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Acceptance and commitment therapy for chronic pain: a quasiexperimental study

Terapia de aceitação e compromisso em grupo para dor crônica: estudo quase-experimental

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Abstract

Objective
Chronic pain is an important health problem and affects both quality of life and mental health. This study assessed psychological inflexibility, pain intensity, quality of life, anxiety and depression symptoms, self-efficacy, and social support among patients with chronic pain.

Method
A quasiexperimental design was used to assess six adult participants pre- and post-group intervention (eight sessions) based on acceptance and commitment therapy.

Results
After the intervention, the patients experienced a reduction in psychological inflexibility, pain, and depression and anxiety symptoms and improvements in quality of life and self-efficacy. The quality of life and depression symptoms and the domains of quality of life and psychological inflexibility were negatively correlated.

Conclusion
Acceptance and commitment therapy is a promising treatment for the interdisciplinary treatment of the Pain Clinic.

Keywords: Acceptance and commitment therapy; Behavior Therapy; Chronic pain; Group psychotherapy; Health Psychology.

Resumo

Objetivo

Dor crônica é um problema de saúde prevalente que acarreta prejuízos para qualidade de vida e saúde mental. Este estudo avaliou inflexibilidade psicológica, intensidade da dor, qualidade de vida, sintomas de ansiedade e de depressão, autoeficácia e suporte social em pacientes com dor crônica.

Método

Utilizou delineamento quase-experimental e os seis participantes adultos foram avaliados por meio de instrumentos no pré e pós-intervenção em grupo (oito sessões) com Terapia de Aceitação e Compromisso.

Resultados

Após a intervenção houve redução da inflexibilidade psicológica e da dor, melhora da qualidade de vida, redução dos sintomas de ansiedade e de depressão e aumento da autoeficácia. Houve correlação inversa entre qualidade de vida e sintomas de depressão e entre domínios da qualidade de vida e inflexibilidade psicológica.

Conclusão

Conclui-se que a Terapia de Aceitação e Compromisso é um tratamento promissor a ser integrado no atendimento interdisciplinar da Clínica de dor.

***Palavras-chave*:** *Terapia de aceitação e compromisso; Terapia Comportamental; Dor crônica; Psicoterapia de grupo; Psicologia em Saúde.*

Chronic pain is one of the main reasons people seek health care and one of the main causes of work disability, with serious psychosocial and economic consequences (Mills et al., 2019). Its prevalence is higher among women, older people and people with lower educational levels. Chronic pain is associated with multiple diseases (e.g., fibromyalgia, cardiovascular diseases, and arthritis) and mental disorders (e.g., depression and anxiety). The most frequently used treatment is pharmacological, although a smaller group reports the use of nonpharmacological strategies (Carvalho et al., 2018).

Many pain behaviors (e.g., facial expressions and pain reports) are adaptive in acute pain because they increase the likelihood of receiving help and care. When pain is chronic, however, these behaviors (e.g., constant complaints/reports of pain) can be treated punitively, since the repeated complaints can be tiring for those who hear them and can negatively affect the interaction between the patient and the context in which they live. Pain is therefore a complex event, and the biopsychosocial model must be considered to properly understand and manage it (Gatzounis et al., 2012).

Psychologists currently play an important role in pain clinics both worldwide (Kitz, 2017) and in Brazil, and psychological interventions have been evaluated in the country (Miyazaki et al., 2018) and in international studies (Agency for Healthcare Research and Quality, [AHRQ] 2017). A recent systemic review has shown the relevance of four types of psychological interventions for pain management: cognitive-behavioral therapy, biofeedback, relaxation techniques, and Acceptance and Commitment Therapy (ACT) (AHRQ, 2017).

The ACT is included in the third wave of behavioral therapies and is based on functional contextualism and relational frame theory, a behavioral theory of human language and cognition. According to relational frame theory, the core of human language and cognition is the "[...] learned and contextually controlled ability to arbitrarily relate events mutually and in combination, and to change the functions of specific events based on their relations to others" (Hayes et al., 2006, p. 5).

The ACT psychopathology model is used to conceptualize cases and to design interventions. Psychological inflexibility is considered the essence of psychopathology or of suffering and "[...] characterizes behavior controlled by language and little driven by values" (Barbosa & Murta, 2014,

p. 39). Psychological Flexibility (PF), on the other hand, is "[...] the ability to contact the present moment more fully as a conscious human being, and to change or persist in behavior when doing so serves valued ends" (Hayes et al., 2006, p. 7). The PF model is therefore simultaneously a model of psychopathology, mental health, and psychological intervention (Barbosa & Murta, 2014; Hayes et al., 2012).

