2014•2015

FACULTEIT GENEESKUNDE EN LEVENSWETENSCHAPPEN

master in de revalidatiewetenschappen en de kinesitherapie

Masterproef

Video support for home exercices during rehabilitation for shoulder pain: a clinical pilot study

Promotor :
Prof. dr. Annick TIMMERMANS

Copromotor :
dr. Sara VAN DEUN

Sara Boven , Wout Smeets

Scriptie ingediend tot het behalen van de graad van master in de revalidatiewetenschappen en de kinesitherapie

universiteit hasselt
KNOWLEDGE IN ACTION

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Prepared according to the guidelines of: 'PlosOne'

http://journals.plos.org/plosone/s/submission-guidelines

Preface

This master thesis contains the result of a clinical pilot study undertaken at the Faculty of Medicine of the University of Hasselt. It is situated in the Master of Rehabilitation Sciences and Physiotherapy.

We would firstly like to thank our promoter, Professor Dr. Annick Timmermans, for her time, valuable input and guiding us from the literature study until this clinical pilot study. With her support and advise we could reach this result.

This clinical pilot study took place in the Virga Jessa Hospital in Hasselt, Belgium. We want to thank the head of the department, Dr. Guido Claes, the head of the paramedical team, Mr. Enzo Olivieri and the physiotherapists of the hospital for their engagement and interest in the study.
In particular we would like to thank Mrs. Stefanie Vanbrabant. She provided management support, she adjusted the exercises on the participants needs and collected the questionnaires. She was also a very good motivator for the participants.

We would like to thank Bente Caels and Ine Camps. This study is conform with their master thesis but the emphasis is set on the neck-shoulder region. They were willing to answer the questions we had at the beginning of the study.

Also, we want to thank all the participants who gave their time to take part in this study. We are very surprised how strict and interested they were in the videos.

We are grateful to the university and the professors for making this study possible. We now both have a broader and deeper view on shoulder and neck pain and we learned to look critically at articles. Today we finished our thesis and we will take this information and results in the future to our clinical practice/professional lives.

Geel, 10/06/2015 S.B. & W.S.

Situating the research

Background

With problems of the neck and shoulder being one of the most prevalent disorders in musculoskeletal diseases [1], it is important to understand their relationship. The neck and shoulder could be seen as one entity because of their connections throughout the cervicoscapular muscles. A changed position at one location could influence the other location [2]. For example rounded shoulder posture, forward head posture, impingement problems could be one of the consequences of these alterations in positions.

Exercise therapy has proven to be successful for the treatment of shoulder and neck problems [3-5]. Pursuing an improvement in home exercises, the use of video-instructed exercises could be useful in saving time and giving the patient a chance to repeat the instructions in order to perform their exercises in a correct way.
Patients need to observe and imagine themselves doing this exercise. Observing the explicit learning process is suggested to be stimulated, while physical activity in combination with observation could change the way the exercise is learned. This implies a more implicit way of learning [6]. People who are abstained of exercising, could benefit more from this kind of programme than persons who are used to perform exercises on a daily or weekly basis [7].

Research context

The objective of this research was to determine the effects of an eight week during home based, technology (video) supported rehabilitation programme on function level, activity and participation in patients with musculoskeletal shoulder pain. Our interest was also focussed on the motivation of the patients and in which way they would find this kind of rehabilitation a worthy adjuvant. In this clinical pilot study, we aimed to find different effect sizes which we can use to set up a randomized controlled trial.

Research framework

Based on the literature study, that was performed by Sara Boven and Wout Smeets in 2013-2014, a clinical pilot study was carried out. The different sorts of rehabilitation for the shoulder region was the base for the current research. The exercises performed by the patients were also supported by the master thesis of Bente Caels and Ine Camps in 2013-2014. Their master thesis consisted of shoulder exercises for patients with shoulder pain. This study put more emphasis on exercises that focus on the shoulder- and neck region as one entity. The target group in this clinical pilot study stayed the same: people with shoulder pain.
Patient informing, recruitment, testing was done by Sara Boven and Wout Smeets, just as collecting data and analysing them. This was all done under supervision of Prof. Dr. Annick Timmermans.
Physical therapist, Stefanie Vanbrabant, was indispensable to our research because of her help in giving exercises to the patients and keeping them motivated. Both students achieved to visit the patients in the hospital for the weekly follow-up.

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Abstract

Objective: This clinical pilot study assessed to which extent video exercises can be used in a home based training programme in combination with a regular rehabilitation programme at the hospital. It is also investigated to which extent changes occur on function level, activity, participation and in the motivation during rehabilitation in patients with shoulder pathology.

Methods: This clinical pilot study involved six participants with shoulder problems (3M/3F; median age: 49; IQR: 37.00-54.75). Patients were followed during rehabilitation for 10 weeks, the last 8 weeks, home exercises were supported by video instructions. Outcome measures were: Shoulder Pain Disability Index (SPADI), Pain Self-Efficacy Questionnaire (PSEFQ), Patient Specific Functioning Scale (PSFS), Numeric Pain Rating Scale (NPRS) and Short-form 36 (SF-36). Posture was assessed with the "evaluation of the scapula position-form" and with "measurement of Forward Head Posture (FHP)". Also the motivation was weekly evaluated (VAS scale).
The secondary outcomes measures were: Credibility and Expectancy Questionnaire (CEQ), Intrinsic Motivation Inventory (IMI), a VAS scale for patient satisfaction and a VAS scale for evaluation of the user friendliness of the system.

Results: Patients were satisfied with the treatment (median: 9.00; IQR: 7.50-10.00). After 10 weeks of rehabilitation, a decrease in mean score of the pain subscale of the SPADI of ± 12 points (IQR: 5.5-27.00) was observed (p=0.013). The following outcome measures showed no improvement after treatment: PSEQ, PSFS, NPRS, SF-36 and motivation. The improvements with regard to FHP and upward rotation of the scapula were not significant. The treatment credibility was high (median: 20.00; IQR: 11.33-23.25) in comparison with treatment expectancy (median: 14.55; IQR: 11.33-23.25). After completion of the programme, participants felt good about their perceived competence and thought that this kind of rehabilitation could be user-friendly and a valuable support.

Conclusions: Video support for home exercises, as an adjuvant for regular therapy at the hospital in persons with shoulder pain was feasible. Findings suggest that video-instructed exercises may have a positive effect on the reduction of pain and on patient satisfaction. The study needs to be repeated with more participants in order to draw more robust conclusions.

Keywords: Video-exercises, Exercises, Adherence, Technology

Introduction

Musculoskeletal problems of the neck and shoulder are after low back pain one of the most prevalent problems. About 10% of the population will suffer from shoulder pain in their respective lifetime [8, 9]

A possible cause of shoulder pain is the scapular position and its relation to the cervical spine. The scapula and cervical spine are connected throughout the cervicoscapular musculature. Position changes in one of the joints will have an influence on the other joint [2]. Wrong postures of the spine and shoulder complex could be the consequence of muscle imbalance and have an influence on muscle activity.

Not only the cervical spine and scapula are related, but the shoulder joint can also be influenced by one or both structures. Forward head posture (FHP), can have an influence on the thoracic spine which can present itself as more flexed. When the angle of the thoracic kyphosis decreases, it has an influence on the shoulder complex. The position of the scapula can be moved to a more elevated, protracted, downward rotated and anterior tilted position. The protracted position of the neck can lead to subacromial impingement syndrome in severe cases. In other words, FHP is related with the impingement process due to changes of the scapula, a muscle imbalance and an increasing thoracic kyphosis [2, 10-13].

It's essential that patients do daily home-based exercises besides their rehabilitation programme in the hospital. It has been suggested that inadequate execution of home-based exercises may lead to a decrease of the treatment's efficacy [14, 15].

But teaching the patient the home exercises is time consuming and may be not effective. Patients can forget the right execution, the explanation can be too technical or they fail to execute them.

In the study of Pilar Escolar-Reina [16], that studies the intrinsic factors that influence the compliance of a home-based exercise programme in patients with neck or low back pain, the participants complain about the 'time consumption' and the 'complexity' of the exercises. The complexity of exercises include the difficulties patients reported when a specific posture or equipment was required, potential of discomfort and the difficulty in initiating the exercises.

Using videos to teach exercises, as an adjunct to physiotherapy, can be a good medium for these problems. Videos have been found to be better than photographs and texts in other disciplines, f.e. the detailed explanations and visualisation to the patients can be better to improve compliance and initiating rehabilitation [15]. But there are no studies for common conditions in clinical practice.

Also numerous studies showed that the combination of imagination a movement (motor imagery) and looking to another person performing a movement increases the corticospinal excitability [17-23].

These videos were in an attempt to 1) support patient with regard to correct exercise instructions. 2) increase the level of patient activation, so that the patient can contribute to its self-management in the home situation. With this study we wanted to highlight the need for tools for the patient's adherence to self-treatment and exercises [24].

The aim of this study was to:

1. Investigate the feasibility of video-assistance in supporting home exercises for people with shoulder problems.
2. Check for changes in function level, activity, participation and the way patients think about their shoulder problems.

Materials and methods

Research questions

Three research questions were formulated:

1. Is a supporting video-instructed rehabilitation programme of eight weeks, as an adjuvant to regular physiotherapy in the hospital, feasible for people with musculoskeletal shoulder problems?
2. Are there changes on function level, activity, participation after doing home-based, video-instructed exercises for eight weeks in people with musculoskeletal shoulder problems?
3. How is the evolution of motivation and compliance during rehabilitation?

Hypotheses

Three hypotheses were formed at the beginning of this research,:

1. A supporting video-instructed rehabilitation programme is feasible for people with musculoskeletal shoulder problems.
2. There are changes on function level, activity, participation in people with musculoskeletal shoulder problems after doing home-based video-instructed exercises.
3. There are changes in motivation and compliance during rehabilitation.

