

Fear and avoidance of shoulder movement according to the International Code of Functioning: cross-sectional study

Medo e evitação de movimento do ombro segundo o Código Internacional de Funcionalidade: estudo transversal

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ABSTRACT

BACKGROUND AND OBJECTIVES: Shoulder pain is a limiting condition that has a major impact on daily activities and work. Knowing which specific activities involving the shoulder are associated with the occurrence of higher levels of pain may be of interest to professionals. The use of images of shoulder movements can be an effective tool to check the presence of pain and fear of movement, break down language and cultural barriers, and facilitate communication between professional and patient. The objectives of this study were: (1) to carry out a descriptive analysis of fear responses and movement avoidance based on passive viewing of images of shoulder movements based on the International Classification of Functioning, Disability and Health (ICF) codes; (2) to check whether there is a correlation between

fear responses and movement avoidance with the Shoulder Pain and Disability Index (SPADI).

METHODS: In this cross-sectional observational study, individuals with chronic shoulder pain were recruited. Participants responded to the Shoulder Pain and Disability Index (SPADI) and the TAMPA Scale of Kinesiophobia (TSK) to measure the intensity of shoulder pain and disability, and fear of movement, respectively. Participants viewed 58 movement images based on codes and descriptors from the third chapter of ICF. In addition, they responded to a numerical scale to judge fear of movement and a second numerical scale to judge movement avoidance.

RESULTS: The study included 42 individuals. The activities belonging to the mobility subgroup (chapter 4), which refers to chapter 3 of the ICF, are those that present greater responses of fear and movement avoidance. Multiple regression resulted in a significant model [$F(1, 40) = 31.119$; $p < 0.001$; $R^2 = 0.438$], when verifying whether fear and movement avoidance responses related to ICF images are associated with SPADI in participants with chronic shoulder pain. The fear response is associated with SPADI ($\beta = 0.661$; $t = 5.578$; $p < 0.001$), however, the avoidance response did not present a significant result with the scale ($\beta = 0.063$; $t = -0.160$; $p = 0.874$).

CONCLUSION: Movements that refer to mobility seem to be the most feared and avoided by people with chronic shoulder pain. Fear of movement is associated with shoulder disability.

Keywords: Chronic pain, Fear, Shoulder pain.

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HIGHLIGHTS

- Individuals with shoulder pain who are afraid of movement are likely to have higher levels of shoulder pain and disability.
- Individuals with shoulder pain thought they had fear and avoidance of movement in relation to the activities represented in the images shown by the ICF Mobility Group.
- The use of movement images based on the ICF codes and descriptions can be a good tool for defining which activities are most feared or avoided by people with shoulder pain.

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RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor no ombro é uma condição limitante, que apresenta grande impacto nas atividades de vida diárias e no trabalho. Conhecer quais atividades específicas envolvendo o ombro estão associadas à ocorrência de maiores níveis de dor pode ser de interesse dos profissionais. A utilização de imagens de movimentos do ombro pode ser uma ferramenta eficaz para verificar a presença de dor e medo de movimento, quebrar barreiras de linguagem e culturais e facilitar a comunicação entre profissional e paciente. Os objetivos deste estudo foram: (1) realizar a análise descritiva das respostas de medo e evitação do movimento a partir da visualização passiva de imagens de movimentos do ombro baseadas nos códigos da Classificação



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Internacional de Funcionalidade, Incapacidade e Saúde (CIF); (2) verificar se há correlação das respostas de medo e evitação do movimento com o Índice de dor e Incapacidade do Ombro (SPADI).

MÉTODOS: Neste estudo observacional do tipo transversal foram recrutadas pessoas com dor crônica no ombro. Os participantes responderam ao *Shoulder Pain and Disability Index* (SPADI) e à Escala TAMPA de Cinesiofobia (TSK) para mensurar a intensidade da dor e incapacidade do ombro, e de medo do movimento, respectivamente. Os participantes visualizaram 58 imagens de movimentos baseadas em códigos e descritores do terceiro capítulo de Atividade e Participação da CIF. Além disso, responderam a uma escala numérica para julgar o medo do movimento e a uma segunda escala numérica para julgar a evitação ao movimento.

RESULTADOS: Participaram do estudo 42 pessoas. As atividades pertencentes ao subgrupo mobilidade (capítulo 4), referente ao capítulo 3 da CIF, são as que apresentam maiores respostas de medo e evitação do movimento. A regressão múltipla resultou em um modelo significativo [F (1, 40) = 31, 119; $p < 0,001$; $R^2 = 0,438$], ao verificar se as respostas de medo e evitação do movimento referente às imagens da CIF estão associadas ao SPADI dos participantes com dor crônica no ombro. A resposta de medo é associada ao SPADI ($\beta = 0,661$; $t = 5,578$; $p < 0,001$), porém a resposta de evitação não apresentou resultado significativo com a escala ($\beta = -0,063$; $t = -0,160$; $p = 0,874$).

CONCLUSÃO: Os movimentos que se referem à mobilidade parecem ser os mais temidos e evitados por pessoas com dor crônica no ombro. O medo do movimento está associado com a incapacidade do ombro.

Descritores: Dor crônica, Dor de ombro, Medo.

INTRODUCTION

The high incidence of shoulder pain is the third most common musculoskeletal pain (MSP) complaint among adults^{1,2}. With a prevalence of 35 per 1000 patients per year, shoulder pain is a limiting condition that has a major impact on activities of daily living and work¹⁻⁴. Approximately 60% of people with shoulder pain report persistent symptoms 6 to 12 months after the first episode of pain^{3,4}.

Chronic MSP can be classified as pain that persists for more than three months, associated with emotional suffering or functional incapacity, not explained by another clinical condition, with its own clinical course⁵. Chronic MSP involves several multidimensional physical, genetic, patho-anatomical, emotional, cognitive-behavioral, psychological, environmental, lifestyle and gender factors, among others^{6,7}. Chronic MSP in the shoulder can cause people to develop movement dysfunctions, reducing their ability to carry out daily activities⁷.

