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This is a Supplementary File for the article titled:

Level of pain catastrophizing determines if patients with longstanding subacromial impingement benefit from more resistance exercise - pre-defined secondary analyses from a pragmatic randomized controlled trial (the SExSI-Trial)

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Abbreviations

PCS – Pain catastrophizing scale

PPT – Pressure pain threshold

TSP – Temporal summation of pain

CPM – Conditioned pain modulation

CPM-detection – Conditioned pain modulation detection threshold

CPM-tolerance – Conditioned pain modulation tolerance threshold

SPADI – Shoulder Pain and Disability Index

MCID – Minimal clinical important difference

cLMM – Constrained linear mixed models

VAS – Visual analogue scale

IG – Intervention group

CG – Control group

Units of measurement

Nm/kg – Newton-meter per kilogram bodyweight

kPa – Kilopascal

Detailed description: assessment of pain mechanism and catastrophizing*Central pain mechanisms*

Temporal Summation of Pain (TSP) and Conditioned Pain Modulation (CPM) were measured at the ipsilateral leg using a computer-controlled cuff pressure algometer (Nocitech, Denmark and Aalborg University, Denmark). Measurements were applied to the leg to examine central pain mechanisms independently from local pain. The testing procedure started with assessment of Cuff Pressure Pain Detection threshold (PDT) and Cuff Pressure Pain Tolerance Threshold (PTT), which were then used as reference levels to measure TSP and CPM. The cuff pressure was set to increase with a rate of 1 kPa/s to a maximal pressure limit of 100 kPa. Participants were instructed to rate pain intensity continuously from the first sensation of pain, using an electronic visual analogue scale (VAS), sampled at 10 Hz, and to press a release button when the pain was no longer tolerable. Zero and 10 cm extremes on the VAS were defined as “no pain” and “maximal pain”, respectively. The pressure value when the subject reached 1 cm on the VAS was defined as the Pain Detection Threshold (PDT). The pressure recorded when the subject pressed the release button was defined as the Pressure Pain Tolerance Threshold (PTT).[1] Measures of PDT and PTT using computerized cuff algometri are found reliable (ICC 0.7 to 0.9)[2] and widely used to study central pain mechanisms in different patient populations.[1,3,4]

TSP was assessed through ten 1-second cuff pressure stimuli with 2-second inter stimulus intervals at an intensity equivalent to the recorded PTT. Participants were instructed to rate the pain intensity continuously. The VAS score at 1 s following each stimuli was automatically extracted, and TSP was quantified as the difference between a mean of the VAS scores for the last three stimulations and the mean for the first four stimulations,[2] (higher scores=more facilitated pain mechanism).

CPM-detection and CPM-tolerance were quantified as the increase in PDT and PTT, respectively, when experimental tonic pain was induced in the contralateral lower leg (conditioning stimulus), using a similar cuff. The cuff maintained a constant pressure corresponding to 75% of the PTT pressure from the initial test of PTT at the ipsilateral lower leg,[5] while a new measurement of PDT and PTT (test stimulus) was conducted in the lower leg on the same side as the shoulder pain. Higher scores indicate less facilitated pain mechanisms.

Local pain sensitivity

Local pain sensitivity was quantified through measurement of Pressure Pain Threshold (PPT) at four standardized body sites using a hand-held pressure algometer (Somedic Sales AB, Sweden). The 1 cm² stimulation area was placed perpendicular to the skin, and pressure applied at a rate of 30 kPa/s. The subjects were instructed to indicate when the sensation changed from a sensation of pressure to the first sensation of pain (lower scores=more pain sensitivity). PPTs were assessed at the side of the painful shoulder, at: I) the deltoid muscle, II) the supraspinatus muscle,[6] III) the infraspinatus muscle[6] and IV) at the site of worst pain as described by the patient. PPT was measured twice at each site, with the average of measurements for each site calculated and used for analyses. Similar measures of PPT in the arm have demonstrated good reliability (ICC 0.87).[2] As pre-specified[7] only PPT for site 1 (deltoid muscle) was included as potential effect-modifier.

Pain catastrophizing

Pain catastrophizing was quantified using the Danish version of the Pain Catastrophizing Scale (PCS), which consists of 13 items.[8] Each item is scored on a 5-point Likert scale (0-4 points, 4 = worst) and combined to a total score (0 to 52, higher scores equals more catastrophizing). The Danish version is found valid and reliable ($\alpha=0.91-0.94$) in patients with chronic pain.[8]

References

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Suppl. table 1. Missingness of data for each outcome at baseline, week 5, week 10, and four months.