The goal of ACT is to place verbal and cognitive processes under better contextual control so the person has greater contact with the positive consequences of their behavior as part of a life lived according to their values. Healthy psychological functioning is associated with the person's ability to respond adaptively to the constant changes that occur in their environments (Hayes et al., 2006).

Contextual behavioral therapies – such as those based on acceptance, commitment, and *mindfulness* – are considered an improvement over the traditional cognitive-behavioral therapy model for pain management (McCracken & Vowles, 2014). In patients with pain, acceptance involves the "[...] willingness to have pain while remaining able to actively choose to continue participating in their life as they want it to be" (Yang & McCracken, 2014, section on acceptance).

Several studies provide data supporting the use of ACT for patients with chronic pain (Aytur et al., 2021; Hann & McCracken, 2014; McCracken & Vowles, 2014; Rickardsson et al., 2021; Yang & McCracken, 2014). However, reviews indicate that further studies are needed for ACT to become a well-established intervention for chronic health problems, including pain (Du et al., 2021; Feliu-Soler et al., 2018; Hann & McCracken, 2014; Hughes et al., 2017). The objective of this study is to evaluate a group intervention program based on ACT for patients with chronic pain treated at the outpatient Pain Clinic of a teaching hospital in the Sistema Único de Saúde (Unified Health System).

Method

Participants

Patients diagnosed with chronic pain treated in the Pain Clinic of a teaching hospital during 2018 were invited to participate in the study. A nonprobabilistic sample was obtained based on the following inclusion criteria: age between 18 and 70 years and diagnosis of chronic pain. The exclusion criteria were chronic cancer pain, presence of severe mental disorders (e.g., schizophrenia), abuse of alcohol or other substances, characteristics recorded in the medical records that hindered participation in the study (e.g., auditory deficit), and patients receiving any type of psychological intervention. Figure 1 shows the study flowchart.

Instruments

For the data collection, the Brazilian versions of the following instruments were used:

Acceptance and Action Questionnaire-II (AAQ-II): used to assess psychological inflexibility, consists of seven questions, with answers ranging from 1 ("never") to 7 ("always") on a Likert-type scale. Its score ranges from 7 to 49 points, with higher scores indicating greater psychological inflexibility. The mean scores of a clinical population were 28.3 ± 9.9, and those of a nonclinical population were 18.51 ± 7.05 (Barbosa & Murta, 2015; Bond et al., 2011).

Visual Analog Scale for Pain (VAS): consists of a 10-cm ruler, on which each centimeter represents a number that indicates pain intensity (Rocha et al., 2016). The participants were asked to indicate the intensity of their pain at that moment, with higher values indicating greater pain intensities.

Inventory of the Quality of Life (SF-36): consists of 36 items divided into eight domains: functional capacity, physical aspects, pain, and general health status (physical components) and vitality, social aspects, emotional aspects, and mental health (mental components). For each domain, the items are coded and transformed on a scale ranging from zero (worst quality of life) to 100 points (best quality of life) (Ciconelli et al.,1999).

Beck Anxiety Inventory (BAI): consists of 21 items ranging from 0 to 3 points on a Likert-type scale. Higher scores indicate anxiety symptoms that are more intense. The total score can be classified as minimal (0 to 10), mild (11 to 19), moderate (20 to 30), or severe (31 to 63) (Cunha, 2001).

Beck's Depression Inventory (BDI): consists of 21 items, ranging from 0 to 3 points on a Likert-type scale. Higher scores indicate depression symptoms that are more intense. The total score can be classified as minimal (0 to 11), mild (12 to 19), moderate (20 to 35), or severe (36 to 63) (Cunha, 2001).

Chronic Pain Self-efficacy Scale (CPSS): is a 22-item instrument that identifies beliefs about the personal ability to perform activities or achieve results related to pain, coping, and functionality (Salvetti & Pimenta, 2005).

Medical Outcomes Study - Social Support Scale (MOS-SSS): is composed of 19 domains, grouped into five support dimensions: informational, emotional, positive social interaction, material, and affective. The scale evaluates the frequency with which each support type is perceived by the patient, and each domain has five response options on a Likert-type scale, ranging from 1 ("never") to 5 ("always") (Zanini et al., 2018).