Study design

This study used a clinical pilot study design. Medical ethics approval for the study has been obtained from the medical ethical committee of Jessa Hospital (Hasselt Belgium) and Hasselt University (Hasselt, Belgium).

Subjects

Recruitment

This study aimed to identify participants who were recruited in the Department of Physical Medicine and Rehabilitation at Jessa in Hasselt. This department is led by Dr. Guido Claes (head of the department) and Mr. Enzo Olivieri (head of paramedical service).
Patients undergoing shoulder rehabilitation in Jessa Hospital were informed about this study. They received the rehabilitation programme (the booklet with the video exercises in photograph-form) and the consent form to get a better view on this study. Patients who gave the consent form within a week to the medical secretary were included. They were asked to sign the informed consent.

Selection criteria

The participants were screened for the selection criteria. The inclusion and exclusion criteria are schematically presented in table 1.

Table 1: Selection criteria

Inclusion	Exclusion
Understanding of written and spoken Dutch	No surgical history of the cervical spine and/or shoulder complex within the last three months
>18 years	No major injury of soft tissue, no injury with fracture or luxation of the shoulder complex and the spine within the last three months
Shoulder problems with or without neck postural disorders	No previous rehabilitation for the neck and/or shoulder complex within the last three months before participation
Main complaints at the shoulder complex or proximal arm	Comorbidity: paresis and sensory problems from n/ rheumatic pain, neurologic disorders/ diabetes mellitus, frozen shoulder (stadia 1 and 2)
	Current insurance claims

Procedure

The study took place at the department of Physical Medicine and rehabilitation in Jessa Hospital (campus Hasselt). The rehabilitation centre offers, among the other items, a rehabilitation programme to patients with musculoskeletal shoulder problems. This programme is lasting for 12 to 16 weeks. The patients, who were following this programme were informed about this study. When they met the selection criteria and were willing to participate, they signed the informed consent and became participants. The participants were following their regular rehabilitation programme in the hospital for ten weeks, the last eight weeks, home exercises were supported by video instructions. The videos were given to the patient by the physiotherapist/researchers, and were used to support regular physiotherapy where exercises would normally be taught face-to face or described on a paper sheet.

The video-based home exercise programme consisted of four parts: exercises for the motor control of scapula and neck, training of the neck and shoulder musculature on endurance and muscle power (function level and ADL) and muscle stretching. Figure 1 shows an example of the four types of exercises which were included in the rehabilitation programme. In addition they received an information booklet as a manual to rely on. The information booklet consisted of 84 exercises (same number as the videos) and contained information about the purposes of the exercises. The manual could be used to read the instructions, if the video instructions were not that clear.
The patients received the exercises in consensus with the physiotherapists. They were given to them in the form of a USB and an information booklet . They were build up progressively and selected on the participants needs.
The participants were advised to execute the exercises daily. They were asked to watch the videos at least five times before executing them. They have to think along with the movement, without overt motor actions (i.e. motor imagery).
A log-sheet was given to record the frequency of executed home exercises during the 8-week period. The sheet required the participant to indicate if all, some or none of the required exercises were performed on the day.

Figure 1: From left to right: analytical training of shoulder endorotators, analytical training of the neck stabilising musculature, functional exercises for daily activities: driving a car and lifting an object, stretching exercise m. Sternocleidomastoideus.

The measurements/assessment sessions were at baseline (T0), two weeks (T1), six weeks (T2) and ten weeks (T3) after the start of the study. During the initial session (T0), participants were given extra information about the study. At T1 the participants were instructed on how to perform their exercise programme and received the videos for the first time. At T2, there was checked how everything went, some additional exercises were given. The final assessment session (T3) was used for the last measurements. Table 2 provides more information on which measurements were taken at which measurement date.

Videos

The videos provide exercises, based on the literature study of master thesis part 1 and the current clinical practice recommendations. The videos were created so that they can be performed easily at home. While making the videos, the complexity of exercises [16] was taken into account. An emphasis was set on specific postures, the right execution of the exercise and explanation of the obstacles that one may encounter and the location in the body one should feel the exercise. The videos were recorded with a Fujifilm X-E1 video camera. For editing the audio and videoclips, Adobe Premiere Elements 12 was used.

The physiotherapists of the hospital were able to choose a number of exercises which were indicated for the participants. Participants were not given exercises who were contra-indicated. The videos were used to support the regular physiotherapy in the hospital.

Measurements

The measures were manifested at the levels of function level, activity, participation, compliance and motivation. A schematic presentation of outcome measure and the procedure is presented in table 2.

Table 2: Overview outcome measures and procedure				
	T0	***T1***	***T2***	***T3***
Primary Outcome Measures				
Shoulder Pain Disability Index	X	X	X	X
Pain Self-Efficacy Questionnaire	X	X	X	X
Patient Specific Functioning Scale	X	X	X	X
Evaluation of the scapula position	X	X	X	X
Forward Head Posture	X	X	X	X
Numeric Pain Rating Scale	X	X	X	X
SF-36	X	X	X	X
Compliance				X
Motivation				X
Secondary Outcome Measures				
Credibility and Expectancy Questionnaire		X	X	
Intrinsic Motivation Inventory				X
Patient Satisfaction			X	X
User friendliness system				X
Abbreviations: T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology);				

Sociodemographic measures:

- Gender
- Age
- Body weight and length
- Education, social and working situation
- Time since the onset of shoulder pain
- Rehabilitation history (general and with regard to shoulder pain)

- Medication use in function of shoulder pain (yes/no/dose)
- Work accident, juridical procedure related to shoulder pain
- The amount of hours work per week
- Duration of work with arm/hand elevation (overhead work)

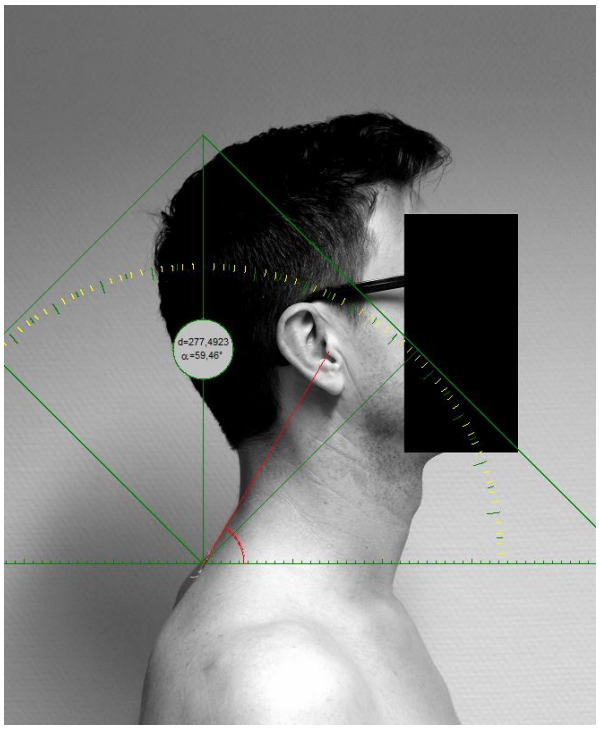
Primary outcome measures

- **Shoulder Pain Disability Index (SPADI) [25]**: A questionnaire which is filled in by the patient to evaluate his/her pain and limitations in the functioning of the shoulder. It aims for musculoskeletal problems of the shoulder. The items are scored on a VAS scale (100mm). The SPADI assess two items, pain and disability. There is a subscale (5 items) that measures pain and a subscale (8 items) that measures disability.
- **Pain Self-Efficacy Questionnaire (PSEQ) [26]**: A numeric rating scale based on 7 scores and consisting of 10 items. It examines if patients feel confident enough to perform certain activities even though they are dealing with the current pain.
- **Patient Specific Functioning Scale (PSFS) [27]**: Implicates important activities for the patient, given by him/herself, that are difficult to perform. The activities are scored on a numerical scale from 0 (= not possible to perform this activity) to 10 (= this activity can be performed as well as before the symptoms). The PSFS has an acceptable validity and reliability.
- **Clinical protocol Scapula Positioning [28]**: A protocol consisting of four parts:
    1. Observation and measurement of the scapular position: the AT-distance (= distance from angulus acromialis to the table) was measured, as well as the length of the m. Pectoralis Minor in a resting position (= the distance the from coracoid process to the lower edge of rib 4), the scapular distance measurement (= the distance between angulus acromialis and processus spinosus of T3) and the scapular upward rotation (done by inclinometry).
    2. Measurement of the dynamic control of the scapula: the medial rotation test.
    3. Scapular positioning and its relationship with the symptoms that the patient represents: the scapular repositioning and assistance test.
- **Forward Head Posture (FHP) [29]**: The measuring of this posture was done in five different stages:
    1. Set-up: There is taken a lateral photograph of the participants against a neutral white wall. With adhesive tape, a marker was set at 20 cm of the wall. To minimize errors the participants Base of Support (BoS) was drawn on an A3 sheet of paper. To ensure the BoS doesn't have an influence, at the different sessions, on the head posture, a video camera was positioned on a marker at a distance of 180 cm of the wall.
    2. Marker: At first the spinous process of C7 was identified by palpation. An adhesive marker was placed on C7.
    3. Participant position: There is chosen to take a photograph in the standing position because this is the most commonly used position in research and clinical practice.

The participant needs to place himself with his feet on the marker. The participants stood in their stockings and the clothes that covered the cervical/upper thoracic region were taken off. The participants were asked to stand in the most natural position for them. A lateral photograph of the participants' affected side was taken.

4. Video camera: A Fujifilm X-E1 video camera was used for making the photographs.
5. Measuring FHP: A lateral photograph is taken of the cervicothoracic region. There is set a marker on C7. Forward head posture is measured by calculating the angle between the horizontal line and the tragus of the ear from C7. We used 'mbruler' to measure these angles. (Figure 2)

Figure 2: The anatomical angle: C7-tragus-horizontal angle.