	Baseline		Week 5		Week 10		4 months	
	IG	CG	IG	CG	IG	CG	IG	CG
PCS	0	0	32	15	38	19	31	20
TSP	-	-	37	18	42	21	36	22
CPM-tolerance	-	-	35	19	42	24	37	21
CP-detection	-	-	35	19	43	25	37	22
PPT-deltoid	-	-	33	15	41	19	35	20
PPT-supraspinatus	-	-	33	15	41	19	35	20
PPT-infraspinatus	-	-	33	15	41	19	35	20
PPT-site of worst pain	-	-	36	21	43	22	38	25

Suppl. table 2. Mean scores for pain mechanism outcomes at 5, 10 and 16 weeks and between group difference at each follow-up time-point

	Control Group		Intervention Group		Between-group difference		
	Mean	SD	Mean	SD	Mean diff.	95%CI	p=
	Difference in mean score						
TSP 5w	2.6	1.7	3.0	1.6	0.5	(-0.1 to 1.1)	0.0892
TSP 10w	2.5	1.6	2.7	1.5	0.2	(-0.4 to 0.8)	0.5229
TSP 16w	3.0	1.9	2.9	1.8	-0.1	(-0.7 to 0.5)	0.8052
CPM-tolerance 5w	3.1	10.9	5.1	9.7	2.0	(-1.9 to 5.8)	0.3155
CPM-tolerance 10w	4.9	12.5	4.7	13.6	-0.2	(-4.5 to 4.1)	0.9206
CPM-tolerance 16w	4.5	11.2	4.7	12.4	0.2	(-3.8 to 4.2)	0.9211
CPM-detection 5w	1.1	8.5	2.9	9.7	1.8	(-0.7 to 4.3)	0.1603
CPM-detection 10w	3.7	6.3	3.5	6.0	-0.1	(-2.5 to 2.2)	0.9055
CPM-detection 16w	3.9	7.4	3.4	6.3	-0.5	(-2.8 to 1.9)	0.6795
PPT-deltoid 5w	236	172	227	168	-9	(-57 to 39)	0.7106
PPT-deltoid 10w	219	158	211	141	-8	(-55 to 39)	0.7414
PPT-deltoid 16w	216	150	206	153	-10	(-57 to 37)	0.6760
PPT-supraspinatus 5w	251	165	229	165	-22	(-69 to 25)	0.3603
PPT-supraspinatus 10w	242	148	241	150	-2	(-49 to 46)	0.9448
PPT-supraspinatus 16w	239	166	208	142	-31	(-79 to 16)	0.1980
PPT-infraspinatus 5w	238	156	206	128	-32	(-73 to 9)	0.1291
PPT-infraspinatus 10w	236	144	227	138	-9	(-51 to 33)	0.6801
PPT-infraspinatus 16w	226	135	200	123	-26	(-67 to 15)	0.2155
PPT-site of worst pain 5w	167	114	161	116	-6	(-43 to 31)	0.7386
PPT-site of worst pain 10w	166	119	149	100	-17	(-53 to 19)	0.3639
PPT-site of worst pain 16w	163	130	156	120	-6	(-45 to 32)	0.7542

Suppl. table 3. Mean Pain Catastrophizing Scale scores with standard deviation for each group at baseline and 5, 10 and 16 weeks, and difference in mean change between each follow-up and from baseline to 16 weeks

Mean score	CG		IG		Difference in mean change	
	Mean	SD	Mean	SD	Mean diff. (95%CI)	p=
PCS baseline	18 ±13		14 ±11		PCS baseline to 5w	2 (-1 to 4) 0.1598
PCS 5w	13 ±13		11 ±10		PCS 5w to 10 w	1 (-2 to 3) 0.7031
PCS 10w	12 ±12		10 ±10		PCS 10w to 16w	-1 (-4 to 2) 0.4256
PCS 16w	11 ±12		9 ±10		PCS baseline to 16w	1 (-2 to 4) 0.4226

Suppl. table 4. Within-group changes in SPADI and shoulder strength outcomes stratified by potential effect-modifiers for the IG and CG, respectively