Procedures

The participants attended eight sessions (one session per week) for two months (June to August 2018), and each session lasted approximately one and a half hours (90 minutes). All the sessions were structured based on an ACT protocol[3] for chronic pain (Miyazaki, 2019; Vowles & Sorrell, 2007). Informal language was used to facilitate the learning of the ACT technical terms and concepts (Miyazaki, 2019), and a minimum frequency of 70% was established to characterize the intervention. Demographic, clinical, and evaluation instruments were collected at the beginning of the study (pre-intervention evaluation). After the intervention, the instruments were reapplied (postintervention evaluation). The professional who led the sessions was trained in contextual therapies, had experience (more than five years) in clinical care to conduct the groups, and was supervised by an experienced therapist and reference in the area.

The study was approved by the Research Ethics Committee – CAAE 77680517.8.0000.5415 and Opinion nº 2,336,735.

Data Analysis

The instrument collection and correction were performed by the therapist who led the group and two other professionals (co-therapists) who volunteered and were trained for the task. The intervention was part of the doctoral thesis of the first author.

The exploratory data analysis included the means, medians, standard deviations, and variations for the continuous variables and the numbers and proportions for the categorical variables.

[3] The protocol features were conducted in organized sessions that discussed the bases and options for treatment (Sessions 1 and 2); learning to live with chronic pain (Session 3); the importance of values and actions (Session 4); the relationship between impulses, thoughts, and desires (Session 5); the need for action (Session 6); a commitment to change (Session 7); and, finally, the maintenance of long-term benefits (Session 8). A detailed description of the intervention is available in Miyazaki (2019).

The normal distribution of the continuous variables was assessed by skewness, kurtosis, and the Kolmogorov-Smirnov test. Comparisons of the variables between the related groups (pre- and postintervention) were performed with a paired t test (for the continuous variables) or the Wilcoxon signed-rank test (for the categorical variables). The categorical variables were compared using McNemar's chi-squared test. The statistical analysis was performed using IBM®SPSS® Statistics version 24 (IBM Corporation, NY, USA).

Results

Of the 88 patients screened at the Pain Clinic of a high-complexity teaching hospital in 2018, 16 met the inclusion criteria and were invited to participate in the intervention. Only eight agreed to participate, and six completed the intervention (Figure 1). Among the six patients who completed the intervention, three were women and three were men, with a mean age of 52.16 ± 5.63 years. All were in a stable relationship. The duration of the pain ranged from two to 17 years (11.5 ± 5.78).

Figure 1
Study flowchart: Selection criteria for participation in the group acceptance and commitment therapy for patients with chronic pain