- **Numeric Pain Rating Scale (NPRS) [30, 31]**: Consists of three 11-part scales (0-10) where the patient has to fill in his average pain, the pain at its worst and best in the last week. The left side of this scale represents "no pain", while the right side represents "the worst pain imaginable". A difference of 2 points or more is considered as a clinically significant and meaningful difference.
- **Short Form 36 (SF-36) [32]**: Measures the difference in life quality in eight different dimensions: physical function, social function, mental health, energy and vitality, pain, general health perception, physical role and emotional role. Only with a difference of 5 points over time, a clinically significant difference can be reached.
- **Compliance**: The patients write the code (used in the written guide of the exercises) down in a diary and when (date and time) they've performed these exercises.

- **Motivation**: Consists of two questions for the patient:
    1. “How motivated were you to practice this week?”. Response was given on a 11-part scale.
    2. “Are there factors that influenced your motivation for home exercises? If yes, could you sum up the good and bad ones?”.

Secondary outcome measures

- **Credibility and Expectancy Questionnaire (CEQ) [33]**: Evaluates the credibility and the expectations of the patient in the given therapy. It is validated for musculoskeletal pain.
- **Intrinsic Motivation Inventory (IMI) [34]**: Is a multidimensional measurement which measures the participants’ subjective experience related to an activity. The instrument has six subscales which assess participants’ interest/enjoyment, perceived competence, effort, value/usefulness, felt pressure and tension and perceived choice while doing a given activity.
- **Patient satisfaction**: Consists of one question that tests the patients satisfaction about the therapy, treatment, etc …:
  “How satisfied were you with this form of technology-assisted rehabilitation?” (in our case).
  The patient then needs to reply by giving his/her conclusion on a 11-point scale.
- **User Friendliness system**: Consists of two questions:
    1. “How easy did you find it to use the system?”
    2. “Was the system challenging enough?”

  The patient then needs to reply by giving her/his conclusion on a 11-point scale.

Data analysis

Analysis was done by using IBM SPSS Statistics 22.0. The Friedman two-way analysis of variance by ranks was used to detect differences across the multiple measurements. This test was only used for the primary outcome measurements results whereby alpha was set on 0.05.
To compare two related samples, the Wilcoxon signed – ranks test was used. The measurement moments T1, T2 and T3 were the most interesting. After this test, the p-values were adjusted according to the Bonferroni correction. Alpha was set on 0.0167.

Two participants dropped out during this study. To adjust these missing data, an imputation technique was used in order to make an estimation of the participants' results on different moments in time. In order to do this, the progress of each individual (expressed in percentage) was taken to calculate the mean progress between two measurement points. This value was applied on the participants where data was missing.

Time planning

The making of the video exercises was done in July and August 2014. In September and October the patient recruitment took place. The intervention ran until the end of December. In this period the follow-up ran together with the data-collection. The data-analysis and data-extraction was planned until the end of May 2015. The presentation of the study was the 30th of June 2015.

Results

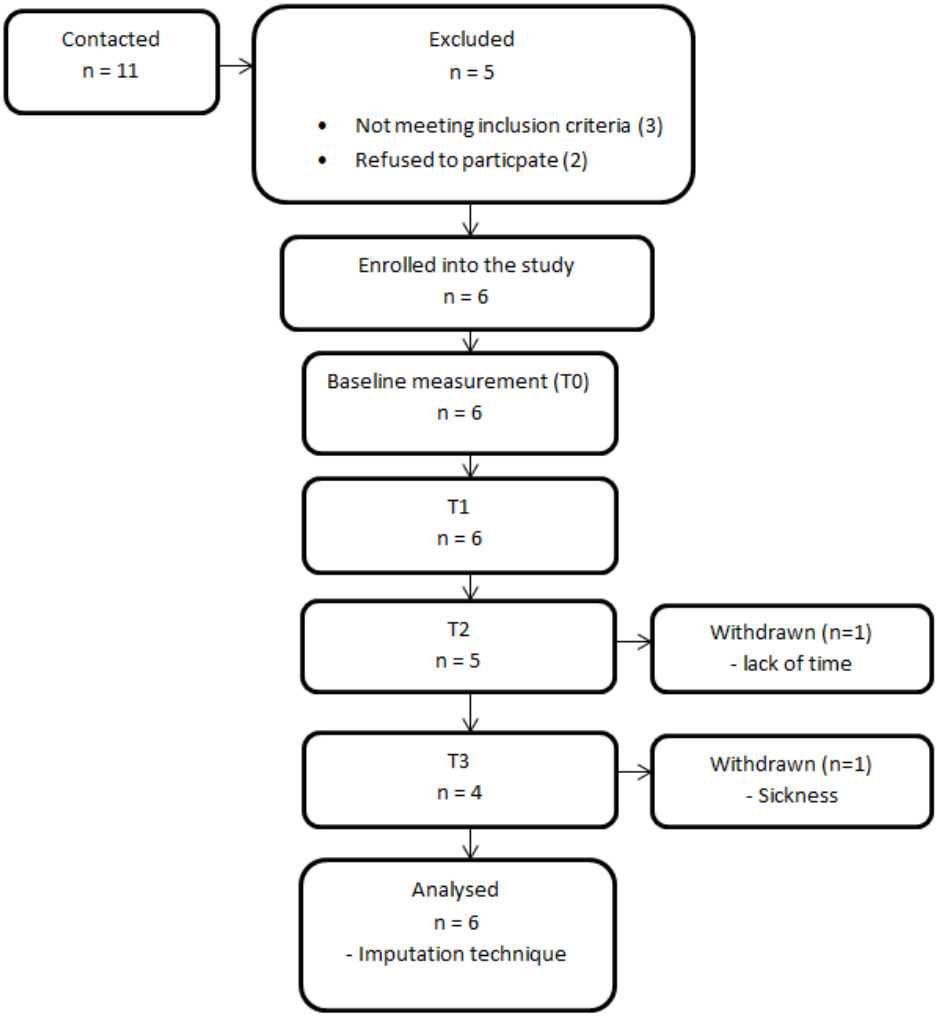
Sociodemographic information

The numbers of participants with shoulder pain recruited to the study and sociodemographic information are shown in Table 3. Six subjects, three female and three male, with a median (IQR) age of 49 (37.00-54.75) years were enrolled in this study.

Table 3: Characteristics of participants at baseline		
		Total (n=6)
Gender	Male	3
	Female	3
Age	Median (IQR)	49 (37.00-54.75)
SPADI (T0) • Pain • Disability • Total	Average (SD)	28.33 - (10.98) 29.17 – (20.14) 57.51 – (29.16)
Social situation	Married	4
	Single	2
Employment situation	Retired	/
	Invalidity	/
	Sick leave	4
	Working	2
Onset shoulder pain	> 12m	3
	>6m	/
	>3m	3
Medication	Yes	6
	No	/
Work accident/Insurance claims	Yes	/
	No	6
Duration of work with arm/hand in elevation (overhead work per day)	<1h	2
	>1h	4
Previous rehabilitation	Yes	4
	No	2

Figure 3 is a flowchart of study participation and results analyses. We contacted 11 persons to participate in this study. From this total sample, five participants were not included in the final sample, three were not meeting the inclusion criteria and two declined to participate in the study. Two participants dropped out during this study. They were contacted by telephone to inform the researchers about the reasons of quitting this study. One dropped out due to lack of time to take part in this study at T2 (divorce + children) and one because of sickness at T3. The data-analysis is done with six participants.

Figure 3: Flowchart of study participation and results analyses



Primary outcome measures

The exact level of significance of every outcome measurement could be seen at appendix n°1.

Participation level: Short-Form 36 (SF-36) and Patient Self-Efficacy Questionnaire (PSEQ)

Table 4 provides data on participation level. The measurement of the SF-36 and PSEQ stated that there is no significant improvement in physical and mental health over the entire period of rehabilitation (p>0.05). When comparing related samples, no differences were found that tended to be significant (p>0.0167).

Table 4: Primary outcome measures: SF-36 and PSEQ (n=6)

		T0 Median (IQR)	T1 Median (IQR)	T2 Median (IQR)	T3 Median (IQR)	Sign. level
Participation level	**SF-36**					
	• **Physical Health**	49.80 (31.77-77.71)	54.59 (30.57-76.20)	40.80 (30.32-81.56)	43.68 (37.95-79.85)	
	• **Mental health**	62.11 (30.88-74.72)	76.38 (29.53-79.35)	69.07 (35.69-85.92)	76.94 (44.89-85.94)	
	PSEQ	45.00 (23.25-55.75)	50.00 (15.25-54.75)	48.50 (30.75-59.25)	50.50 (37.25-60.00)	

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology);

Friedman test significant for T0-T3: † = p ≤ 0.05; Friedman test significant for T1-T3: †† = p ≤ 0.05; Wilcoxon signed rank test significant for T1-2: * = p ≤ 0.0167; Wilcoxon signed rank test significant for T2-3: ** = p ≤ 0.0167; Wilcoxon signed rank test significant for T1-3: *** = p ≤ 0.0167;

IQR: Interquartile Range;

PSEQ: Patient Self-Efficacy Questionnaire; SF-36: Short-Form 36.

Activity level: Shoulder Pain and Disability Index (SPADI) and Patient Specific Functioning Scale (PSFS)

Table 5 shows the data of the SPADI and PSFS. There was no improvement showed for the SPADI when comparing two measurement moments with each other, none showed to be significant (p>0.0167). The SPADI pain subscale showed a difference across measurements from T0-3 and T1-3 during the Friedman test (p<0.05). But when looking closer, there were no significant differences (p>0.0167) found in the repeated measurements for all moments. Although, when looking at the related samples of T2-3, we can see that it's level of significance is lower than T1-T3 and T1-T2 (Appendix n°1). None of these effects were found for the disability subscale. There was no improved noted after 8 (T1-T3) or 10 (T0-T3) weeks of rehabilitation (p>0.05) and in related samples (p>0.0167). In the PSFS was no significant difference to be found at T0-T3 and T1-T3 (p>0.05). Observing the period of time when video-instructions were given, the initial reaction was a drop of almost 2,5 points in mean score (Appendix n°15), which was not to be found significant (p>0.0167). The rise in score thereafter (T2-3), was also found not to be significant (p>0.0167). These scores are based on activities the patient has difficulties with, due to their shoulder problem. An overview of the activities and scoring are shown in table 6.