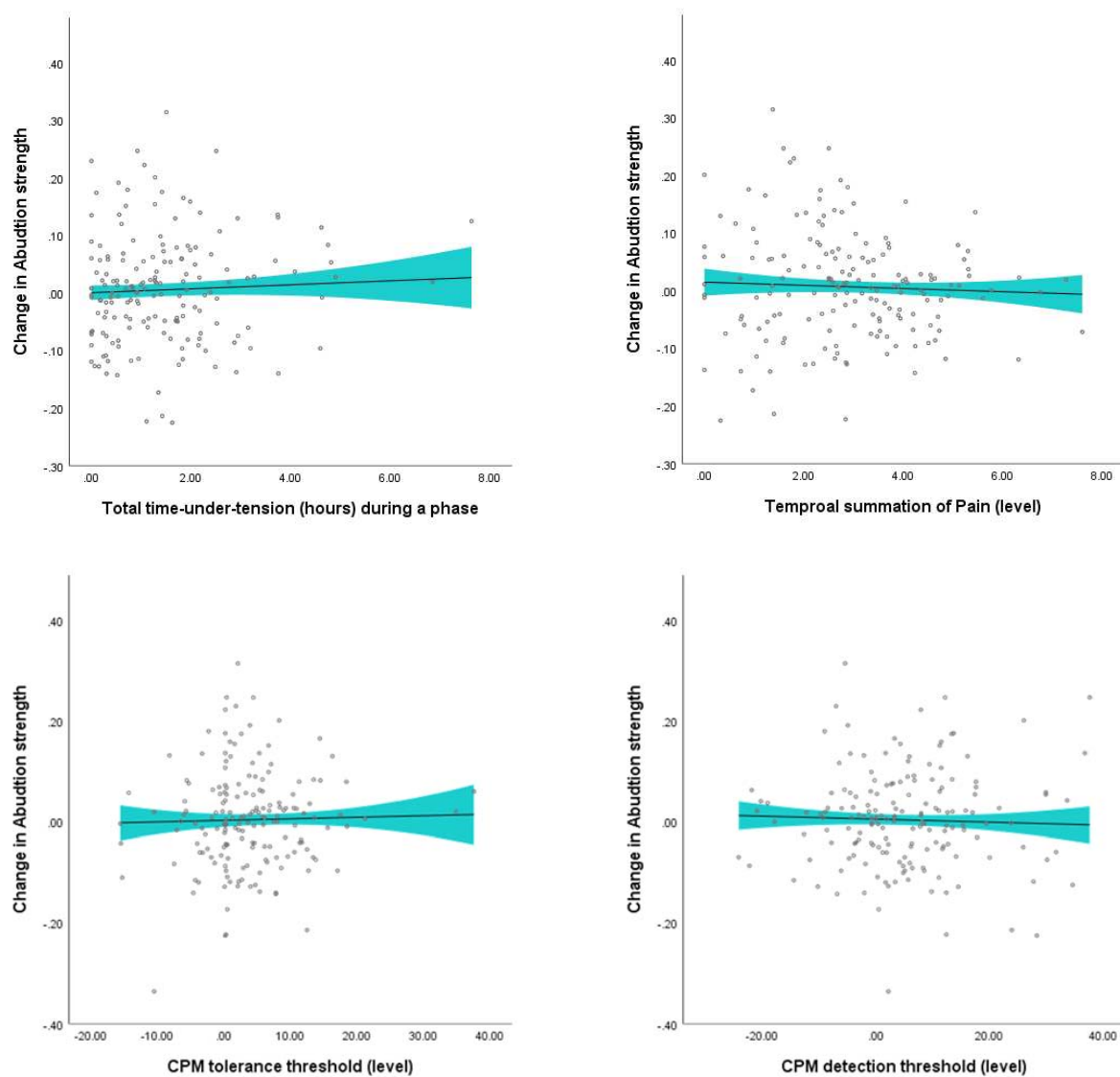
	Baseline to 5 weeks		5 to 10 weeks		10 to 16 weeks		Baseline to 16 weeks	
	CG	IG	CG	IG	CG	IG	CG	IG
SPADI, 0 (best) to 100 (worst)								
TSP higher	-18.3 (-24 to -13)	-16.3 (-22 to -11)	-0.5 (-7 to 6)	-5.0 (-11 to 1)	-3.3 (-10 to 3)	-2.3 (-9 to 4)	-22.1 (-28 to -16)	-23.6 (-30 to -18)
TSP lower	-15.2 (-20 to -10)	-15.6 (-22 to -9)	-3.4 (-9 to 2)	-5.1 (-12 to 2)	-4.3 (-10 to 1)	-0.5 (-8 to 7)	-22.9 (-28 to -18)	-21.2 (-28 to -14)
CPM-tolerance higher	-17.5 (-23 to -12)	-16.1 (-22 to -11)	-2.0 (-7 to 4)	-6.4 (-13 to 0)	-6.7 (-12 to -1)	-3.5 (-10 to 3)	-26.2 (-32 to -21)	-26.1 (-32 to -20)
CPM-tolerance lower	-12.4 (-18 to -7)	-13.9 (-20 to -8)	-2.9 (-8 to 3)	-4.9 (-12 to 2)	-1.7 (-7 to 4)	2.2 (-5 to 9)	-17.0 (-23 to -11)	-16.6 (-23 to -10)
CPM-detection higher	-16.7 (-22 to -11)	-17.1 (-23 to -12)	-2.6 (-8 to 3)	-4.4 (-10 to 2)	-5.7 (-12 to 0)	0.2 (-6 to 7)	-25.0 (-31 to -19)	-21.2 (-27 to -15)
CPM detection lower	-13.3 (-19 to -8)	-12.9 (-19 to -7)	-2.6 (-8 to 3)	-8.8 (-16 to -2)	-3.2 (-9 to 2)	-0.6 (-7 to 6)	-19.2 (-25 to -14)	-22.3 (-29 to -16)
PPT-deltoid higher	-16.1 (-21 to -11)	-18.2 (-24 to -12)	-1.2 (-7 to 4)	-7.9 (-14 to -1)	-5.2 (-10 to 0)	-0.7 (-7 to 6)	-22.5 (-28 to -17)	-26.7 (-33 to -20)
PPT-deltoid lower	-15.1 (-20 to -10)	-12.4 (-18 to -7)	-3.1 (-9 to 2)	-5.0 (-11 to 1)	-3.5 (-9 to 2)	-2.2 (-8 to 4)	-21.8 (-27 to -16)	-19.6 (-26 to -14)
PCS higher	-17.9 (-23 to -12)	-11.0 (-17 to -5)	-1.5 (-7 to 4)	-1.8 (-9 to 5)	-3.5 (-9 to 2)	-1.3 (-10 to 7)	-22.9 (-29 to -17)	-14.1 (-22 to -6)
PCS lower	-15.3 (-20 to -11)	-19.2 (-24 to -14)	-2.3 (-7 to 2)	-8.6 (-13 to -4)	-5.2 (-10 to 0)	-2.8 (-7 to 2)	-22.9 (-28 to -18)	-30.6 (-35 to -26)
Abduction MVC, Nm/kg								
