our sample did not adequately represent the whole distribution for expectations since no participant indicated a negative score on the Likert scale at any time point. This could be explained by the fact that participants in this study volunteered to take part in the project after receiving our recruitment email. The fact that they volunteered may suggest that they already had some favorable biases. In clinical practice, some patients consult rehabilitation professionals because they are referred by their physician or a third-party payer, and they may present negative expectations towards intervention effectiveness based on beliefs or past experiences for example. Finally, aiming to identify factors that predict prognosis can be difficult since there is a wide variety of factors that can explain the evolution of a MSKD over time. In addition, several of these factors also influence each other, which can make the process of identifying key variables difficult.

Conclusion

In our study, individuals in the motor control group who experienced symptom resolution based on the WORC had higher levels of expectations regarding intervention effectiveness. This is also true for those presenting with higher levels of PSE, regardless of the intervention they received. Clinicians should consider monitoring PSE and patients' expectations in individuals with RCRSP as they could be useful indicators of outcome. Interventions could be tailored towards improving understanding of RCRSP and self-management.

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Conflict of interest: None declared for MOD, JSR, FD, RC. JL conceptualized the SSMP concept, which was part of the movement or motor control program used in the trial leading to those secondary analyses. To avoid bias he was not involved in any assessment, treatment, or data collection, and had no contact with any study participants. He remained in another country during the entire RCT. Like the other authors he had no access to the data before the end of the trial and was not involved in any of the data analysis or interpretation.

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