Table 5: Primary outcome measures: SPADI and PSFS (n=6)

		T0 Median (IQR)	T1 Median (IQR)	T2 Median (IQR)	T3 Median (IQR)	Sign. level
Activity level	**SPADI**					
	• **Pain**	31.00 (26.00-39.00)	27.00 (11.00-35.50)	27.00 (12.25-31.65)	20.95 (5.5-27.00)	Pain: †, ††
	• **Disability**	24.50 (12.00-53.50)	21.00 (10.50-54.25)	21.20 (6.25-45.75)	21.95 (2.5-41.90)	
	PSFS	6.65 (2.75-8.50)	6.65 (4.15-8.50)	3.00 (2.58-5.53)	6.15 (3.85-8.25)	

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology);

Friedman test significant for T0-T3: † = p ≤ 0.05; Friedman test significant for T1-T3: †† = p ≤ 0.05; Wilcoxon signed rank test significant for T1-2: * = p ≤ 0.0167; Wilcoxon signed rank test significant for T2-3: ** = p ≤ 0.0167; Wilcoxon signed rank test significant for T1-3: *** = p ≤ 0.0167;

IQR: Interquartile Range;

Patient Specific Functioning Scale; SPADI: Shoulder Pain and Disability Index.

Table 6: PSFS - Overview limited activities and scoring over time (n=6)					
	Limited activities	**T0**	**T1**	**T2**	**T3**
P01	Putting on and removing bra	2	5	3	9
	Average	2	5	3	9
P02	Washing windows	4	4	3	5
	Driving car	7	7	5	8
	Riding a bike	8	8	6	9
	Average	6.3	6.3	4.7	7.3
P03	Washing back	9	9	1	2
	Putting on coat	5	5	5	8
	Driving car	7	7	3	5
	Average	7	7	3	5
P04	Washing back	8	9	8	8
	Putting on sweater	8	8	8	8
	Putting on shirt	8	7	8	8
	Average	8	8	8	8
P05	Window cleaning	0	0	0	0
	Peeling apples	6	3	5	7
	Working behind laptop	3	2	4	7
	Average	3	1.6	3	4.6
P06	Washing back	10	10	1	1
	Sitting relaxed	10	10	1	2
	Neutral position scapula	10	10	2	2
	Average	10	10	1.3	1.6

Function level: Numeric Pain Rating Scale (NPRS)

Table 7 shows the data on the NPRS scale. Scores showed not to be significant (p>0.0167) for the comparison of repeated measurement moments (T1-T2, T2-T3 and T1-T3). Overall, there was no significant decline in pain (p>0.05).

Table 7: Primary outcome measures: NPRS (n=6)

		T0 Median (IQR)	**T1 Median (IQR)**	**T2 Median (IQR)**	**T3 Median (IQR)**	**Sign. level**
Function level	**NPRS**	6.50 (4.50-8.00)	6.00 (4.25-7.50)	7.00 (2.75-7.00)	5.00 (1.00-6.75)	

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology);

Friedman test significant for T0-T3: † = p ≤ 0.05; Friedman test significant for T1-T3: †† = p ≤ 0.05; Wilcoxon signed rank test significant for T1-2: * = p ≤ 0.0167; Wilcoxon signed rank test significant for T2-3: ** = p ≤ 0.0167; Wilcoxon signed rank test significant for T1-3: *** = p ≤ 0.0167;

IQR: Interquartile Range; NPRS: Numeric Pain Rating Scale.

Scapula Positioning

The results of scapula positioning are presented in table 8. Scapular distance to processus spinosus of vertebrae T3 didn't suggest a clear difference over time (T0-T3 and T1-T3). No significant effect was to be found ($p>0.05$). The continuance in results will also affect the results of the repeated measurements, which is insignificant in all cases ($p>0.0167$).

The m. Pectoralis Minor of the participants in general was not found to be shortened. The mean score at the beginning was bigger than 7.65 (Appendix n°15). The pectoralis minor index (PMI) didn't increase significantly ($p>0.05$) during the last eight weeks (T1-T3). For the entire period (T0-T3), no significant difference was displayed ($p>0.05$). No discrepancy was measured in related samples ($p>0.0167$).

Participants didn't show a bigger capacity to move their scapula when performing abduction of the arm. This increase in upward rotation of the scapula didn't have a significant difference ($p>0.05$) over the entire rehabilitation programme (T0-T3 and T1-T3) neither did it when comparing the different measurement moments with each other ($p>0.0167$).

Table 8: Primary outcome measures: Scapula positioning (n=6)

	T0 Median (IQR)	**T1 Mean (IQR)**	**T2 Mean (IQR)**	**T3 Mean (IQR)**	**Sign. level**
Angulus acromialis - T3 distance (cm)	*20.00 (16.88-23.50)*	*19.75 (18.50-22.70)*	*20.50 (18.15-21.25)*	*21.00 (18.85-22.60)*	
PMI	*9.85 (9.35-10.78)*	*9.90 (9.13-10.65)*	*10.75 (9.90-11.55)*	*10.95 (9.68-11.80)*	
Upward Rotation Scapula (°)	*8.00 (4.00-11.25)*	*10.00 (9.00-16.50)*	*14.50 (11.50-18.50)*	*10.00 (9.00-15.75)*	

Abbrevations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology)

Friedman test significant for T0-T3: † = $p \leq 0.05$; Friedman test significant for T1-T3: †† = $p \leq 0.05$; Wilcoxon signed rank test significant for T1-2: * = $p \leq 0.0167$; Wilcoxon signed rank test significant for T2-3: ** = $p \leq 0.0167$; Wilcoxon signed rank test significant for T1-3: *** = $p \leq 0.0167$;

IQR: Interquartile Range;

PMI: Pectoralis Minor Index

Forward Head Posture

Table 9 shows the data on FHP. Forward head posture tended to change positively (p=0.060) over the period from T0 to T3. Nevertheless, this final outcome is not significant. Not over the entire period, nor the repeated measurements, meaning that the clinical interpretation shouldn't be interpreted as important. It's important to notice that a bigger angle in this case, represents a smaller forward head posture (Figure 2).

Table 9: Primary outcome measures: Forward Head Posture (n=6)					
	T0 Median (IQR)	**T1 Median (IQR)**	**T2 Median (IQR)**	**T3 Median (IQR)**	**Sign. level**
FHP (°)	*45.13 (38.87-56.47)*	*47.56 (41.98-53.58)*	*53.59 (45.81-57.51)*	*52.66 (44.38-54.53)*	

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology)

Friedman test significant for T0-T3: † = p ≤ 0.05; Friedman test significant for T1-T3: †† = p ≤ 0.05; Wilcoxon signed rank test significant for T1-2: * = p ≤ 0.0167; Wilcoxon signed rank test significant for T2-3: ** = p ≤ 0.0167; Wilcoxon signed rank test significant for T1-3: *** = p ≤ 0.0167;

IQR: Interquartile Range;

FHP: Forward Head Posture.

Motivation

Results of the secondary outcome measure motivation are presented in table 10. Participants showed to be very motivated (5 is a neutral score and 10 is the maximum score). The minimum of both measurement moments is 5 and 6, which is still half of the score. There was a drop-out of one patient. When comparing T2 and T3, we can see that there is no significant increase in motivation (p>0.05).

Table 10: Primary outcome measures: Motivation		
	T2	**T3**
N	5	
Median	6.00	8.00
Interquartile Range	5.50-8.50	6.00-9.00
Minimum	5.00	6.00
Maximum	9.00	9.00
Asymp. Sig. (Wilcoxon Signed Ranks test)	0.102	

Secondary outcome measures

Credibility Expectance Questionnaire (CEQ)

Table 11 shows the data of the Credibility Expectance Questionnaire. Overall, the scores for credibility and expectancy are moderately positive (13.5 is a neutral score and 27 is the maximum score). For credibility, the median stayed the same (20.00) and the minimum score changed from 9.00 to 9.30. This rise in the mean (Appendix n°15) score is however not significant ($p>0.05$). The maximum remained unchanged.

Expectancy tended to be lower after six weeks. The mean (Appendix n°15) scores declined, as well as the minimum and maximum score. The minimum declined from 8.40 to 7.50, while the median score decreased from 18.20 to 14.55. No significance was to be found in the deterioration of expectancy subscale ($p>0.05$).