TSP higher	0.01 (-0.02 to 0.04)	0.00 (-0.03 to 0.03)	-0.01 (-0.04 to 0.03)	0.02 (-0.01 to 0.05)	0.04 (0.01 to 0.08)	0.02 (-0.01 to 0.06)	0.05 (0.02 to 0.08)	0.04 (0.01 to 0.07)
TSP lower	-0.01 (-0.04 to 0.03)	0.05 (0 to 0.09)	0.02 (-0.02 to 0.05)	-0.05 (-0.1 to 0)	0.02 (-0.02 to 0.06)	0.01 (-0.04 to 0.07)	0.03 (-0.01 to 0.06)	0.01 (-0.04 to 0.06)
CPM-tolerance higher	0.01 (-0.02 to 0.05)	0.03 (-0.01 to 0.07)	0.00 (-0.04 to 0.03)	0.00 (-0.05 to 0.03)	0.02 (-0.02 to 0.06)	0.02 (-0.02 to 0.06)	0.03 (-0.01 to 0.07)	0.04 (0 to 0.08)
CPM-tolerance lower	-0.03 (-0.06 to 0.01)	-0.02 (-0.05 to 0.01)	0.02 (-0.01 to 0.05)	0.00 (-0.04 to 0.04)	0.03 (-0.01 to 0.06)	0.01 (-0.03 to 0.05)	0.02 (-0.01 to 0.05)	-0.01 (-0.05 to 0.03)
CPM-detection higher	0.00 (-0.04 to 0.04)	0.01 (-0.02 to 0.05)	0.02 (-0.02 to 0.06)	-0.02 (-0.06 to 0.02)	0.01 (-0.03 to 0.05)	0.01 (-0.04 to 0.05)	0.03 (-0.01 to 0.07)	0.00 (-0.04 to 0.04)
CPM detection lower	-0.01 (-0.04 to 0.01)	0.00 (-0.03 to 0.03)	0.01 (-0.02 to 0.04)	0.01 (-0.03 to 0.04)	0.03 (0 to 0.06)	0.03 (-0.01 to 0.07)	0.02 (-0.01 to 0.05)	0.03 (0 to 0.07)
PPT-deltoid higher	-0.02 (-0.05 to 0.01)	0.03 (0 to 0.07)	0.00 (-0.03 to 0.04)	-0.05 (-0.09 to 0)	0.05 (0.01 to 0.08)	0.05 (0.01 to 0.10)	0.03 (-0.01 to 0.06)	0.04 (0 to 0.08)
PPT-deltoid lower	0.02 (-0.01 to 0.05)	-0.01 (-0.04 to 0.02)	0.01 (-0.02 to 0.04)	0.02 (-0.01 to 0.05)	0.00 (-0.03 to 0.03)	0.00 (-0.04 to 0.03)	0.03 (0 to 0.06)	0.00 (-0.03 to 0.03)
PCS higher	0.01 (-0.02 to 0.04)	-0.02 (-0.06 to 0.02)	0.00 (-0.03 to 0.04)	0.01 (-0.04 to 0.06)	0.01 (-0.03 to 0.04)	0.01 (-0.03 to 0.06)	0.02 (-0.02 to 0.06)	0.00 (-0.04 to 0.05)
PCS lower	-0.01 (-0.04 to 0.02)	0.04 (0 to 0.07)	0.02 (-0.01 to 0.05)	-0.02 (-0.06 to 0.02)	0.05 (0.01 to 0.08)	0.03 (0 to 0.07)	0.05 (0.02 to 0.08)	0.05 (0.02 to 0.08)
External rotation MVC, Nm/kg								