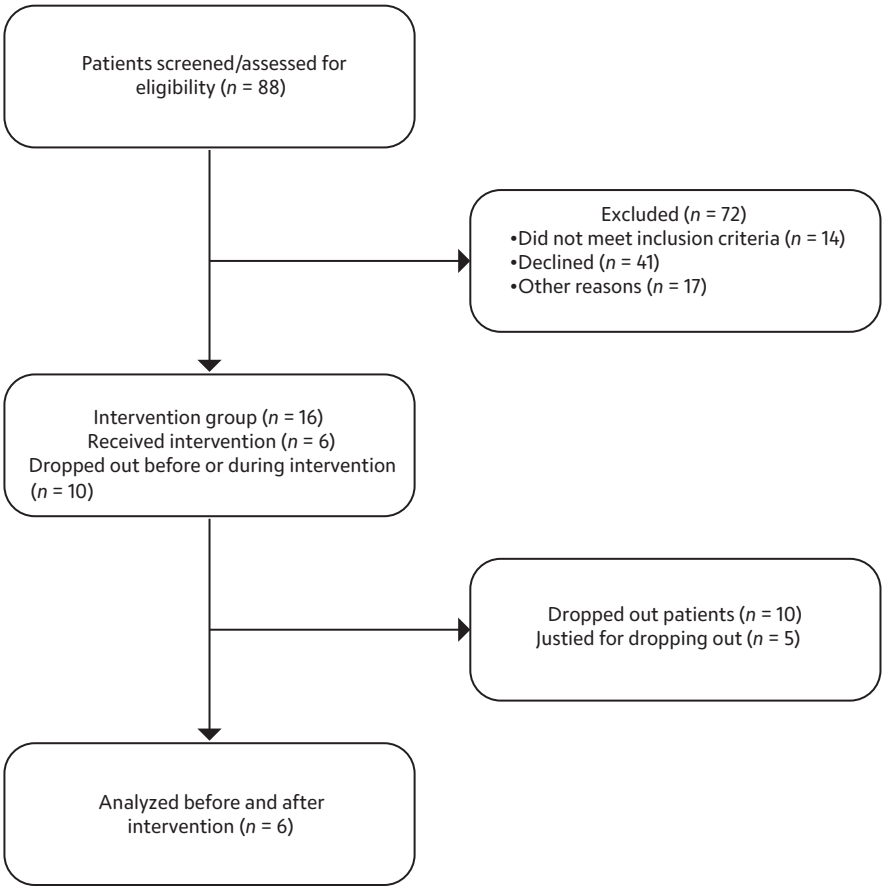

Table 1 shows the pre- and postintervention results measured by the instruments used to evaluate pain, anxiety symptoms, depression symptoms, psychological inflexibility, self-efficacy, and social support. After the intervention, there was a statistically significant reduction in the perceived pain (p = 0.026), anxiety symptoms (p = 0.028), and depression symptoms (p = 0.028).

The depression scores decreased categorically for four of the six participants. One went from mild to minimal, one went from moderate to mild, one went from severe to mild and one went from severe to moderate. Among those who did not experience a change, one remained in the minimal category and the other remained in the moderate category. The anxiety scores decreased in the category for five of the six participants. One went from severe to mild, two went from severe to moderate, one went from moderate to minimal, and one went from moderate to mild. The participants who did not change categorically remained in the minimal category.

The AAQ-II scores indicated that psychological inflexibility decreased from the pre- to the postintervention evaluation for all the participants, but this difference was not statistically significant. The mean participant score after the intervention (18.16), however, was below the mean score of nonclinical populations (mean 18.51 ± 7.05) (Bond et al., 2011), indicating that, although the difference was not statistically significant, there was a clinically significant difference after the intervention.

For self-efficacy, all the patients had increased scores after the intervention. The sum of the self-efficacy means, self-efficacy for pain control, functionality and coping with other symptoms underwent statistically significant improvements. However, these increases were not statistically significant for the total instrument score. Before the intervention, all the patients had a score below 185, which is considered the cutoff score for self-efficacy for chronic pain (Salvetti & Pimenta, 2005). After the intervention, only two of the six patients had a score below 185, and even these patients had increased scores in the postintervention evaluation.

The scores for social support in the material, affective, emotional, and informational dimensions increased after the intervention, but the pre- and postevaluations exhibited no significant difference.

Table 2 shows the comparative analysis of the quality of life before and after the intervention. After the intervention, functional capacity, pain, vitality, social aspect, emotional aspect, and mental health significantly improved. Although after the intervention, the scores improved for the physical aspects and general health status, the difference was not significant. These data improved in several of the quality-of-life domains because of the therapy.

Table 1

Comparative analysis of the patients evaluated pre- and postintervention (ACT) regarding pain perception (VAS), anxiety symptoms (BAI), depression symptoms (BDI), psychological inflexibility (AAQ-II), and self-efficacy (CPSS)

Variables	Preintervention	Postintervention	*p*-value
Pain perception (VAS)	8 (5-10)	5 (1-7)	**0.026**
Anxiety symptoms (BAI)	35 (10-43)	16.5 (1-27)	**0.028**
Depression symptoms (BDI)	23 (10-38)	11.5 (2-24)	**0.028**
Inflexibility* (AAQ-II) n (%)	6 (100)	2 (33.3)	0.125
Self-efficacy (CPSS)			
For pain control	34.0±15.4	64.3±26.9	**0.027**
For functionality	49.2±17.6	75.9±12.9	**0.046**
To deal with other symptoms	42.5±12.3	72.9±23.6	**0.026**
Self-efficacy, sum of means	125.9±34.1	213.2±50.8	**0.028**
Good efficacy† (CPSS) n (%)	0 (0)	4 (66.7)	0.125
Social support			
Material type	6.5 (4-11)	9.5 (4-15)	0.216
Affective type	7 (0-10)	7.5 (4-12)	0.916
Emotional/informational type	12 (0-26)	13.5 (5-31)	0.246
Social interaction type	10 (3-16)	10 (3-16)	1.000

Note: *Considered for patients with a score greater than 24 points. † Considered when the sum of the three means is greater than 185. Categorical variables are presented as number (percentage). Numerical variables are presented as the mean ± standard deviation or median (variation). Values in bold indicate a $p \leq 0.005$. AAQ: Acceptance and Action Questionnaire; BAI: Beck Anxiety Inventory; BDI: Beck's Depression Inventory; CPSS: Chronic Pain Self-efficacy Scale; VAS: Visual Analog Scale.