Emotional aspects such as pain-related fear, beliefs and movement avoidance are key points in the pain experience and the development of disability in chronic MSP⁸⁻¹⁰. Studies on the fear and movement avoidance model and its influence on persistent pain have shown that the pain experience and associative learning are interrelated and linked to the individual coping process,

the intensity of the pain response and behavior^{9,10}. Experiences related to the adaptive learning process of pain, together with the misinterpretation that movements lead the individual to feel pain, consequently lead to pain-related fear; thus defensive responses can arise, such as escape behavior, avoidance and hypervigilance^{12,13}.

A photographic scale assessing avoidance behavior in people with chronic shoulder pain (Avoidance of Daily Activities Photo Scale - ADAP)¹⁴ was recently published. This work was based on the items of the International Classification of Functioning, Disability and Health (ICF) to develop the scale, investigating avoidance behavior due to pain¹⁴. The images are described in chapter 3 (activity and participation) of the ICF¹⁶. ICF's chapter 3 is separated into smaller sub-chapters: mobility, self-care, home life, interpersonal interactions and relationships, paid and unpaid work, community, social and civic life¹⁶. In addition, shoulder dysfunctions can be assessed using the Shoulder Pain and Disability Index (SPADI), which measures the level of disability based on the intensity of pain when moving the shoulder by judging the activities described¹⁷.

Thus, investigating which specific activities involving the shoulder are associated with higher levels of pain may be of interest to professionals. By judging the images of shoulder movements, it is possible to establish which activities have a higher level of avoidance or fear and thus divide the images into subgroups according to intensity. With this division, it is possible to know which ICF classification an activity belongs to and to list the domain that represents the highest levels of fear and avoidance.

Therefore, the present study's objectives were: (1) to carry out a descriptive analysis of the fear and avoidance of movement responses based on the passive visualization of images of shoulder movements based on ICF codes; (2) to check whether there is a correlation between the fear and avoidance of movement responses and the shoulder pain and disability index (SPADI). As a hypothesis, it is hoped that (1) the analysis of the judgment of movement images based on the ICF descriptors will show which subgroup of Activity and Participation has the greatest intensity of fear and avoidance of movement; (2) it is hoped to find a correlation between the responses of fear and avoidance of movement with the shoulder pain and disability index.

METHODS

This study is characterized as a cross-sectional observational study and follows the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)¹⁸. This study was approved by the Research Ethics Committee (CEP - CAAE: 79517717.0.0000.5414). Participants were informed about the objectives and procedures of this study. Participants were informed of their rights during the study, with a guarantee of total anonymity, freedom of participation and the possibility of withdrawing at any time during the study. The risk of a breach of data confidentiality was minimized by keeping all the participants' identification data in digital analysis files held

exclusively by the study's two main researchers (postgraduate student and supervisor). Considering that the methods, as well as the inclusion and exclusion criteria, were known, the techniques were not invasive or mastered by the researchers responsible, so this research offered minimal risk to the health of the participants. No intervention was required as part of this study. All participants agreed to the Free and Informed Consent Term (FICT).

Participants

People with chronic shoulder pain were recruited through the public health system of the Ribeirão Preto city Municipal Health Department. In addition, other participants were recruited by invitation from private clinics and supplementary health services (such as private health insurance) in the municipality of Ribeirão Preto and surrounding area.

The inclusion criteria for the participants were chronic shoulder pain with a clinical diagnosis of different musculoskeletal dysfunctions of the shoulder, shoulder pain for at least three months with an average pain intensity of at least 3/10 in relation to the week before the assessment, and age over eighteen. People with clear difficulties in understanding the questions on the questionnaires, the presence of a diagnosed tumor and visual impairments that compromised the judgment of the images were excluded.

Instruments

Questionnaires and scales

Participants with shoulder pain were assessed, including an initial interview to collect sociodemographic data and characterize the sample. Participants were asked if they had ever been diagnosed with anxiety or depression, and if they did any physical activity at least once a week. All the participants answered: the Tampa Scale of Kinesiophobia (TSK)¹⁹; the SPADI-Br¹⁷; and the Numerical Pain Scale (NPS)²⁰.

TSK assesses the level of kinesiophobia (fear of movement) through 17 questions about pain and symptom intensity^{18,21}. The values for each item range from 1 to 4 points, with 1 point for "totally disagree", 2 points for "partially disagree", 3 points for "partially agree" and 4 points for "totally agree"^{18,21}. For questions 4, 8, 12 and 16, the scoring should be done in reverse²¹. The final score can vary from 17 to 68 points and the highest values indicate a high degree of kinesiophobia. The questionnaire should be self-administered^{18,21}.

SPADI-Br assesses pain and disability associated with shoulder dysfunction¹⁷. This instrument consists of 13 items, distributed in the domains of pain and function, scored on a numerical evaluation scale from zero to 10 points¹⁷. A higher score means worse shoulder function¹⁷. The scale should be self-administered. This instrument describes daily movements that people with shoulder pain find difficult to perform and the questions relate to the week prior to the assessment¹⁷.

NPS was used to measure the intensity of pain perceived by the patient. The horizontal scale presents ordered values ranging from zero to 10 and the value marked by the person during the application of the scale is interpreted in such a way that zero

indicates "no pain, displeasure or interference"; 1 to 3 indicates "pain, displeasure or mild interference"; 4 to 6 indicate "pain, displeasure or moderate interference"; and 7 to 10 indicate "pain, displeasure or intense interference"^{20,22}.

Shoulder movement images

Fifty-eight images of shoulder movement were used¹⁵. The images were based on the items in the ICF Activity and Participation domain. These items were considered important to be assessed in people with shoulder pain, as they have a biomechanical influence and there are frequent complaints of functional limitation in people with shoulder pain¹⁵. ICF was used to select the shoulder movement images based on its codes and descriptors and their relevance to the assessment of people with shoulder pain¹⁵. ICF aims to describe functionality and disability in relation to health conditions, rather than disability and a biopsychosocial approach, which incorporates aspects of health at the bodily and social levels¹⁶. ICF also provides a standardized language and model for describing health and its related states¹⁶.