TSP higher	-0.01 (-0.03 to 0)	-0.01 (-0.02 to 0)	0.00 (-0.01 to 0.02)	0.01 (0 to 0.02)	0.01 (-0.01 to 0.02)	0.00 (-0.01 to 0.02)	-0.01 (-0.02 to 0.01)	0.00 (-0.01 to 0.02)
TSP lower	0.00 (-0.02 to 0.01)	0.01 (0 to 0.03)	0.01 (0 to 0.02)	0.00 (-0.01 to 0.02)	0.00 (-0.01 to 0.01)	-0.01 (-0.03 to 0.01)	0.01 (-0.01 to 0.02)	0.01 (-0.01 to 0.03)
CPM-tolerance higher	0.00 (-0.01 to 0.02)	0.01 (-0.01 to 0.02)	0.01 (-0.01 to 0.02)	0.00 (-0.01 to 0.02)	0.00 (-0.02 to 0.01)	0.00 (-0.01 to 0.02)	0.01 (-0.01 to 0.02)	0.01 (0 to 0.03)
CPM-tolerance lower	-0.02 (-0.03 to -0.01)	-0.01 (-0.02 to 0.01)	0.00 (-0.01 to 0.02)	0.01 (0 to 0.03)	0.01 (0 to 0.02)	-0.01 (-0.02 to 0.01)	0.00 (-0.02 to 0.01)	0.00 (-0.02 to 0.02)
CPM-detection higher	0.00 (-0.02 to 0.01)	-0.01 (-0.02 to 0.01)	0.01 (0 to 0.02)	0.01 (-0.01 to 0.02)	0.00 (-0.01 to 0.01)	-0.01 (-0.03 to 0)	0.01 (-0.01 to 0.02)	-0.01 (-0.02 to 0)
CPM detection lower	-0.01 (-0.02 to 0)	0.00 (-0.01 to 0.02)	0.00 (-0.01 to 0.01)	0.01 (-0.01 to 0.02)	0.01 (-0.01 to 0.02)	0.01 (0 to 0.03)	0.00 (-0.01 to 0.01)	0.02 (0.01 to 0.04)
PPT-deltoid higher	-0.01 (-0.03 to 0)	0.01 (-0.01 to 0.02)	0.01 (0 to 0.02)	0.00 (-0.01 to 0.02)	0.00 (-0.01 to 0.01)	0.01 (-0.01 to 0.02)	-0.01 (-0.02 to 0.01)	0.02 (0 to 0.04)
PPT-deltoid lower	0.00 (-0.01 to 0.01)	0.00 (-0.02 to 0.01)	0.00 (-0.01 to 0.01)	0.01 (-0.01 to 0.02)	0.00 (-0.01 to 0.02)	-0.01 (-0.02 to 0.01)	0.01 (-0.01 to 0.02)	0.00 (-0.02 to 0.01)
PCS higher	-0.01 (-0.02 to 0.01)	-0.01 (-0.02 to 0.01)	0.01 (0 to 0.02)	0.01 (-0.01 to 0.03)	0.00 (-0.01 to 0.01)	0.00 (-0.02 to 0.01)	0.00 (-0.01 to 0.02)	0.00 (-0.02 to 0.02)
PCS lower	-0.01 (-0.02 to 0)	0.01 (-0.01 to 0.02)	0.00 (-0.01 to 0.01)	0.00 (-0.01 to 0.02)	0.01 (-0.01 to 0.02)	0.01 (-0.01 to 0.02)	0.00 (-0.02 to 0.01)	0.01 (0 to 0.03)