Table 11: Secondary outcome measures: CEQ

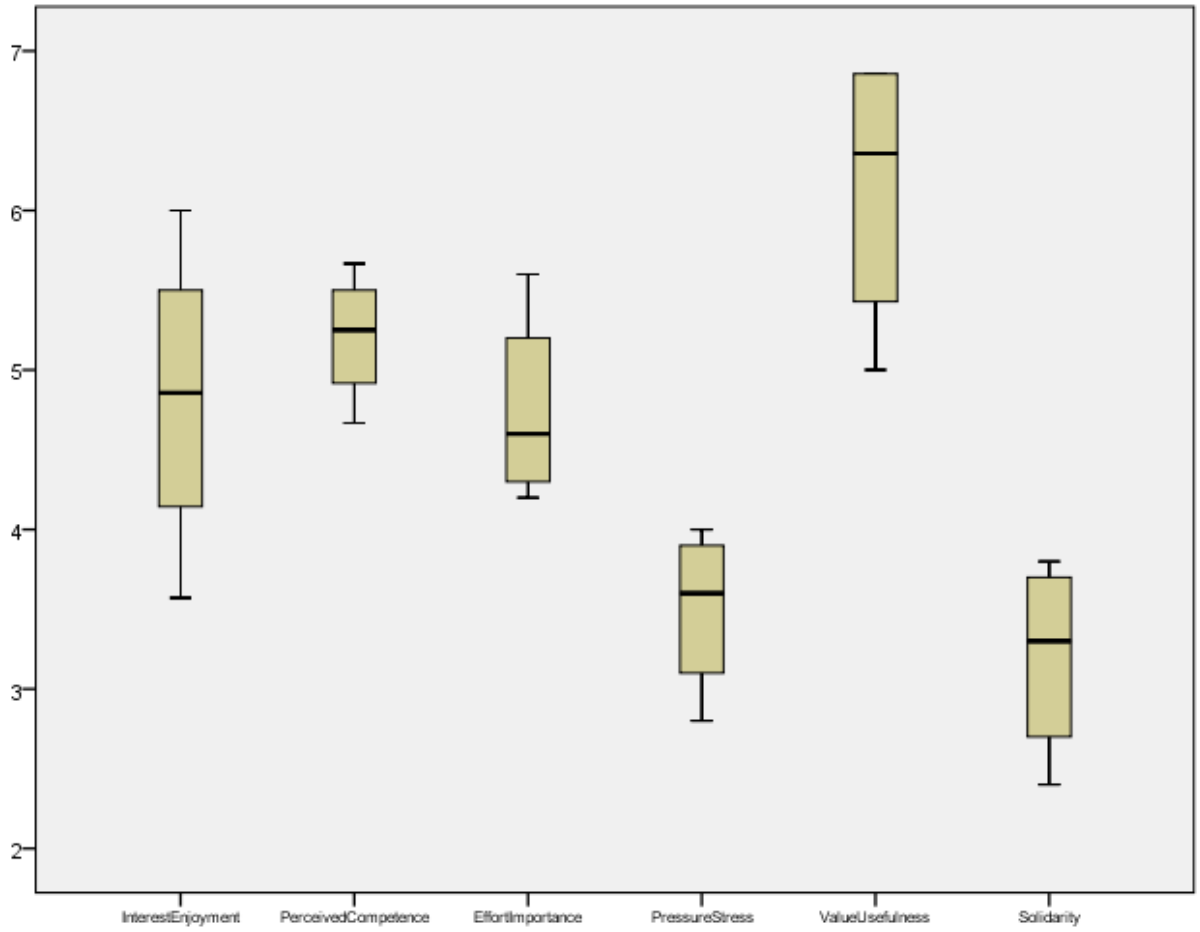
	Credibility		***Expectancy***	
	T1	**T2**	**T1**	**T2**
N	6			
Median	20.00	20.00	18.20	14.55
Interquartile Range	12.00-21.75	11.33-23.25	9.15-24.20	8.18-21.65
Minimum	9.00	9.30	8.40	7.50
Maximum	24.00	24.00	24.20	22.40
Asymp. Sig. (Wilcoxon Signed Ranks test)	0.674		0.293	

Intrinsic Motivation Inventory (IMI)

In table 12, the mean scores per subscales are shown for the IMI. Only four participants out of six could fill in the questionnaire. The other two results couldn't be noted due to drop-out at T3. Perceived competence (mean = 5.21) and value/usefulness (mean = 6.14) seemed to be the two scores that reached the highest mean scores out of 7. Other good scores are interest/enjoyment and effect/importance. Figure 4 demonstrates means and 95%-confidence intervals of the IMI for the six subitems.

Table 12: Secondary outcome measures: IMI						
Subscales	**N**	**Mean**	**Median**	**Interquartile Range**	**Minimum**	**Maximum**
Interest/enjoyment	4	4.82	4.86	4.43-5.25	1	7
Perceived competence		5.21	5.25	5.04-5.42	1	7
Effort/importance		4.75	4.60	4.35-5.00	1	7
Pressure/stress		3.50	3.60	3.25-3.85	1	7
Value/Usefulness		6.14	6.36	5.64-6.86	4	7
Solidarity		3.20	3.30	2.85-3.65	1	6

Figure 4: Boxplot IMI



Patient satisfaction

Patient satisfaction increased significantly ($p<0.05$). In the second measurement the maximum was reached, which is in contrast with T2. The maximum score increased from 9.00 to 10.00 points. Also, the minimum score made a positive evolution throughout the last four weeks of the programme (from 5.00 to 9.00). The exact results are shown in table 13.

Table 13: Primary outcome measures: Patient Satisfaction		
	T2	**T3**
N	5	
Median	8.00	9.00
Interquartile Range	6.50-9.00	7.50-10.00
Minimum	5.00	6.00
Maximum	9.00	10.00
Asymp. Sig. (Wilcoxon Signed Ranks test)	0.025	

User-Friendliness

This measurement was taken at T3. The median scores for both subscales are 9.00, almost reaching the maximum score (10.00) as shown in table 14.

	Table 14: Secondary outcome measures: User - Friendliness				
Subscales	**N**	**Median**	**Interquartile Range**	**Minimum**	**Maximum**
Usability	4	9.00	8.25-9.75	8	10
Challenge		9.00	8.25-9.75	8	10

Discussion

The results of this study showed that it was feasible to support home exercises during rehabilitation for shoulder pain with video instructions. However, the effects of video-based home exercises for patients with musculoskeletal shoulder problems could only be shown for pain and patient satisfaction. It is possible that this is due to the limited number of participants we included in this study.

Main findings participation level: Short-Form 36 (SF-36) and Pain Self-Efficacy Questionnaire (PSEQ)
There was no significant difference in participation. It is noticeable that the SF-36 showed better results with almost 2 and 14 points in mean score (Appendix n°15) on the Physical and Mental health subscale, respectively and the PSEQ also presented an increase in score. The results observed from the measures of the PSEQ were unexpected, an increase in self-efficacy could be expected due to the nature of this home exercise programme. A possible reason could be the difference in focus of the self-efficacy measure (pain) and the focus of the home exercise programme (activity).

Main findings activity level: Shoulder Pain And Disability Index (SPADI) and Patient Specific Functioning Scale (PSFS)
The present study shows for physical activity that the participants' shoulder displayed less pain and more functionality over the entire period of time. This can explain the fact that they could execute their activities better than before participation in the study. On the other hand, the change in the pain subscale can be important to the participants considering the minimal clinically important difference (MCID) is 8 points whereas the difference is 12 points. Nevertheless, the minimal detectable change (MDC) is 18 points when the SPADI is used more than once (repeated measures) [35].
Since the video-based home exercises utilised some restricted activities from the PSFS, improvements could be expected on this measure. The PSFS declined over time, but there was no achieving of statistical significance.

Main findings function level: Numeric Pain Rating Scale (NPRS)
The mean pain on the NPRS decreased, but no significant effect was found. But there is the possibility that the participants feel less pain after the entire period of rehabilitation. The chance of this happening is rather small, because of the MCID is 2 points [30, 31].

Main findings scapula positioning and forward head posture (FHP)
The objective aspects (angulus acromialis – T3 distance, pectoralis minor index (PMI), upward rotation and FHP) didn't change that much. From the start to the ending, the PMI and the distance from the angulus acromialis to T3 didn't change and stayed relatively close to its beginning values. There was a small increase (± 4°), which was not significant, in the upward rotation of the scapula. We included the measuring of FHP, because of the emphasis on exercises that focus on the shoulder- and neck region as one entity. The angle didn't increase significantly. There is also the question if an increase of 4° is clinically significant. Overall, the video-instructed exercises didn't have a big effect on the objective aspects of the shoulder-neck complex. This could be explained by the fact that the video-instructed

exercises weren't always focussed on the actual measurements. For example the pectoralis minor stretch wasn't always given, even though we measured this outcome or not every participant had an exercise for the scapula retractors. If this would've took place, the outcome could have been influenced even more by the therapy the participant received. It may be that the small improvements could be attributed to the fact that videos have a fixed content. A physiotherapist can adjust the exercise to the particular physical and cognitive needs of the patient.

Main findings motivation: Intrinsic Motivation Inventory (IMI), Credibility Expectancy Questionnaire (CEQ) and compliance

Participants were satisfied with this kind of rehabilitation. This could be a consequence of the motivation (IMI) they withdrew out of the programme. The subscales of the IMI, value and usefulness, were the subscales that scored highest, which can give rise to a bigger satisfaction. This could be interpreted in the fact that the patients thought that the addition of video-instructed exercises could be very useful and that the participants feel more competent to perform the requested exercises.
On the other hand, the other outcome measures like CEQ didn't present promising results. The expectancy subscale even showed a decrease in results, which was not significant. A study from Goossens et al. [36] reported similar findings of moderate expectancy scores in a behavioural intervention in chronic pain. This could suggest that patients suffering from a chronic problem could have low expectations and credibility because of previous disappointing interventions. All the participants in this study have shoulder pain for more than three months, three of them even for six months.
Three participants had an excellent compliance, they filled in the diary an did the video-exercises at home very consistent. On average, they exercised every day around 30 minutes. With these three patients, we didn't see a reduction over time in frequency and intensity. One participant, who dropped out of this study on measurement T2, was not very consistent in filling the diary and doing the home-exercises. The second participant who dropped out of this study on measurement T3, trained on average three times a week for 20 minutes. Another participant had a recoil because of a lot of deadlines at work, this was seen in the personal diary. After these deadlines he was motivated again and trained systematically every day for 30 minutes on average. The participants filled in a diary but we still don't really know how much they practiced at home. This could give a faulty reproduction of the results. It's partly in correlation with the motivation the participants have for this kind of rehabilitation and if they already received some short-term results. This motivation could also be influenced by the difficulty and quantity in exercises they got from the physiotherapists and researchers in the hospital. As personal experience we noted that the quantity of the videos is not important, patients were not inclined to do many exercises at home. The higher the difficulty of the exercises, the less motivated the participants were.