Fear and avoidance movement

The participants, who had chronic shoulder pain, answered two questions for the shoulder images, related to fear and avoidance of the movement described by the images depicted, and the answers were considered for analysis. The questions were as follows: "How much do you avoid this activity because of the pain in your shoulder?" and "How much are you afraid of performing this activity because of the pain in your shoulder?"¹⁵. The answers were marked with an "x" according to a numerical scoring scale ranging from zero to 10, with a score of 0 representing responses of no avoidance and no fear, while a score of 10 represented responses of maximum avoidance and great fear of movement¹⁵.

Image presentation

Fifty-eight images of shoulder movement were shown, and the sequence of image presentation was randomized in a simple way for each participant²³. At the start of the image presentation, a fixation point (FP) in the shape of a white cross (+) was shown on a black background for five seconds²⁴⁻²⁷. Next, a full-screen image was shown for six seconds²⁶⁻²⁸. After the image was shown, a screen with a black background was presented and the participants answered the fear and movement avoidance questions. The response time was not determined by the evaluator. After the answers, the evaluator changed the screen and a new FP remained for five seconds^{27,29}, indicating the start of the next image. The summary of the image presentation protocol is illustrated in figure 1.

FP observation for 5 seconds, followed by image presentation for 6 seconds and time to answer the questions not determined by the evaluator. After filling in the answers, the procedure was repeated for the next image.

Instructions

The participants were informed that the protocol consisted of viewing and evaluating images of shoulder movement. The

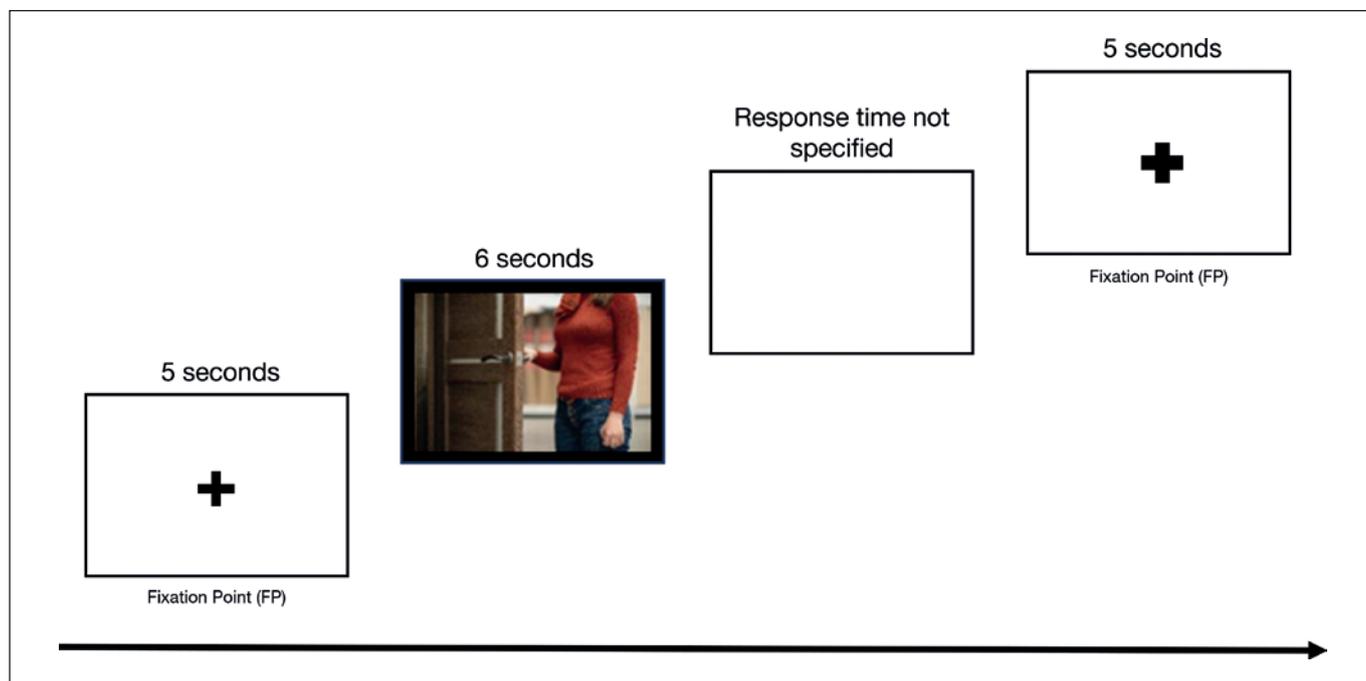


Figure 1. Summary of the image presentation protocol.

participants were instructed to pay attention to the images that would be shown, as they would be asked questions about what they saw^{24,28,30}. The evaluator explained the procedure and made a file available on the computer screen with the instructions for the procedure to be carried out. After the explanation, the evaluator was available to answer any questions the participant might have.

Statistical analysis

The data was stored on physical forms and put transferred to spreadsheets in Microsoft[®] Excel 16.0 files (Office 2016). The digital files were stored on a desktop computer and in the cloud (Google drive[™] - USP). Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS-20.0) software. Data normality was checked by visual inspection of the histograms and the Shapiro Wilk test. The sample was characterized using descriptive statistics, including frequency, central tendency and dispersion.

The responses of fear and avoidance of movement were noted and separated by the corresponding ICF code. The median and interquartile range of the fear and avoidance of shoulder movement responses were calculated. A check was made to see which images had scores equal to or greater than four in the fear and movement avoidance responses.

Multiple Linear Regression was used to check whether the responses of fear and avoidance of movement in relation to the ICF images are associated with SPADI. The independent variables that showed a univariate association with SPADI at a significance level of $p \leq 0.20$ were included as independent variables in the Multiple Linear Regression carried out using the backward method³¹. The standardized (Beta) and unstandardized (β) coefficients are a measure of how strongly each independent variable

influences the dependent variable (ADAP). Beta is measured in standard deviation units and β in its natural units. Cohen's standard for Beta values above 0.10, 0.30 and 0.50 represents a small, moderate and large relationship, respectively.