Suppl. table 5. The modifying effect of central and local pain mechanisms and pain catastrophizing on between-group differences for changes in SPADI and shoulder strength outcomes.

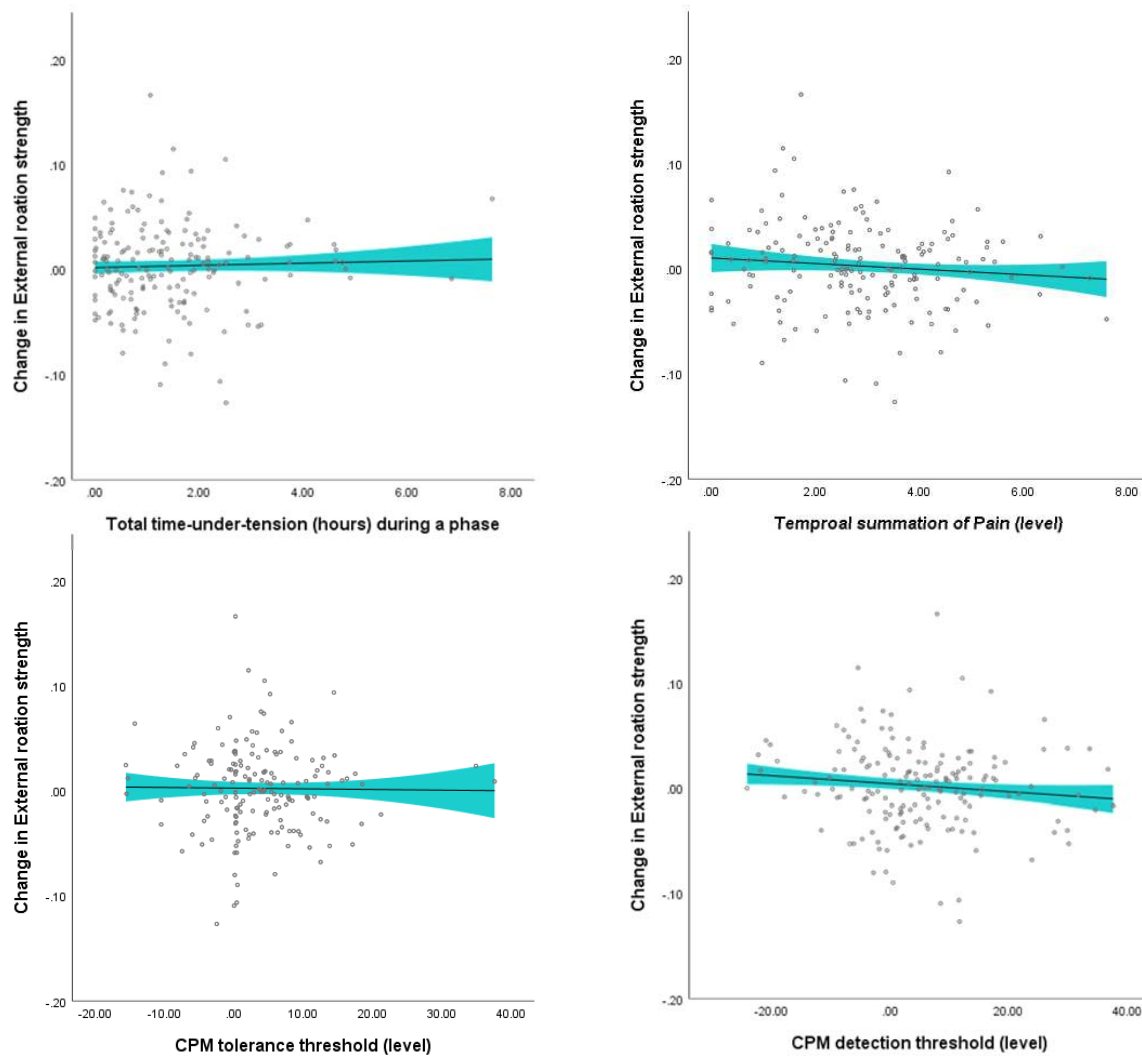
	Baseline to 5 weeks		5 to 10 weeks		10 to 16 weeks		Baseline to 16 weeks		Interaction <i>p</i> =
	Mean	95%CI	Mean	95%CI	Mean	95%CI	Mean	95%CI	
SPADI, 0 (best) to 100 (worst)									
TSP higher	2	(-6 10)	-4	(-13 4)	1	(-8 10)	-1	(-10 7)	0.2986
TSP lower	0	(-8 7)	-2	(-11 7)	4	(-5 13)	2	(-7 10)	
CPM-tolerance higher	1	(-6 9)	-4	(-13 4)	3	(-5 11)	0	(-8 8)	0.4801
CPM-tolerance lower	-1	(-9 6)	-2	(-11 7)	4	(-5 13)	0	(-8 9)	
CPM-detection higher	0	(-8 7)	-2	(-10 6)	6	(-3 15)	4	(-4 12)	0.1186
CPM detection lower	0	(-7 8)	-6	(-15 3)	3	(-6 11)	-3	(-11 5)	
PPT-deltoid higher	-2	(-10 5)	-7	(-15 2)	5	(-4 13)	-4	(-12 4)	0.1356
PPT-deltoid lower	3	(-5 10)	-2	(-10 6)	1	(-7 10)	2	(-6 10)	
PCS higher	7	(-1 15)	0	(-9 9)	2	(-8 12)	9	(-1 18)	0.0029
PCS lower	-4	(-11 3)	-6	(-13 0)	2	(-4 9)	-8	(-14 -1)	
Abduction MVC, Nm/kg									
TSP higher	-0.01	(-0.06 0.03)	0.02	(-0.02 0.07)	-0.02	(-0.06 0.03)	-0.01	(-0.05 0.03)	0.4216
TSP lower	0.05	(0.00 0.11)	-0.06	(-0.13 0.00)	-0.01	(-0.07 0.06)	-0.02	(-0.08 0.04)	
CPM-tolerance higher	0.02	(-0.03 0.07)	-0.01	(-0.06 0.05)	0.00	(-0.06 0.05)	0.01	(-0.05 0.06)	0.1552
CPM-tolerance lower	0.01	(-0.04 0.05)	-0.02	(-0.07 0.03)	-0.02	(-0.07 0.03)	-0.03	(-0.08 0.02)	
CPM-detection higher	0.01	(-0.04 0.07)	-0.04	(-0.09 0.02)	-0.01	(-0.07 0.05)	-0.03	(-0.09 0.02)	0.1276
CPM detection lower	0.01	(-0.03 0.06)	0.00	(-0.05 0.04)	0.00	(-0.05 0.05)	0.01	(-0.04 0.06)	
PPT-deltoid higher	0.05	(0.00 0.11)	-0.05	(-0.11 0.00)	0.01	(-0.05 0.07)	0.01	(-0.04 0.07)	0.1468
PPT-deltoid lower	-0.03	(-0.07 0.01)	0.01	(-0.04 0.05)	0.00	(-0.05 0.04)	-0.03	(-0.07 0.02)	
PCS higher	-0.03	(-0.08 0.02)	0.01	(-0.05 0.07)	0.01	(-0.05 0.07)	-0.02	(-0.08 0.04)	0.3712
PCS lower	0.05	(0.00 0.09)	-0.04	(-0.09 0.01)	-0.01	(-0.06 0.04)	-0.01	(-0.05 0.04)	
External rotation MVC, Nm/kg									
TSP higher	0.00	(-0.01 0.02)	0.01	(-0.01 0.02)	0.00	(-0.02 0.02)	0.01	(-0.01 0.03)	0.3161
TSP lower	0.02	(0.00 0.04)	-0.01	(-0.03 0.02)	-0.01	(-0.03 0.01)	0.00	(-0.02 0.02)	
CPM-tolerance higher	0.00	(-0.02 0.02)	0.00	(-0.02 0.02)	0.00	(-0.02 0.02)	0.00	(-0.02 0.02)	0.4914
CPM-tolerance lower	0.01	(-0.01 0.03)	0.01	(-0.01 0.03)	-0.01	(-0.03 0.01)	0.00	(-0.02 0.02)	
CPM-detection higher	0.00	(-0.02 0.02)	0.00	(-0.02 0.02)	-0.01	(-0.03 0.01)	-0.02	(-0.04 0.00)	0.0015
CPM detection lower	0.01	(0.00 0.03)	0.01	(-0.01 0.03)	0.01	(-0.02 0.03)	0.03	(0.01 0.05)	
PPT-deltoid higher	0.02	(0.00 0.04)	-0.01	(-0.03 0.01)	0.01	(-0.01 0.03)	0.02	(0.00 0.04)	0.0095
PPT-deltoid lower	0.00	(-0.02 0.01)	0.01	(-0.01 0.03)	-0.01	(-0.03 0.01)	-0.01	(-0.03 0.01)	
PCS higher	0.00	(-0.02 0.02)	0.00	(-0.02 0.02)	0.00	(-0.03 0.02)	0.00	(-0.03 0.02)	0.0823
PCS lower	0.01	(0.00 0.03)	0.00	(-0.02 0.02)	0.00	(-0.02 0.02)	0.02	(0.00 0.03)	