Implications for the result interpretations

The sixth participant was suffering from recoil during the fifth week of the study programme because of deadlines for his work. In the beginning, the exercises and pain were easy to control for him. In the

period between the second and third measure moment, this participant suffered from a kickback. Sometimes heavy pain emerged. After the kickback, this participant showed bigger compliance and motivation to execute the video-instructed exercises. This change could influence the overall results because of the small inclusion of patients (n=6). Participant 6 could have been seen as an outlier. Because of this event, the results could be altered in a significant way. Where the participants normally had a positive trend towards the ending of the rehabilitation, this participant had the tendency to develop more negative results. We tried to examine the results without this outlier. Several differences were seen in the primary outcome measures. In the first analysis only the SPADI pain subscale showed significant improved over time, while in the second analysis (Appendix n°14) there were significant improvements to be seen in the SPADI Pain and Disability subscale, SF-36 Physical Health subscale, PSEQ, NPRS and FHP. All differences were seen over time (T0-T3 and T1-T3) but not in repeated measures.

Considerations for future research

This study analysis has some potential limitations, which can be taken into account in future studies. There is a need to include more participants. The sample was recruited at the hospital, not taken from the whole population. There was a lack of blinding the practitioners, participants and the assessors. The study could be done in a more standardized way throughout the process of receiving hospital-based rehabilitation before or after the measurements. We recommend a control group in future study, you can determine whether video-instruction exercises are a worthy adjuvant to the usual rehabilitation programme. Also the use of co-interventions, such as the use of analgesia, during the intervention should be taken in consideration in future studies.

Strengths

The set-up of the study was very strict. The measurements were done by the same researcher and every time the same measure tools were used. The measurements were always done in the same order. The unique contribution of this study is the inclusion of the whole neck-shoulder complex instead of only focussing to the shoulder pathology. In the usage of these videotapes, we tried to give exercises that could affect this complex as a whole.

We received positive feedback about the videos that indicated the right posture and execution of daily tasks. These exercises could be easily implemented during the daily activities. The step of really executing them is lower.

As personal experience we noted that the five remaining participants were satisfied with the videos. Some quotes: ‘Easy to use. Clear instructions and of good quality’, ‘Not time consuming, but finding time to do them’, ‘I really like the daily exercises, I tend to do them more’.

We think that home-based video exercises could be a worthy adjuvant for a rehabilitation process. Although future studies are needed, our study shows important implications (without participant 6) for a future design of home-based exercises programmes for decreasing pain levels, disabilities, and determining motivation in patients with musculoskeletal shoulder problems.

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Conclusion

Video-instructed exercises can be a useful addition to the rehabilitation programme for patients with shoulder problems. Participants showed promising results in perspective of their personal traits. Exercises were done for ten weeks. The last eight weeks, home exercises were supported by video-instructions. Positive significant results were found for Shoulder Pain and Disability Index, pain subscale and in patient satisfaction. Other outcome measures didn't show an significant improvement. The perceived competence of the patients to perform the exercises was high, and they felt that this kind of rehabilitation was a valuable support to their regular rehabilitation. Adding video-instructed exercises can be experienced as user-friendly.

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Appendix n°1: Level of Significance (primary outcome measures)

Level of Significance (primary outcome measures)			
Primary Outcome Measures	**Kind of test**	**Period**	**Significance level**
SF – 36 (physical)	Friedman	T0-T3	0.260
		T1-T3	0.223
	Wilcoxon	T1-T2	0.600
		T2-T3	0.116
		T1-T3	0.345
SF – 36 (mental)	Friedman	T0-T3	0.572
		T1-T3	0.513
	Wilcoxon	T1-T2	0.463
		T2-T3	0.116
		T1-T3	0.345
PSEQ	Friedman	T0-T3	0.123
		T1-T3	0.094
	Wilcoxon	T1-T2	0.248
		T2-T3	0.269
		T1-T3	0.248
SPADI (pain)	Friedman	T0-T3	***0.013***
		T1-T3	***0.042***
	Wilcoxon	T1-T2	0.340
		T2-T3	0.027
		T1-T3	0.046
SPADI (Disability)	Friedman	T0-T3	0.068
		T1-T3	0.084
	Wilcoxon	T1-T2	0.207
		T2-T3	0.225
		T1-T3	0.173
PSFS	Friedman	T0-T3	0.170
		T1-T3	0.074
	Wilcoxon	T1-T2	0.080
		T2-T3	0.043
		T1-T3	0.893
NPRS	Friedman	T0-T3	0.131
		T1-T3	0.119
	Wilcoxon	T1-T2	0.785
		T2-T3	0.194
		T1-T3	0.248

Level of Significance (primary outcome measures)			
Primary Outcome Measures	**Kind of test**	**Period**	**Significance level**
Angulus acromialis -T3 distance (cm)	Friedman	T0-T3	0.260
		T1-T3	0.069
	Wilcoxon	T1-T2	0.248
		T2-T3	0.172
		T1-T3	0.344
PMI	Friedman	T0-T3	0.245
		T1-T3	0.108
	Wilcoxon	T1-T2	0.078
		T2-T3	0.343
		T1-T3	0.046
Upward Rotation Scapula (°)	Friedman	T0-T3	0.097
		T1-T3	0.438
	Wilcoxon	T1-T2	0.248
		T2-T3	0.343
		T1-T3	0.752
FHP (°)	Friedman	T0-T3	0.060
		T1-T3	0.069
	Wilcoxon	T1-T2	0.173
		T2-T3	0.173
		T1-T3	0.249

Appendix n°2: SPADI (Dutch)

(Roach et al, vertaalde versie)

Wilt u a.u.b. de onderstaande vragenlijst invullen.
De vragen gaan over uw schouder en hebben betrekking op de afgelopen week.

PIJN SCHAAL

Hoe erg is uw pijn?

Omcirkel het getal dat het best uw pijn weergeeft.
0 = geen pijn en **10** = de ergst bedenkbare pijn

De pijn op zijn hevigst…….. ……..	0 1 2 3 4 5 6 7 8 9 10
Wanneer u op de pijnlijke zijde ligt…. ……..	0 1 2 3 4 5 6 7 8 9 10
Reikend naar iets op een hoge plank ……..	0 1 2 3 4 5 6 7 8 9 10
Het aanraken van de achterkant van de nek…….	0 1 2 3 4 5 6 7 8 9 10
Duwen met de pijnlijke arm……..	0 1 2 3 4 5 6 7 8 9 10

Totaal pijn score _____

BEPERKING SCHAAL

Hoeveel moeite heeft u om het volgende uit te voeren?

Omcirkel het getal dat het best uw ervaring weergeeft.
0 = geen enkele moeite en **10** = zo moeilijk dat hulp hiervoor nodig is

Uw haar wassen……..	0 1 2 3 4 5 6 7 8 9 10
Uw rug wassen……..	0 1 2 3 4 5 6 7 8 9 10
Een hemd aantrekken…….	0 1 2 3 4 5 6 7 8 9 10
Een shirt met knopen aantrekken……	0 1 2 3 4 5 6 7 8 9 10
Uw broek aantrekken……	0 1 2 3 4 5 6 7 8 9 10
Een object op een hoge plank plaatsen……	0 1 2 3 4 5 6 7 8 9 10
Een zwaar object dragen van 5 kg……	0 1 2 3 4 5 6 7 8 9 10
Iets pakken uit uw achterzak. ……..	0 1 2 3 4 5 6 7 8 9 10

Totaal pijn score _____ **Totaal SPaDI score** _____

Appendix n°3: SF – 36 (Dutch)

Instructie: Deze vragenlijst gaat over uw standpunten t.a.v. uw gezondheid. Met behulp van deze gegevens kan worden bijgehouden hoe U zich voelt en hoe goed U in staat bent Uw gebruikelijke bezigheden uit te voeren.

Beantwoord elke vraag door het antwoord op de aangegeven wijze te markeren. Als U niet zeker weet hoe U een vraag moet beantwoorden, geef dan het best mogelijke antwoord.

1. Hoe zou U over het algemeen uw gezondheid noemen? (omcirkel één cijfer)
   Uitstekend…….. 1
   Zeer goed……. 2
   Goed…… 3
   Matig…… 4
   Slecht…….. 5

2. Hoe beoordeelt U nu uw gezondheid over het algemeen, vergeleken met een jaar geleden? (Omcirkel één cijfer)

   Veel beter nu dan een jaar geleden…….. 1
   Wat beter nu dan een jaar geleden……. 2
   Ongeveer hetzelfde nu als een jaar geleden…… 3
   Wat slechter nu dan een jaar geleden……. 4
   Veel slechter nu dan een jaar geleden…….. 5

3. De volgende vragen gaan over bezigheden die U misschien doet op een doorsnee dag. Wordt U door uw gezondheid op dit moment beperkt bij deze bezigheden? Zo ja, in welke mate? (omcirkel één cijfer op elke regel)

BEZIGHEDEN	**Ja, ernstig beperkt**	**Ja, een beetje beperkt**	**Nee, helemaal niet beperkt**
a. Forse inspanning, zoals hardlopen, tillen van zware voorwerpen, een veeleisende sport beoefenen	1	2	3
b. Matige inspanning, zoals een tafel verplaatsen, stofzuigen, zwemmen of fietsen	1	2	3
c. Boodschappen tillen of dragen	1	2	3
d. Een paar trappen oplopen	1	2	3
e. Eén trap oplopen	1	2	3
f. Bukken, knielen of hurken	1	2	3
g. Meer dan een kilometer lopen	1	2	3
h. Een paar honderd meter lopen	1	2	3
i. Ongeveer honderd meter lopen	1	2	3
j. Uzelf wassen of aankleden	1	2	3

4. Heeft u in de afgelopen 4 weken, een van de volgende problemen bij uw werk of andere dagelijkse bezigheden gehad, ten gevolge van uw lichamelijke gezondheid? (omcirkel één cijfer op elke regel)

	JA	**NEE**
a. U besteedde **minder tijd** aan werk of andere bezigheden	**1**	**2**
b. U heeft **minder bereikt** dan u zou willen	**1**	**2**
c. U was beperkt in het **soort** werk of andere bezigheden	**1**	**2**
d. U had **moeite** om uw werk of andere bezigheden uit te voeren (het kostte u bv. extra inspanning)	**1**	**2**

5. Heeft u in de afgelopen 4 weken, een van de volgende problemen ondervonden bij uw werk of andere dagelijkse bezigheden ten gevolge van emotionele problemen (zoals depressieve of angstige gevoelens)?