The following assumptions necessary for this analysis were assessed: (i) linear relationship between the dependent variable and independent variables using Pearson's correlation coefficient and scatter plots, (ii) independence of observations using the Durbin-Watson test, (iii) multicollinearity with variance inflation factors and tolerances, (iv) normality of the distribution of residuals and homoscedasticity with a plot of standardized residuals versus predicted values, (v) influence of residuals on the results, and (vi) number of at least 20 participants for each independent variable. A probability value of 0.05 was considered significant in the multiple regression³¹.

RESULTS

A total of 106 people with chronic shoulder pain were recruited to take part in this study. Thirty participants did not agree to take part, six were absent on the day of data collection, seven were excluded for not understanding the procedure, three were excluded for not having pain of at least 3 points compared to the week before the assessment, two participants were infected with COVID-19 and sixteen did not respond to the phone call or text message. Therefore, 42 people took part in this study. The flow-chart is shown in figure 2. The characteristics of the participants are shown in table 1.

The images that scored 4 or more in the fear and movement avoidance responses were checked. The number of responses considered to be fear and movement avoidance is presented in table 2.

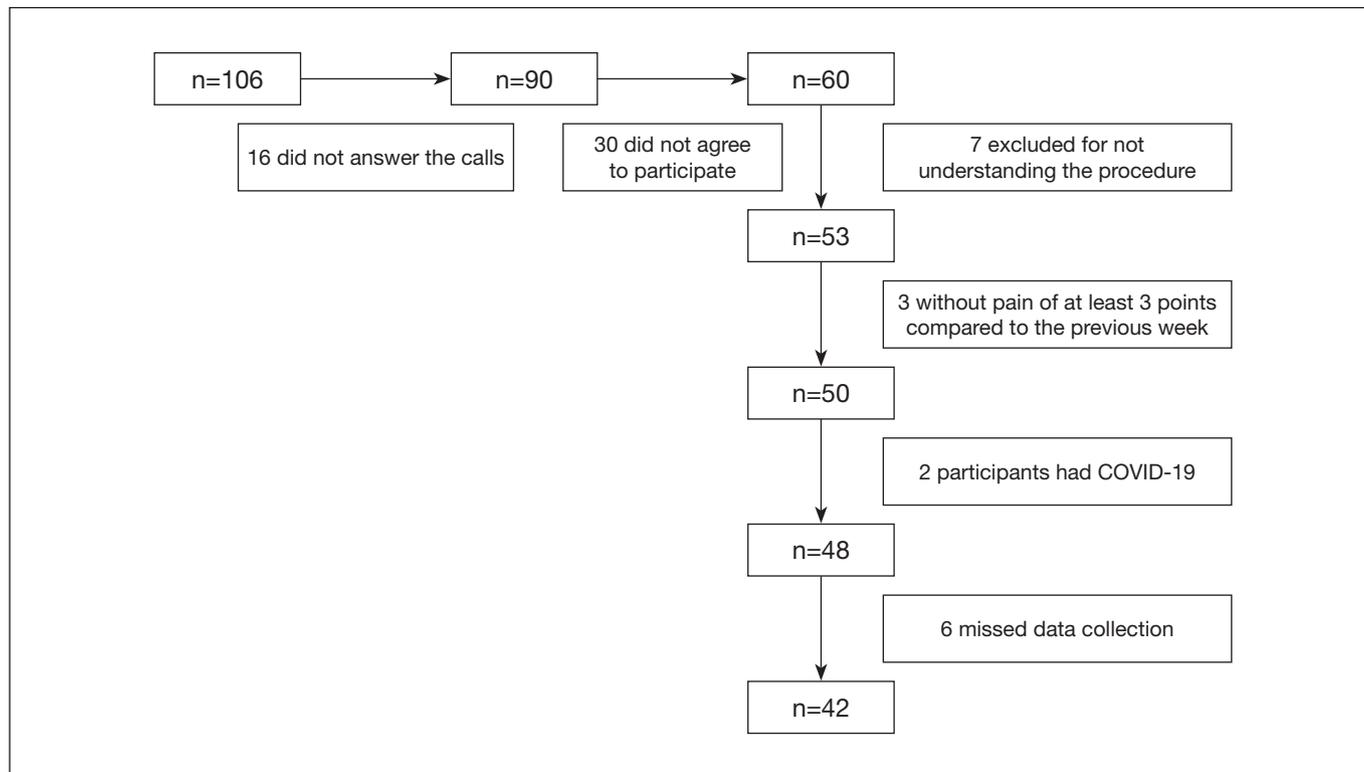


Figure 2. Flowchart of people recruited for this study.

Table 1. Descriptive data on the participants (n=42)

Characteristics	Participants shoulder pain (n=42)
Age (years), mean (SD)	45.76 (13.0)
Gender, n (%)	
Female	29 (69.04%)
Male	13 (30.96%)
Dominant arm, n (%)	
Right	41 (97.61)
Left	1 (2.59%)
TSK, mean (SD)	41.38 (8.70)
Painful shoulder, n (%)	
Right	19 (45.23%)
Left	13 (30.95%)
Right and left	10 (23.80%)
Pain time (months), mean (SD)	26.16 (25.30)
NPS, mean (SD)	
Rest	3.66 (2.80)
Movements	7.35 (2.29)
Last week	7.59 (2.16)
SPADI, mean (SD)	
Total	57.14 (24.16)
Function	52.42 (29.97)
Pain	63.02 (24.55)

SD = standard deviation; n = number of participants; TSK = TAMPA Scale Kinesiophobia; NPS = Numerical Pain Scale; SPADI = Shoulder Pain and Disability Index.

ICF is divided into groups and the images presented to the participants are described in Group 3, Activity and Participation. Also in ICF's Group 3, there are divisions into chapters, such as chapters 4 (mobility), 5 (self-care), 6 (home life), 7 (interpersonal interactions and relationships), 8 (major life areas) and 9 (community, social and civic life).