Suppl. table 6. Median [IQR] for potential effect-modifiers:

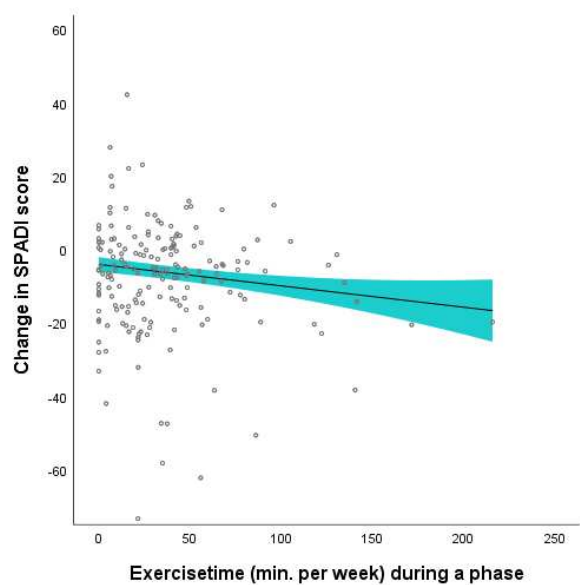
	All	Low strata	High strata
PCS	16 [8.67;27]	9 [3;13]	27 [20;34.5]
TSP	2.7 [1.4;3.9]	1.4 [0.8;2.1]	3.9 [3.3;4.8]
CPM-tolerance	1.5 [-2.15;6.275]	-2.1 [-7.0;0.2]	6.1 [4.1;11.9]
CPM-detection	3.3 [-2.0;9.5]	-2.1 [-7.1;0.6]	9.6 [6.2;17.3]
PPT-deltoid	176 [119;288]	120 [86;152]	288 [228;349]