(omcirkel één cijfer op elke regel)

	JA	**NEE**
a. U besteedde minder tijd aan werk of andere bezigheden	**1**	**2**
b. U heeft minder bereikt dan u zou willen	**1**	**2**
c. U deed uw werk of andere bezigheden niet zo zorgvuldig als gewoonlijk	**1**	**2**

6. In hoeverre hebben Uw lichamelijke gezondheid of emotionele problemen U gedurende de afgelopen 4 weken gehinderd in Uw normale omgang met familie, vrienden of buren, of bij activiteiten in groepsverband? (omcirkel één cijfer)

Helemaal niet..... 1

Enigzins..... 2

Nogal..... 3

Veel..... 4

Heel erg veel..... 5

7. Hoeveel lichamelijke pijn heeft u de afgelopen 4 weken gehad? (omcirkel één cijfer)

Geen..... 1

Heel licht..... 2

Licht..... 3

Nogal..... 4

Ernstig..... 5

Heel ernstig..... 6

8. In welke mate bent u de afgelopen 4 weken door pijn gehinderd in uw normale werk (zowel buitenshuis als huishoudelijk werk)? (omcirkel één cijfer)

Helemaal niet..... 1

Een klein beetje..... 2

Nogal..... 3

Veel..... 4

Heel erg veel..... 5

9. Mentale Gezondheid en Vitaliteit

Deze vragen gaan over hoe u zich voelt en hoe het met u ging in de afgelopen vier weken.
Wilt u a.u.b. bij elke vraag het antwoord geven dat het best benadert hoe u zich voelde.

Scoremogelijkheden:	
1	altijd
2	meestal
3	vaak
4	soms
5	zelden
6	nooit

Hoe vaak gedurende de afgelopen vier weken:

	Omcirkel één cijfer op elke regel					
Voelde u zich levenslustig?	1	2	3	4	5	6
Was u erg zenuwachtig?	1	2	3	4	5	6
Zat u zo in de put dat niets u kon opvrolijken	1	2	3	4	5	6
Voelde u zich rustig en tevreden?	1	2	3	4	5	6
Had u veel energie?	1	2	3	4	5	6
Voelde u zich somber en neerslachtig?	1	2	3	4	5	6
Voelde u zich uitgeput?	1	2	3	4	5	6
Was u een gelukkig mens?	1	2	3	4	5	6
Voelde u zich moe?	1	2	3	4	5	6

10. Hoe vaak hebben uw lichamelijke gezondheid of emotionele problemen U gedurende de afgelopen 4 weken gehinderd bij Uw sociale activiteiten (zoals vrienden of familie bezoeken, etc.)? (Omcirkel één cijfer op elke regel)

Altijd……1

Meestal……2

Soms……3

Zelden……4

Nooit……5

11. Hoe JUIST of ONJUIST is elk van de volgende uitspraken voor U?
Omcirkel één cijfer op elke regel

	Volkomen juist	Grotendeels juist	Weet ik niet	Grotendeels onjuist	Volkomen onjuist
a. Ik lijk wat gemakkelijker ziek te worden	1	2	3	4	5
b. Ik ben even gezond als andere mensen	1	2	3	4	5
c. Ik verwacht dat mijn gezondheid achteruit zal gaan	1	2	3	4	5
d. Mijn gezondheid is uitstekend	1	2	3	4	5

Appendix n°4: The Pain Self-Efficacy Questionnaire (Dutch)

Duid aan **hoe zeker** u van uzelf bent dat u **op dit moment** de onderstaande dingen kan doen, **ondanks uw pijn**. Omcirkel het cijfer dat uw antwoord het best weergeeft, waarbij 0 = helemaal niet zeker of helemaal geen vertrouwen, en 6 = volledig zeker of vol vertrouwen.

Let op, er wordt niet gevraagd of u deze dingen al dan niet doet, maar wel **hoe zeker u van u zelf bent dat u deze dingen kan doen, ondanks uw pijn.**

1. Ik kan van dingen genieten, ondanks mijn pijn.

0 1 2 3 4 5 6
Helemaal niet zeker **Volledig zeker**

2. Ik kan de meeste huishoudelijke taken (vb. opruimen, afwassen, enz.) doen, ondanks mijn pijn.

0 1 2 3 4 5 6
Helemaal niet zeker **Volledig zeker**

3. In vergelijking met vroeger, kan ik even vaak met mijn vrienden en familie afspreken, ondanks mijn pijn.

0 1 2 3 4 5 6
Helemaal niet zeker **Volledig zeker**

4. Ik kan met mijn pijn omgaan in de meeste situaties.

0 1 2 3 4 5 6
Helemaal niet zeker **Volledig zeker**

5. Ik kan enige vorm van werk doen, ondanks mijn pijn ('werk' houdt zowel huishoudelijk werk, onbetaald als betaald werk in)

0 1 2 3 4 5 6
Helemaal niet zeker **Volledig zeker**

6. Ik kan nog altijd veel dingen doen waar ik van geniet, zoals hobby's en vrije tijds-activiteiten, ondanks mijn pijn.

0 1 2 3 4 5 6

Helemaal niet zeker **Volledig zeker**

7. Ik kan met mijn pijn omgaan zonder medicatie.

0 1 2 3 4 5 6

Helemaal niet zeker **Volledig zeker**

8. Ik kan nog steeds de meeste van mijn doelen in mijn leven behalen, ondanks mijn pijn.

0 1 2 3 4 5 6

Helemaal niet zeker **Volledig zeker**

9. Ik kan een normale levensstijl behouden, ondanks mijn pijn.

0 1 2 3 4 5 6

Helemaal niet zeker **Volledig zeker**

10. Ik kan geleidelijk aan meer actief worden, ondanks mijn pijn.

0 1 2 3 4 5 6

Helemaal niet zeker **Volledig zeker**

Appendix n°5: Patient Specific Functional Scale (Dutch)

Eerste onderzoek (lees dit voor)

Ik ga u vragen 3 tot 5 belangrijke activiteiten te noemen die u niet of met moeite kunt uitvoeren als gevolg van uw _____ probleem. Zijn er vandaag activiteiten die u niet of met moeite kunt uitvoeren als gevolg van uw _____ probleem? (Leg de 0-10 schaal uit en vraag de patiënt elke activiteit een cijfer toe te kennen).

Aanvulling: Zijn er nog overige activiteiten die u een beetje moeite kosten om uit te voeren?
Bijvoorbeeld, activiteiten die u een score van 6 of meer zou toekennen.
Benoem niet meer dan twee activiteiten. (Schrijf deze op als Extra 1 en 2)

Vervolg onderzoek (lees dit voor)
Toen ik bij u de vragenlijst afnam op (noem datum eerste onderzoek), vertelde u mij dat u moeite had met (lees één voor één alle activiteiten van de lijst op).
In welke mate heeft u vandaag de dag nog steeds moeite met genoemde activiteiten? (laat de patiënt de activiteiten uit het eerste onderzoek nogmaals scoren).

Patiënt specifieke activiteiten schaal (wijs cijfer aan):

0 1 2 3 4 5 6……..7…….8…….9……10

Kan activiteit Niet uitvoeren **Kan activiteit zo goed uitvoeren als voor probleem**

Appendix n°6: Numeric Pain Rating Scale (Dutch)

Datum van afname:

Selecteer het cijfer dat het best de ernst van uw pijn weergeeft.
Hoe hevig was uw pijn (*gemiddeld*) de afgelopen week (7 dagen)?

Geen pijn 0 1 2 3 4 5 6 7 8 9 10 Ergste pijn voorstelbaar

Selecteer het cijfer dat het best de ernst van uw pijn weergeeft.
Hoe hevig was uw pijn op de *slechtste* momenten in de afgelopen week (7 dagen)?

Geen pijn 0 1 2 3 4 5 6 7 8 9 10 Ergste pijn voorstelbaar

Selecteer het cijfer dat het best de ernst van uw pijn weergeeft.
Hoe hevig was uw pijn op de *beste* momenten in de afgelopen week (7 dagen)?

Geen pijn 0 1 2 3 4 5 6 7 8 9 10 Ergste pijn voorstelbaar

Appendix n°7: Credibility Expectancy Questionnaire (Dutch)

1e reeks vragen

1. Hoe logisch lijkt u de geboden therapie nu?

1	2	3	4	5	6	7	8	9
Helemaal niet logisch			enigszins logisch				zeer logisch	

2. Hoe succesvol denkt u nu dat deze behandeling zal zijn voor de behandeling van uw schoudersymptomen?

1	2	3	4	5	6	7	8	9
Helemaal niet succesvol		enigszins succesvol				zeer succesvol		

3. Zou u er vertrouwen in hebben deze behandeling aan een vriend aan te raden die dezelfde problemen heeft?

1	2	3	4	5	6	7	8	9
Geen vertrouwen		enig vertrouwen				vol vertrouwen		

4. Hoeveel verbetering zal er volgens u aan het eind van de therapie in uw schoudersymptomen zijn opgetreden?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

2e reeks vragen

Sluit voor deze reeks een paar momenten uw ogen en probeer te achterhalen wat u werkelijk *voelt* ten aanzien van de therapie en het waarschijnlijke succes. Beantwoord dan de volgende vragen.

1. Hoeveel *voelt* u nu dat therapie u zal helpen uw schoudersymptomen te verminderen?

1	2	3	4	5	6	7	8	9
Niets			Enigszins				Zeer veel	

2. Hoeveel verbetering *voelt* u dat er aan het eind van de therapie in uw schoudersymptomen zal zijn opgetreden?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Appendix n°8: Motivation (Dutch)

1 Hoe gemotiveerd bent u voor het uitvoeren van de thuisgerelateerde oefeningen? 0 = helemaal niet, 10 = Extreem gemotiveerd, uitdagend.