The five activities most feared by the majority of participants was: d4450 (pulling), d9201 (sports), d4304 (carrying on head), d4451 (pushing), d4300 (lifting objects). It can be seen that of the five most feared activities, four belong to chapter 4 (mobility) of ICF's Activities and Participation Group, and one belongs to the Community, Social and Civic Life chapter (table 2). Chapter 5, Self-care, had the majority of its activities with medians of high intensity of fear and avoidance. Of the fourteen images judged in chapter 5, nine had a median score greater than or equal to 4.

As for the other chapters analyzed, in chapter 6, Domestic Life, four of the nine activities described had medians greater than or equal to 4. chapters 8 and 9 had only one activity with a score considered high in each of them, d850 (paid work) and d9201 (sports). Chapter 7 did not result in any median scores considered to be high intensity. Furthermore, in the analysis of the responses to the judgments of the 58 images described, the results provided evidence that activities involving greater physical effort, such as d4300 (lifting objects) and d4304 (carrying on the head), from the Mobility subgroup (chapter 4), and d9201 (sports) from the Community, Social and Civic Life subgroup (chapter 9), showed the greatest fear and avoidance responses from the participants.

Table 2. Number of responses considered to be high fear and avoidance of movement

Activity and Participa- tion Group Chapter (Description)	ICF Code (Description)	Fear (n %)	Avoidance (n %)	Activity and Participa- tion Group Chapter (Description)	ICF Code (Description)	Fear (n %)	Avoidance (n %)
Chapter 4 (Mobility)					d4751 (Driving motor vehicles)	24 (57.14)	21 (50)
	d4502 (Walking on different sur- faces)	5 (11.9)	5 (11.9)		d4752 (Driving animal-drawn vehicles)	21 (50)	24 (57.14)
	d4750 (Driving human-drawn transport)	24 (57.14)	24 (57.14)		d4200 (Self-transfer in sitting po- sition)	27 (64.28)	29 (69.04)
	d4602 (Moving outdoors)	10 (23.80)	9 (21.42)	Chapter 5 (Self-Care)			
	d4552 (Running)	18 (42.85)	20 (47.61)		d5200 (Skin care)	7 (16.66)	8 (19.04)
	d4453 (Rotating or twisting hands or arms)	26 (61.9)	26 (61.9)		d560 (Drink)	4 (9.52)	6 (14.28)
	d4550 (Crawling)	27 (64.28)	29 (69.04)		d550 (Running)	9 (21.42)	8 (19.04)
	d4452 (Reaching out)	31 (73.80)	30 (71.42)		d5400 (Dressing up)	29 (69.04)	28 (66.66)
	d4451 (Pushing)	34 (80.95)	35 (83.33)		d5401 (Undressing)	27 (64.28)	26 (61.9)
	d4303 (Carrying on the shoulders)	17 (40.47)	40 (95.23)	Chapter 6 (Domestic Life)			
	d4450 (Pulling)	40 (95.23)	19 (45.23)		d6403 (Using household applian- ces)	23 (54.76)	27 (64.28)
	d4106 (Changing the body's cen- ter of gravity)	22 (52.38)	21 (50)		d6405 (Removing garbage)	18 (42.85)	22 (52.38)
	d4302 (Carry in arms)	26 (61.9)	28 (66.66)		d6300 (Preparing simple meals)	11 (26.19)	9 (21.42)
	d4454 (Throwing)	25 (59.52)	25 (59.52)		d6404 (Storing necessary goods)	23 (54.76)	25 (59.52)
	d4702 (Using public transport)	30 (71.42)	30 (71.42)		d6601 (Helping others to move)	9 (21.42)	11 (26.19)
	d4554 (Swimming)	27 (64.28)	29 (69.04)		d6505 (Taking care of plants)	16 (38.09)	17 (40.47)
	d4401 (Grabbing)	11 (26.19)	11 (26.19)		d6506 (Taking care of animals)	13 (30.95)	14 (33.33)
	d4304 (Carrying on the head)	34 (80.95)	35 (83.33)		d6402 (Cleaning the house)	28 (66.66)	30 (71.42)
	d4553 (Jumping)	14 (33.33)	15 (35.71)		d6400 (Washing and drying clo- thes)	31 (73.8)	30 (71.42)
	d4305 (Putting down objects)	25 (59.52)	27 (64.28)	Chapter 7 (Interactions and Interpersonal Relationships)			
	d4300 (Lifting objects)	33 (78.57)	32 (76.19)		d7702 (Sexual relationships)	13 (30.95)	12 (28.57)
	d4150 (Remain lying down)	7 (16.66)	7 (16.66)	Chapter 8 (Main Areas of Life)			
	d4600 (Moving indoors)	5 (11.9)	6 (14.28)		d850 (Paid work)	26 (61.9)	24 (57.14)
	d4551 (Going up/down)	7 (16.66)	9 (21.42)		d855 (Unpaid work)	18 (42.85)	18 (42.85)
	d4455 (Catching)	31 (73.8)	31 (73.8)	Chapter 9 (Community, Social and Civic Life)			
	d4402 (Handling)	4 (9.52)	8 (19.04)		d9200 (Games)	17 (40.47)	21 (50)
	d4301 (Carry in hand)	24 (57.14)	25 (59.52)		d9202 (Arts and culture)	16 (38.09)	20 (47.61)
	d4701 (Using private motorized transport)	9 (21.42)	9 (21.42)		d9203 (Handicrafts)	20 (47.61)	21 (50)
					d9201 (Sports)	38 (90.47)	38 (90.47)

ICF = International Classification of Functioning, Disability and Health; n = number of responses; % = percentage of responses.

Multiple linear regression

Multiple regression was used to verify whether the responses of fear and avoidance of movement referring to the ICF images were associated with the pain and disability index of participants with chronic shoulder pain. The analysis resulted in a significant model [$F(1, 40) = 31, 119; p < 0.001; R^2 = 0.438$]. The fear response to the movement of the images presented was associated with the shoulder pain and disability index ($\beta = 0.661; t = 5.578; p < 0.001$) and explained 42.4% of the variance [95%CI=4.262 to 9.105]. The avoidance response did not show a significant association with the shoulder pain and disability index ($\beta = -0.063; t = -0.160; p = 0.874$).