Suppl. figure 1. Changes in abduction strength during a phase (baseline to 5 weeks, 5 to 10 weeks and 10 to 16 weeks) per unit increase in A) exercise dose, B) level of temporal summation of pain, C) level of CPM tolerance threshold and D) level of CPM detection threshold for the respective phase. The curve is a smooth curve fitted to the predicted values obtained from the linear mixed model and fitted using a kernel density estimator. The shaded represents a smoothing of the 95% confidence limits of individual prediction intervals



Suppl. figure 2. Changes in external rotation strength during a phase (baseline to 5 weeks, 5 to 10 weeks and 10 to 16 weeks) per unit increase in A) exercise dose, B) level of temporal summation of pain, C) level of CPM tolerance threshold and D) level of CPM detection threshold for the respective phase. The curve is a smooth curve fitted to the predicted values obtained from the linear mixed model and fitted using a kernel density estimator. The shaded represents a smoothing of the 95% confidence limits of individual prediction intervals



Suppl. figure 3. Changes in SPADI during a phase (baseline to 5 weeks, 5 to 10 weeks and 10 to 16 weeks) per unit increase in average time spent on usual care exercise the respective phase. The curve is a smooth curve fitted to the predicted values obtained from the linear mixed model and fitted using a kernel density estimator. The shaded represents a smoothing of the 95% confidence limits of individual prediction intervals.