Table 2
Comparative analysis of the quality of life (SF-36) pre- and postintervention (ACT) for chronic pain

Domains	Preintervention	Postintervention	*p*-value
Functional capacity	30.0±11.7	66.0±15.6	**0.003**
Physical aspects	10.0±13.7	63.0±42.9	0.064
Pain	12.4±17.3	25.3±11.3	**0.046**
General health status	56.0±17.1	53.0±20.5	0.841
Vitality	33.0±36.3	64.0±24.3	**0.010**
Social aspect	32.5±24.4	85.3±21.9	**0.010**
Emotional aspects	26.6±43.4	93.4±14.7	**0.022**
Mental health	44.8±29.6	66.4±27.4	**0.003**

Note: Continuous variables are described as the mean ± standard deviation. Values in bold indicate a $p \leq 0.005$.
SF-36: Medical Outcomes Study 36-Item Short Form Health Survey.

Table 3 shows the correlations obtained through the application of the instruments that evaluated the quality-of-life domains and the anxiety symptoms, depression symptoms, and psychological inflexibility pre- and postintervention. The main correlations with the quality of life were found for depression symptoms and PF. This result is possibly related to the increase in the rate of behaviors displayed by the study participants, since pain took on a secondary role in their lives, which allowed greater social interactions, the display of more adaptive behaviors, and increased occurrence of reinforcers.

The patient reports during the intervention were recorded and may exemplify the acceptance of and commitment to living a value-driven life despite the pain. The data obtained through the instrument application signaled changes, and the statements help to understand how the values and changes in their life were perceived by each patient: 1) *"Caring for my granddaughter is one of the reasons to get out of bed every day despite the pain"*. 2) *"My son called me to look at*

Table 3
Correlation analysis between the SF-36 domains and the BDI, BAI, AAQ-II scores pre- and postintervention*

Domains SF-36	BDI		BAI		AAQ-II	
	r	*p*-value	*r*	*p*-value	*r*	*p*-value
Preintervention						
Functional capacity	-0.46	0.112	0.14	0.645	0.29	0.337
Physical appearance	-0.13	0.663	0.36	0.231	-0.38	0.201
Pain	-0.45	0.128	**-0.75***	0.003	-0.25	0.411
General health status	-0.52	0.071	0.069	0.822	0.001	0.996
Vitality	-0.55	0.052	**-0.78***	0.001	0.29	0.336
Social aspect	-0.31	0.293	-0.20	0.513	0.09	0.758
Emotional aspect	-0.39	0.187	-0.55	0.051	0.28	0.364
Mental health	**-0.75***	**0.003**	**-0.59***	0.034	0.52	0.070
Postintervention						
Functional capacity	-0.09	0.871	-0.37	0.468	-0.46	0.354
Physical aspects	-0.97	**0.001**	-0.79	0.059	-0.85	**0.032**
Pain	-0.87	**0.024**	-0.58	0.228	-0.66	0.152
General health status	-0.81	**0.050**	0.67	0.148	-0.44	0.381
Vitality	-0.97	**< 0.001**	-0.75	0.084	-0.75	0.086
Social aspects	-0.94	**0.005**	-0.76	0.080	-0.96	**0.003**
Emotional aspects	-0.68	0.140	-0.78	0.069	-0.69	0.132
Mental health	-0.93	**0.008**	-0.84	**0.036**	-0.88	**0.020**

Note: *indicates a negative correlation. Values in bold indicate a $p \leq 0.005$.
AAQ: Acceptance and Action Questionnaire; BAI: Beck Anxiety Inventory; BDI: Beck's Depression Inventory; SF36: Medical Outcomes Study 36-Item Short Form Health Survey.

paintings. Before, I would not go. Now, I go. I laid on his bed and gave my opinion". 3) "*Before, I thought that pain controlled everything. Nowadays, I know that pain is just a small part of it. ... I can understand that pain is a part, but neither the greatest nor the most important part. I am more than pain. I am a father, I am a husband".* 4) "*The worst is not when I isolate myself because of the pain but when it goes away and you realize you missed out on the whole day*". 5) "*Before, I did nothing. I liked to play in the church, but I was in pain and therefore would not go. I understood that I could feel pain and still go. I liked the dynamics of the clay on the windshield*" (refers to an experiential exercise performed in session, which focused on accepting adverse situations without attempting to change them, as such attempt worsens the situation).