DISCUSSION

This study found that the activities in Chapter 4 - Mobility of Activity and Participation of the ICF received the highest fear and avoidance responses, with medians greater than or equal to four. Among the 28 activities in the subgroup, 14 activities were judged to have the greatest fear and avoidance of movement. Multiple linear regression showed an association between the fear response and the shoulder pain and disability index. On the other hand, although there was a high movement avoidance response to the ICF images, multiple linear regression showed no association between the avoidance response to the images presented and the shoulder pain and disability index.

These findings are in line with a study that showed an association between high levels of shoulder disability and pain intensity and higher levels of fear of movement³². Other studies have found associations between fear and avoidance of movement and high levels of shoulder disability^{32,33}. The Spanish Fear-avoidance Components Scale (FACS) and the short version of the TAMPA Kinesiophobia Scale (TSK-11) were used to measure fear and to assess movement avoidance, and the SPADI was used to measure pain intensity and disability^{33,34}.

In the present study, no association was found between the pain and disability index and movement avoidance. This is due to the fact that the questions were asked using a likert scale and not an instrument suitable for assessing shoulder avoidance behavior, such as ADAP¹⁴. In other musculoskeletal conditions, such as low back pain, an association has been observed between movement-related fear (assessed by the Photograph Series of Daily Activities - PHODA) and pain intensity^{35,36}. A study involving individuals with low back pain, which also used the presentation of images of selected activities from the PHODA scale, assessed the level of fear-avoidance of movement and its correlation with disability³⁷. And yet, using a Visual Analog Scale of 0 to 10 points and TSK to assess fear, the study found no difference between the control and intervention groups with regard to fear of movement³⁷.

A study using ICF activity codes presented data on activities related to shoulder functionality, in which at least one participant scored the maximum value for avoidance or fear of the activity described¹⁵. This can be explained by the presence of catastrophizing and generalization of stimuli in patients with musculoskeletal pain^{38,39}. Clinical studies have shown that fear of pain,

movement catastrophizing and hypervigilance are associated with increased pain sensitivity, clinical pain intensity and disability, respectively; and that these interrelated factors corroborate increased disability^{40,41}. In addition, there is great variability between the answers, for example, the answers to d6403 (using household appliances) ranged from two to nine points for avoiding the task and from zero to eight points for fear of the task described¹⁵.

The lower values may be associated with protective factors such as high self-efficacy, education about pain, familiarity with the activity described, level of daily physical activity, range of motion, among others^{42,43}. Also in the domestic activities domain, activities such as d6506 (taking care of animals), d6505 (taking care of plants) or d6300 (preparing simple meals) had medians equal to zero. This information may indicate that, despite the shoulder pain, the survey participants were still able to maintain essential basic activities of their day-to-day domestic care and carry out these activities functionally⁴⁴⁻⁴⁷. However, other activities, still related to domestic care, were judged to have high levels of fear and avoidance, such as d6400 (washing and drying clothes), d6402 (cleaning the house) and d6403 (using household appliances), which had medians higher than four for both avoidance and fear of the activity. This may be related to the degree of effort required to carry out the activity, the duration of the activity or time taken to complete the task, and the posture maintained when carrying it out.

The present study has provided evidence of the association between fear and avoidance of movement responses and the rate of shoulder pain and disability in relation to specific shoulder complex activities. As for the high avoidance and fear responses, it can be inferred that these tasks are more complex, involve more effort or offer greater joint and muscle stress to the shoulder complex, according to the participants' reports based on the analysis of the images. This information contrasts with the low scores for other activities, whether or not they are in the same domain. Activities that involve, for example, mostly the lower limbs, such as d4502 (walking on different surfaces) and d4600 (moving indoors), or greater joint stability, such as d4150 (remain lying down) and d4402 (handling), do not involve much work on the shoulder.

A limitation of this study was that it did not analyze the association between range of motion (ROM) and the presence of pain in the shoulder arc of motion during the activities described, with fear and avoidance responses, which could be the focus of future studies. Movement avoidance behavior could be assessed by ADAP¹⁴ in future studies. It is known that there is a relationship between ROM and high levels of disability in individuals with shoulder pain⁴⁶. The presence of pain is related to reduced ROM when performing activities of daily living, such as washing your back and combing your hair^{48,49}.

Presenting images of activities based on the ICF code descriptors could be a way of identifying the fear and avoidance responses to shoulder movements in people with shoulder pain. Since the use of images can reduce language and cultural barriers and facilitate communication between clinician and patient, patients are able to expose their expectations and experiences of those

movements. The use and analysis of the association between fear and avoidance of movement with disability could be the focus of future studies, as well as the evaluation of the task complexity or the specific clinical-diagnostic condition of each individual.

The present study's information implies that there are differences between the type of activity performed, its complexity and level of effort, and the presence or absence of fear and avoidance of movement in the face of potential pain. By analyzing the answers obtained, it is possible for clinician to know which activities may cause the greatest fear and avoidance in their patients, and thus be able to propose more targeted therapies, such as techniques for gradual or gradual exposure to activities. The results can guide clinicians as to the importance of multimodal treatment of chronic shoulder pain. In addition, this study provides positive evidence regarding the use of descriptor images of ICF codes as screening tools for activities that may be impaired by the presence of pain.

CONCLUSION

The descriptive analysis revealed that there is heterogeneity in the responses of fear and avoidance of movement from passive visualization of images of shoulder movements, varying in low and high intensity responses with regard to the activities described by the ICF codes, but with a higher prevalence of high fear and avoidance in the mobility subgroup. In addition, a significant association was found between the response of fear to movement, but not avoidance, of the images with the pain and disability index.