1 2 3 4 5 6 7 8 9 10

2 Welke factoren beïnvloedde de thuisgerelateerde oefeningen?

Positief:

Negatief:

Appendix n°9: Patient - Satisfaction (Dutch)

1 In welke mate bent u tevreden over deze technologie ondersteunende revalidatie?

1 2 3 4 5 6 7 8 9 10

Appendix n°10: User - Friendliness (Dutch)

1 Hoe gemakkelijk vond u het om het systeem te gebruiken

1 2 3 4 5 6 7 8 9 10

2 Vond u het systeem uitdagend genoeg

1 2 3 4 5 6 7 8 9 10

3 Zijn er negatieve factoren met betrekking tot de gebruiksvriendelijkheid?

Appendix n°11: Intrinsic Motivation Inventory (Dutch)

Interesse/Genot

1. Ik heb erg genoten van deze schouder-nek training

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

2. Deze schouder-nek training was leuk

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

3. Ik vond deze schouder-nek training saai

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

4. Deze training kon mijn aandacht helemaal niet vasthouden

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

5. Ik vond deze schouder-nek training interessant

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

6. Ik dacht dat deze schouder-nek training vrij prettig was

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

7. Terwijl ik deze training deed, dacht ik na over hoe prettig ik het vond

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar		zeer waar	

Ervaren competentie

8. Ik denk dat ik vrij goed ben in deze training

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

9. Ik denk dat ik deze training vrij goed doe in vergelijking met andere deelnemers

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

10. Na een beetje ervaring met deze training, voelde ik me vrij competent

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

11. Ik ben tevreden met mijn prestatie op deze trainingsactiviteit

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

12. Ik was vrij vaardig in het uitvoeren van deze trainingsactiviteit

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

13. Dit was een trainingsactiviteit die ik niet goed kon uitvoeren

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

Inspanning/Belangrijkheid

14. Ik heb veel moeite gedaan voor deze schouder-nek training

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

15. Ik heb niet echt geprobeerd om goed te presteren op deze trainingsactiviteit

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

16. Ik heb me veel moeite gedaan tijdens deze trainingsactiviteit

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

17. Het was belangrijk voor mij om deze training goed te doen

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

18. Ik heb niet veel energie gestoken in de trainingsactiviteit

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

Druk/Spanning

19. Ik heb me helemaal niet zenuwachtig gevoeld terwijl ik de oefende

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**			**zeer waar**

20. Ik heb me erg gespannen gevoeld terwijl ik oefende

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**			**zeer waar**

21. Ik was zeer ontspannen tijdens het doen van deze oefeningen

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**			**zeer waar**

22. Ik voelde me angstig tijdens het oefenen

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**			**zeer waar**

23. Ik voelde dat ik onder druk stond tijdens het trainen

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**			**zeer waar**

Waarde/Nut

24. Ik geloof dat deze activiteit waarde voor mij kan hebben

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

25. Ik denk dat deze activiteit nuttig is voor het verbeteren van schouder-nek vaardigheid

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

26. Ik denk dat deze training belangrijk is omdat ik mijn schouder-nek meer en beter kan gebruiken

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

27. Ik zou dit nog opnieuw willen doen omdat het enige waarde voor mij heeft

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

28. Ik denk dat het doen van deze activiteit mij zou kunnen helpen om mijn aangedane schouder meer te gebruiken in alledaagse activiteiten

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

29. Ik geloof dat het doen van deze training mij ten goede komt

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

30. Ik denk dat dit een belangrijke training is

1	2	3	4	5	6	7
helemaal niet waar			enigszins waar			zeer waar

Samenhorigheid

31. Ik voelde me echt afstandelijk tot deze training

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**		**zeer waar**	

32. Ik zou graag een kans krijgen om vaker met deze trainingsmethode/ dit trainingssysteem te oefenen

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**		**zeer waar**	

33. Ik zou echt verkiezen om niet meer met deze trainingsmethode/dit trainingssysteem te oefenen in de toekomst

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**		**zeer waar**	

34. Ik voel niet dat ik deze trainingmethode/-systeem echt kan vertrouwen

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**		**zeer waar**	

35. Ik voel me aangetrokken tot deze trainingsmethode/dit trainingssysteem

1	2	3	4	5	6	7
helemaal niet waar			**enigszins waar**		**zeer waar**	

Appendix n°12: Evaluation scapula position (Dutch)

Observatie stand scapula (statisch & dynamisch):	
AT-afstand (afstand van angulus acromialis tot tafel):	
Meting rustlengte M. Pectoralis Minor:	
Meting scapulaire afstand (afstand van angulus acromialis tot T3):	
Meting scapulaire afstand (afstand van angulus acromialis tot T4):	
Meting scapulaire opwaartse rotatie:	
Medial rotation test:	
Scapular repositioning test:	
Scapular assistance test:	

Appendix n°13: Sociodemographical evaluation (Dutch)

Geslacht:	
Leeftijd:	
Opleiding:	
Lichaamslengte:	
Gewicht:	
Sociale- en werksituatie:	-
Tijd sinds het ontstaan van schouderpijn:	
Revalidatiegeschiedenis (algemeen en met betrekking tot schouderpijn):	
Medicatie gebruik i.f.v. schouderpijn: (Ja/Neen/Dosis)	
Werkongeval, juridische procedure i.v.m. schouderpijn:	
Gemiddeld aantal uren werk per week:	
Tijdsduur werk met arm/hand in elevatie (overhead work):	

Appendix n°14: Results without the outlier (Participant 6)

Primary outcome measures: SPADI, PSEQ, SF-36, NPRS and PSFS						
		T0 Mean (IQR)	**T1 Mean (IQR)**	**T2 Mean (IQR)**	**T3 Mean (IQR)**	**Sign. level**
Participation level	**SF-36**					
	• **Physical Health**	46.58 (37.19)	47.00 (45.21)	52.61 (53.33)	57.58 (43.90)	†, ††
	• **Mental health**	54.29 (46.75)	58.10 (52.69)	69.86 (41.28)	75.48 (32.61)	
	PSEQ	38.20 (34.00)	35.60 (39.00)	48.00 (25.00)	49.40 (24.50)	†, ††
Activity level	**SPADI**					
	• **Pain**	30.60 (19.00)	26.20 (28.00)	23.04 (22.60)	16.98 (22.40)	†, ††
	• **Disability**	35.00 (36.00)	32.80 (43.50)	25.68 (44.00)	23.02 (43.60)	†, ††
	PSFS	5.26 (5.00)	5.58 (4.20)	4.34 (3.35)	6.78 (3.70)	
Function level	**NPRS**	6.40 (3.50)	6.00 (4.00)	5.20 (4.50)	3.60 (4.50)	†, ††

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology);

Friedman test significant for T0-T3: † = p ≤ 0,05; Friedman test significant for T1-T3: †† = p ≤ 0,05; Wilcoxon signed rank test significant for T1-2: * = p ≤ 0,0167; Wilcoxon signed rank test significant for T2-3: ** = p ≤ 0,0167; Wilcoxon signed rank test significant for T1-3: *** = p ≤ 0,0167;

NPRS: Numeric Pain Rating Scale; PSEQ: Patient Self-Efficacy Questionnaire; PSFS: Patient Specific Functioning Scale; SF-36: Short-Form 36; SPADI: Shoulder Pain and Disability Index.

Primary outcome measures: Forward Head Posture					
	T0 Mean (IQR)	**T1 Mean (IQR)**	**T2 Mean (IQR)**	**T3 Mean (IQR)**	**Significance level**
FHP (°)	*44,19 (14,05)*	*45,87 (11,34)*	*51,47 (12,49)*	*49,96 (11.17)*	†, ††

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology)

Friedman test significant for T0-T3: † = p ≤ 0,05; Friedman test significant for T0-T3: †† = p ≤ 0,05; Wilcoxon signed rank test significant for T1-2: * = p ≤ 0,0167; Wilcoxon signed rank test significant for T2-3: ** = p ≤ 0,0167; Wilcoxon signed rank test significant for T1-3: *** = p ≤ 0,0167;

FHP: Forward Head Posture.

Appendix n°15: Results with mean values

Primary outcome measures: SF-36, PSEQ, SPADI, PSFS, NPRS, scapula evaluation and FHP					
		T0 Mean	**T1 Mean**	**T2 Mean**	**T3 Mean**
Participation level	**SF-36**				
	• **Physical Health**	52.50	53.19	50.55	54.41
	• **Mental health**	56.89	61.46	63.76	70.53
	PSEQ	41.00	39.67	45.50	48.00
Activity level	**SPADI**				
	• **Pain**	30.67	25.67	23.53	18.32
	• **Disability**	29.17	29.17	24.73	23.18
	PSFS	6.05	6.32	3.83	5.92
Function level	**NPRS**	6.17	5.83	5.50	4.50
Scapula evaluation	**Angulus acromialis -T3 distance (cm)**	20.25	20.55	19.90	20.70
	PMI	10.10	9.88	10.68	10.77
	Upward Rotation Scapula (°)	8.17	12.00	14.83	12.83
	FHP (°)	46.79	48.19	52.11	50.43

Abbreviations:

T0: Baseline measurement; T1: Measurement after 2 weeks rehabilitation (without technology); T2: Measurement after 6 weeks rehabilitation (including 4 weeks with technology); T3: Measurement after 10 weeks rehabilitation (including 8 weeks with technology);

NPRS: Numeric Pain Rating Scale; PMI: Pectoralis Minor Index;PSEQ: Patient Self-Efficacy Questionnaire; SF-36; PSFS: Patient Specific Functioning Scale;Short-Form 36; SPADI: Shoulder Pain and Disability Index.

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