The patients' statements indicated that they considered changes to have occurred because of the therapeutic process: there is a possibility beyond pain. After values that made sense for each participant were identified (e.g., being a good father or being a good grandmother), a new perspective appeared, enabling not only the acceptance of pain but also engagement in reinforcing activities.

Discussion

Psychological inflexibility, a key concept of ACT, seems to play an important role in emotional distress and pain (Gentili et al. 2019; Rickardsson et al., 2021). Although the AAQ-II scores pre- and postintervention exhibited no statistically significant difference, the increase in PF seems to have been sufficient to improve pain management, since the patients perceived a significantly lower intensity of pain. The patients' psychological inflexibility clinically reduced; that is, most moved from the dysfunctional to the functional group according to the AAQ-II scores (Jacobson & Truax, 1991). Thus, the data obtained are compatible with other studies, which indicate that the reduction in psychological inflexibility plays an important role in the adaptation of patients to chronic pain (Gentili et al., 2019; Rickardsson et al., 2021).

The choice to live a value-driven life, one of the processes associated with the reduction in psychological inflexibility, was observed, as in another study (Casey et al., 2020), in the patient reports during the intervention. These data are consistent with the ACT premise that psychological inflexibility is associated with pain and suffering, preventing the person from adapting to their context and life situation. On the other hand, the increased flexibility allows the person to have contact with the consequences of their behavior in the present and to live according to their values (Casey et al., 2020; Hayes et al., 2012). This correlation was evidenced in the data of the present article, which showed changes in the correlations between the AAQ-II and the SF-36 pre- (no statistically significant correlation) and postintervention (statistically significant correlation between the AAQ-II and the SF-36 in the domains of physical aspects [p = 0.032], social aspects [p = 0.003], and mental health [p = 0.020]).

Yu et al. (2017) concluded that ACT-based treatment caused changes in the "self as context" and in comprehensive distancing, helping patients cope with chronic pain. The distancing from the "conceptualized self" and the search for the "self as context" enables a change in the perspective towards the event and helps the patient manage the current situation by allowing a type of cognitive defusion, that is, a change in the way the patient interacts with their thoughts, reducing their harmful effects on behavior (Hayes et al., 2006). Accepting pain and displaying responses that can produce positive reinforcers indicate that, despite the pain, living a worthwhile life is possible.

Although the objective of the intervention performed in this study was not to reduce pain directly, the participants' pain scores decreased significantly, as indicated by the VAS. The acceptance

of pain and the commitment to the resumption or introduction of reinforcing activities in their daily lives helped the patients gain control of contingencies (e.g., experiencing reinforcing situations, such as discussing paintings with a child despite the pain) than under the control of self-rules (e.g., "I cannot go out because I will feel a lot of pain"). In this sense, it is evident that value-oriented actions can help patients manage everyday situations and cope with potentially aversive situations (e.g., the possibility of pain). That is, although there is an aversive component (pain), there is also the possibility of the reinforcing event (e.g., caring for the granddaughter or relating to family members).

Given the impact of pain on overall functioning, studies have evaluated the quality of life of patients with chronic pain. The data obtained in this study are consistent with the literature, which associates pain with a worse quality of life and shows a relationship between pain reduction and an increased quality of life (Samani et al., 2019). The escape and avoidance of situations that require movement, avoided by patients with chronic pain, are also associated with a worse quality of life. In this study, the patients' reports showed how much they avoided certain behaviors due to pain, leading to the loss of important reinforcers and causing a negative impact on the quality of life. On the other hand, the reports also showed the impact that the intervention had on the patient relationships and the quality of life.

The domains with the worst quality-of-life scores (SF-36) in the pre-intervention were the physical aspects and pain, and in the postintervention, they were the general health status and physical aspects. These data are consistent with the results of a study conducted in the same outpatient clinic (Martins et al., 2017). Therefore, this study's patients may not have experienced a greater improvement in the physical domain because, despite the improvement observed in pain, pain continued to be present.