AUTHORS' CONTRIBUTIONS

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REFERENCES

- Greving K, Dorrestijn O, Winters JC, Groenhof F, van der Meer K, Stevens M, Diercks RL. Incidence, prevalence, and consultation rates of shoulder complaints in general practice. *Scand J Rheumatol*. 2012;41(2):150-5.
- Barrett E, Larkin L, Caulfield S, de Burca N, Flanagan A, Gilsean C, Kelleher M, McCarthy E, Murtagh R, McCreesh K. Physical therapy management of nontraumatic shoulder problems lacks high-quality clinical practice guidelines: a systematic review with quality assessment using the AGREE II Checklist. *J Orthop Sports Phys Ther*. 2021;51(2):63-71.
- Kuijpers T, van der Windt DAWM, van der Heijden GJMG, Bouter LM. Systematic review of prognostic cohort studies on shoulder disorders. *Pain*. 2004;109(3):420-31.
- Huygen F, Patijn J, Rohof O, Lataster A, Mekhail N, van Kleef M, Van Zundert J. Painful shoulder complaints. *Pain Pract*. 2010;10(4):318-26.
- Nicholas M, Vlaeyen JWS, Rief W, Barke A, Aziz Q, Benoliel R, Cohen M, Evers S, Giamberardino MA, Goebel A, Korwisi B, Perrot S, Svensson P, Wang SJ, Treede RD; IASP Taskforce for the Classification of Chronic Pain. The IASP classification of chronic pain for ICD-11: chronic primary pain. *Pain*. 2019;160(1):28-37.
- Caneiro JP, Smith A, Bunzli S, Linton S, Moseley GL, O'Sullivan P. From fear to safety: a roadmap to recovery from musculoskeletal pain. *Phys Ther*. 2022;102(2):pzab271.
- Martinez-Calderon J, Meeus M, Struyf F, Miguel Morales-Asencio J, Gijon-Noguero G, Luque-Suarez A. The role of psychological factors in the perpetuation of pain intensity and disability in people with chronic shoulder pain: a systematic review. *BMJ Open*. 2018;8(4):e020703.
- Reis FJJ, Nijs J, Parker R, Sharma S, Wideman TH. Culture and musculoskeletal pain: strategies, challenges, and future directions to develop culturally sensitive physical therapy care. *Braz J Phys Ther*. 2022;26(5):100442.
- Alaiti RK, Zuccolo PF, Hunziker MHL, Caneiro JP, Vlaeyen JWS, Fernandes da Costa M. Pain can be conditioned to voluntary movements through associative learning: an experimental study in healthy participants. *Pain*. 2020;161(10):2321-9.
- Hotta GH, de Oliveira AS, Alaiti RK, Reis FJ. Therapeutic approach to pain-related fear and avoidance in adults with chronic musculoskeletal pain: an integrative review and a roadmap for clinicians. *BrJP*. 2022;5(1):72-9.
- Vlaeyen JWS, Linton SJ. Fear-avoidance model of chronic musculoskeletal pain: 12 years on. *Pain*. 2012;153(6):1144-7.
- Vlaeyen JWS, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*. 2000;85(3):317-32.
- Meulders A, Vansteenkoven D, Vlaeyen JWS. The acquisition of fear of movement-related pain and associative learning: a novel pain-relevant human fear conditioning paradigm. *Pain*. 2011;152(11):2460-9.
- Ansanello W, Dos Reis FJJ, Tozzo MC, Zatiti SCA, Meulders A, Vlaeyen JWS, de Oliveira AS. Development of the avoidance daily activities photo scale for patients with shoulder pain. *Phys Ther*. 2022;102(2):pzab268.
- Tozzo MC. Impacto motivacional evocado por imagens de movimento do ombro em participantes com dor no ombro. 2022. Dissertação (Mestrado) – Universidade de São Paulo, Ribeirão Preto, 2022. Disponível em: <https://www.teses.usp.br/teses/disponiveis/17/17152/tde-03012023-103830/>. Acesso em: 02 jun. 2023.
- Farias N, Buchalla CM. A classificação internacional de funcionalidade, incapacidade e saúde da organização mundial da saúde: conceitos, usos e perspectivas. *Rev Bras Epidemiol*. 2005;8(2):187-93.
- Martins J, Napoles BV, Hoffman CB, Oliveira AS. The Brazilian version of Shoulder Pain and Disability Index: translation, cultural adaptation and reliability. *Rev Bras Fisioter*. 2010;14(6):527-36.
- Malta M, Cardoso LO, Bastos FI, Magnanini MM, Silva CM. STROBE initiative: guidelines on reporting observational studies. *Rev Saude Publica*. 2010;44(3):559-65.
- Siqueira FB, Teixeira-Salmela LF, Magalhães LC. Análise das Propriedades Psicométricas da Versão Brasileira da Escala TAMPA de Cinesiofobia. *Acta Orthop Bras*. 2007;6(6):1-6.
- Farrar JT, Young JP Jr, LaMoreaux L, Werth JL, Poole MR. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain*. 2001;94(2):149-58.
- de Souza FS, Marinho Cda S, Siqueira FB, Maher CG, Costa LO. Psychometric testing confirms that the Brazilian-Portuguese adaptations, the original versions of the Fear-Avoidance Beliefs Questionnaire, and the Tampa Scale of Kinesiophobia have similar measurement properties. *Spine*. 2008;33(9):1028-33.
- Turk DC, Dworkin RH, Allen RR, Bellamy N, Brandenburg N, Carr DB, Cleland C, Dionne R, Farrar JT, Galer BS, Hewitt DJ, Jadad AR, Katz NP, Kramer LD, Manning DC, McCormick CG, McDermott MP, McGrath P, Quessy S, Rappaport BA, Robinson JP, Royal MA, Simon L, Stauffer JW, Stein W, Tollett J, Witter J. Core outcome domains for chronic pain clinical trials: IMMPACT recommendations. *Pain*. 2003;106(3):337-345.
- David IA, Krutman L, Fernández-Santaella MC, Andrade JR, Andrade EB, Oliveira L, Pereira MG, Gomes FS, Gleiser S, Oliveira JM, Araújo RL, Volchan E, Braga F. Appetitive drives for ultra-processed food products and the ability of text warnings to counteract consumption predispositions. *Public Health Nutr*. 2018;21(3):543-57.
- Lang PJ. International Affective Picture System (IAPS): Instruction Manual and Affective Ratings. Technical report A-6, The Center for Research in Psychophysiology, 2005.
- Santos ME, Bastos AF, Oliveira JM, Figueira I, Gleiser S, Pereira MG, Volchan E, Erthal FS. Hands Up! Atypical defensive reactions in heavy players of violent video games when exposed to gun-attack pictures. *Front Psychol*. 2019;10:191.
- Nakakoga S, Higashi H, Muramatsu J, Nakauchi S, Minami T. Asymmetrical characteristics of emotional responses to pictures and sounds: evidence from pupillometry. *PLoS One*. 2020;15(4):e0230775.

27. Bandeira PM, Reis FJJ, Muniz FDN, Chaves ACS, Fernandes O Jr, Arruda-Sanchez T. Heart rate variability and pain sensitivity in chronic low back pain patients exposed to passive viewing of photographs of daily activities. *Clin J Pain*. 2021;37(8):591-7.
28. Paes J, de Oliveira L, Pereira MG, David I, Souza GG, Sobral AP, Machado-Pinheiro W, Mocaiber I. The perception of aversiveness of surgical procedure pictures is modulated by personal/occupational relevance. *PLoS One*. 2016;11(8):e0160582.
29. Lang PJ, Bradley MM, Cuthbert BN. *International Affective Picture System (IAPS): Technical Manual and Affective Ratings*. NIMH Center for the Study of Emotion and Attention. Psychology, 1997.
30. Nascimento BE, Oliveira L, Vieira AS, Joffily M, Gleiser S, Pereira MG, Cavalcante T, Volchan E. Avoidance of smoking: the impact of warning labels in Brazil. *Tob Control*. 2008;17(6):405-9.
31. Field A. *Descobrimo a estatística usando o SPSS*. 2ª ed. Porto Alegre: Artmed Editora S.A, 2009;688p.
32. Luque-Suarez A, Martinez-Calderon J, Navarro-Ledesma S, Morales-Asencio JM, Meeus M, Struyf F. Kinesiophobia is associated with pain intensity and disability in chronic shoulder pain: a cross-sectional study. *J Manipulative Physiol Ther*. 2020;43(8):791-8.
33. Lentz TA, Barabas JA, Day T, Bishop MD, George SZ. The relationship of pain intensity, physical impairment, and pain-related fear to function in patients with shoulder pathology. *J Orthop Sports Phys Ther*. 2009;39(4):270-7.
34. González Aroca J, Díaz ÁP, Navarrete C, Albarnez L. Fear-avoidance beliefs are associated with pain intensity and shoulder disability in adults with chronic shoulder pain: a cross-sectional study. *J Clin Med*. 2023;12(10):3376.
35. Trost Z, France CR, Thomas JS. Examination of the photograph series of daily activities (PHODA) scale in chronic low back pain patients with high and low kinesiophobia. *Pain*. 2009;141(3):276-82.
36. de Jong JR, Vlaeyen JW, de Gelder JM, Patijn J. Pain-related fear, perceived harmfulness of activities, and functional limitations in complex regional pain syndrome type I. *J Pain*. 2011;12(12):1209-18.
37. Glombiewski JA, Riecke J, Holzapfel S, Rief W, König S, Lachnit H, Seifart U. Do patients with chronic pain show autonomic arousal when confronted with feared movements? An experimental investigation of the fear-avoidance model. *Pain*. 2015;156(3):547-54.
38. Vangrosveldt KHL, Peters M, Goossens, M, Vlaeyen J. The influence of fear of movement and pain catastrophizing on daily pain and disability in individuals with acute whiplash injury: a daily diary study. *Pain*. 2008;139(2):449-57.
39. Silva NS, Abreu SS, Suassuna PD. Kinesiophobia and associated factors in elderly females with chronic musculoskeletal pain: pilot study. *Rev Dor*. 2016;17(3):188-91.
40. George SZ, Hirsh AT. Psychologic influence on experimental pain sensitivity and clinical pain intensity for patients with shoulder pain. *J Pain*. 2009;10(3):293-9.
41. Shigetoh H. Hypervigilance to pain affects activities of daily living: an examination using the Japanese version of the pain vigilance awareness questionnaire. *J Phys Ther Sci*. 2017;29(12):2094-6.
42. Elfving B, Andersson T, Grooten WJ. Low levels of physical activity in back pain patients are associated with high levels of fear-avoidance beliefs and pain catastrophizing. *Physiother Res Int*. 2007;12(1):14-24.
43. La Touche R, Grande-Alonso M, Arnes-Prieto P, Paris-Aleman A. How does self-efficacy influence pain perception, postural stability and range of motion in individuals with chronic low back pain? *Pain Physician*. 2019;22(1):E1-E13.
44. Jensen MP, Solé E, Castarlenas E, Racine M, Roy R, Miró J, Cane D. Behavioral inhibition, maladaptive pain cognitions, and function in patients with chronic pain. *Scand J Pain*. 2017;17:41-8.
45. Cresswell C, Galantino ML, Myezwa H. The prevalence of fear avoidance and pain catastrophising amongst patients with chronic neck pain. *S Afr J Physiother*. 2020;76(1):1326.
46. Tagliaferri SD, Miller CT, Owen PJ, Mitchell UH, Brisby H, Fitzgibbon B, Masse-Alarie H, Van Oosterwijck J, Belavy DL. Domains of chronic low back pain and assessing treatment effectiveness: a clinical perspective. *Pain Pract*. 2020;20(2):211-25.
47. Banerjee A, Hendrick P, Blake H. Predictors of self-management in patients with chronic low back pain: a longitudinal study. *BMC Musculoskelet Disord*. 2022;23(1):1071.
48. Anwer S, Alghadir AH, Al-Eisa ES, Iqbal ZA. The relationships between shoulder pain, range of motion, and disability in patients with shoulder dysfunction. *J Back Musculoskelet Rehabil*. 2018;31(1):163-7.
49. Triffitt PD. The relationship between motion of the shoulder and the stated ability to perform activities of daily living. *J Bone Joint Surg Am*. 1998; 80(1):41-6.