The literature has shown a relationship between quality of life, pain, anxiety symptoms, and depression symptoms. Björnsdóttir et al. (2017) concluded that a mindfulness-based interdisciplinary intervention with a pain specialist team was effective in managing long-term chronic musculoskeletal pain (six-month follow up). The present study also used mindfulness in part of the intervention, which specifically helped the participants come into contact with the present and break the link established between pain and other facets of life (e.g., being stuck in thoughts and self-rules). The analysis of the pre- and postintervention data for the correlations between the quality of life and the depression and anxiety symptoms measured by the SF-36, BDI, and BAI were also aligned with the data found in the literature.

Patients with chronic pain experience a consistent loss of reinforcers resulting from the limitation or reduction of activities. This loss occurs not only through pain but also through self-rules and verbal constraints (e.g., going out makes my pain worse), which can become a conditioned aversive stimulus, maintained through negative reinforcement (Luque-Suarez et al., 2018), which increases the probability of escape or avoidance responses. In this study, the relationship "social activities worsen pain intensity" was deconstructed during the intervention, which allowed the decrease in control by rules and the increase in control by contingencies. This is one of the ACT's proposals, especially using cognitive defusion. The intervention also helps the patient to behave under the control of delayed reinforcement and not under the control of the elimination of the aversive stimulus.

The present study found a statistically significant clinical manifestation of depression symptoms. At some points, the groups discussed behavioral patterns aimed at developing repertoires as an alternative to escape and avoidance and related to obtaining positive reinforcers. The use of metaphors and mindfulness exercises at the end of each session also helped the participants to

cope with aversive stimuli in the short term to obtain reinforcers in the medium and long terms (Report 5). This training, combined with behavioral therapies, has shown promising results in the treatment of depression in patients with chronic pain (De Jong et al., 2018; Vowles et al., 2020). Cheng et al. (2018) evaluated the relationship between depressive symptoms in adults and pain self-efficacy and concluded that self-efficacy is a protective factor for depressive symptoms. The reduction in depressive symptoms, in turn, can improve the quality of life of patients with chronic pain.

Social support can also contribute to an improved quality of life (Finlay et al., 2018). It involves relationships (person–person or person–person–environment) that can be explained by the selection-by-consequences model (Skinner, 1981). Although the study found no statistical correlation between these variables, several of the participant reports affirmed the importance of this relationship (Reports 1, 2 and 3). To better understand these relationships, it is necessary to look at the intertwining of contingencies, which indicates the importance of two or more people in a relationship (Glenn, 1991) and highlights the importance of the context in which "pain behavior" occurs.

The mediating value of reinforcement results in some noteworthy implications. Social reinforcement usually depends on the occurrence of a response. In addition, the condition of the reinforcing agent may vary, which leads to variation in the reinforcement. A third implication is the slow change in some contingency characteristics. Finally, the reinforcement scheme is rarely adjusted inorganically by the reinforcing agent (Skinner, 1953/2003). The following changes were observed during the sessions: the change in the participant's behavior resulted in a change in the relationships around them and consequently a change in the reinforcement relationships.

The operant relationship in chronic pain was first evidenced by Fordyce (1976), which highlights the need to study social support for chronic pain. The chronic nature of pain means the subject experiencing the pain and the people around them must develop skills to manage the situation. The present study compared the social support available before and after the intervention. Although the instrument scores increased, the increase was not statistically significant. The group was expected to serve as an important source of both social support for the participants and skill development to manage pain. These were both supposed to develop based on the statements and strategies used by the other participants and on the repertoire developed through the participants' contact with their peers, the participants' access to the material, and their discussions with health professionals.

The lack of a significant increase in social support scores could be due to two possibilities. The first is that, unlike in Finlay et al. (2018), these participants did not know each other previously. The second is that they already had adequate social support before the intervention, and their group participation did not appreciably change that situation.

Conclusion

The present study concludes that the group treatment with ACT was effective for the participants, resulting in a statistically significant reduction in pain, anxiety and depression symptoms, and psychological inflexibility and a statistically significant improvement in the participants' quality of life and self-efficacy scores. However, the small number of participants and the study design require further research. An additional important aspect to be included in future studies is a sleep evaluation, given that it is often altered in patients with chronic pain.

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