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REGULAR ARTICLE

Goal Adjustment and Well-Being: The Role of Optimism in Patients with Chronic Pain

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Abstract

Background Chronic pain directly or indirectly interferes with valued personal goals. Goal adjustment plays a central role in patients' adaptation. Studies on the relationship between optimism and goal regulation have shown that people with high dispositional optimism adjust their goals in a flexible way, and that flexible goal adjustment promotes quality of life.

Purpose The aim of this study was to analyze the relationship among optimism, goal adjustment, and adaptation in patients with chronic pain.

Methods A sample of 258 patients with chronic musculoskeletal pain completed questionnaires on optimism, reengagement, disengagement, flexibility, tenacity, rumination, purpose in life, well-being, pain intensity, daily functioning, and impairment.

Results Structural equation modeling analysis showed that optimism had a positive association with reengagement, flexibility, and tenacity, and a negative association with disengagement. Disengagement was positively associated with rumination, whereas reengagement, flexibility, and tenacity were associated with higher levels of purpose in life, which were strongly associated with adaptation in patients with chronic pain.

Conclusions This study supports the conclusions of previous research on the role of goal adjustment as a mediator variable between optimism and well-being.

Keywords Optimism • Goal adjustment • Well-being • Chronic pain

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Introduction

Chronic pain interferes with daily activities and goals. Pain directly or indirectly interferes with valued personal goals [1, 2]. When there is an increase in pain or fatigue, the physical and cognitive effort required for voluntary goal–directed activity may not be available. Consequently, patients may need to negotiate competition among their goals for limited physical and cognitive resources. Success in this negotiation is important, because goals not only make demands but also provide psychological benefit.

The theoretical literature on goal adjustment strategies offers three models. On one hand, the dual process model [3, 4] distinguishes the assimilative mode (tenacious goal pursuit), which is used to maintain goals, from the accommodative mode (flexible goal adjustment), which is

used to promote adjustment of goals to changes in the individual's personal situations. Several studies [5, 6] have found that higher tenacity in goal pursuit and higher flexibility in goal adjustment predicted improved psychological functioning and decreased psychological distress in people affected by neurological injury. On the other hand, goal adjustment theory [7, 8] suggests that goal adjustment entails both disengaging from the unattainable goal and reengaging in alternative goals. Disengagement contributes to well-being because it allows individuals to expend effort on more attainable goals [9]. Successful disengagement could contribute to quality of life by preventing the stress of repeated failure and continued rumination concerning the unattainable goal [8]. Thus, van Randernborgh et al. [10] concluded that there is a negative association between rumination and disengagement, because they found that individuals who fail to disengage from unreachable goals have higher levels of rumination. It must be emphasized that although goal disengagement is strongly associated with a reduction in negative psychological states, goal reengagement is associated with positive aspects of subjective well-being [11]. In line with these results, recent empirical studies have shown that in different samples (young and older adults, undergraduate students, parents of children with cancer, and parents of medically healthy children), the capacity to disengage from the unattainable goal and reengage in alternative goals is predictive of subjective well-being and physical health [12–14]. The present study is set within the framework of a third model: The Integrated Model of Goal Management [15], which integrates the dual process model and goal adjustment theory. This third model includes four strategies: goal maintenance (tenacious goal pursuit), goal adjustment (comprising flexible goal adjustment and disengagement), and goal reengagement. Goal adjustment is a good strategy when goals are under threat. However, if a goal can still be attained, goal maintenance is a better strategy. Goal reengagement is an appropriate strategy to complement existing goals or to replace unattainable goals. Arends et al. [15] tested their model in a sample of patients with arthritis and found that patients who reported a higher tendency to adjust their goals to changed circumstances experienced more purpose in life, more positive affect, and were more satisfied with their participation in daily life, work, and education. Similarly, Wrosch et al. [16] examined the association between goal adjustment and subjective well-being in three samples: students, young and older adults, and parents of children with cancer and parents of medically healthy children. The results showed that goal reengagement was associated with higher levels of purpose in life. Thus, the tendency to adjust threatened goals seemed to be associated with successful adaptation. Apart from adjusting personal goals, the tendency to keep striving for goals also seemed to benefit adaptation to a chronic disease, because patients who had a stronger tendency to keep striving for their goals experienced more purpose in life, positive affect, and satisfaction with their participation in the setting of work. In a subsequent study, these authors [17] examined domain-specific goal management and the preferred strategies used by patients with arthritis to manage their goals. The results showed that their strategic preference was associated with the specific life domain (i.e., family or work) and that disengagement was the least preferred strategy by which to manage goals.

Optimism is a personality factor that seems to be inextricably linked with greater well-being [18–20]. Dispositional optimism is a personality trait that reflects the extent to which people hold generalized favorable expectations concerning their future [19, 21]. Therefore, people high in optimism are inclined to pursue goals tenaciously [22]. Studies on the relationship between optimism and self-regulation have shown that people with high dispositional optimism show more flexible behavior in the face of changing circumstances, and that flexible goal adjustment protects people from negative consequences in stressful circumstances and promotes quality of life [16, 23–26]. It has also been suggested that optimists reengage in new attainable goals if they repeatedly fail to attain certain goals [27–30]. Therefore, flexible goal adjustment seems to be a mechanism by which optimism can influence several aspects of well-being. Recent clinical and experimental evidence suggests that optimism is an important resilient resource for successful adaptation to acute and chronic pain [19, 31–37]. The present study analyzed the role of goal adjustment strategies as the mechanisms through which optimism is related to well-being in patients with chronic pain.

To the best of our knowledge, only two studies [15, 17], which used samples of arthritis patients, have been conducted within the framework of the integrated model of goal management. The present study investigated the relationship between dispositional optimism, the four-goal adjustment strategies proposed by Arends et al. [15], and well-being in a sample of patients with chronic musculoskeletal pain. In line with previous evidence, we designed a hypothetical model that included optimism, reengagement, disengagement, flexibility, tenacity, rumination, purpose in life, well-being, pain, functioning, and impairment (Fig. 1). It was hypothesized that higher levels of optimism would be associated with flexible adjustment when goals are threatened, striving for goals when they are still reachable (tenacity), and disengaging from current ones when they are unreachable and engaging in new ones [15, 17, 23, 27–29]. Therefore, high levels of optimism are expected to be positively associated with tenacious goal pursuit, flexible goal adjustment

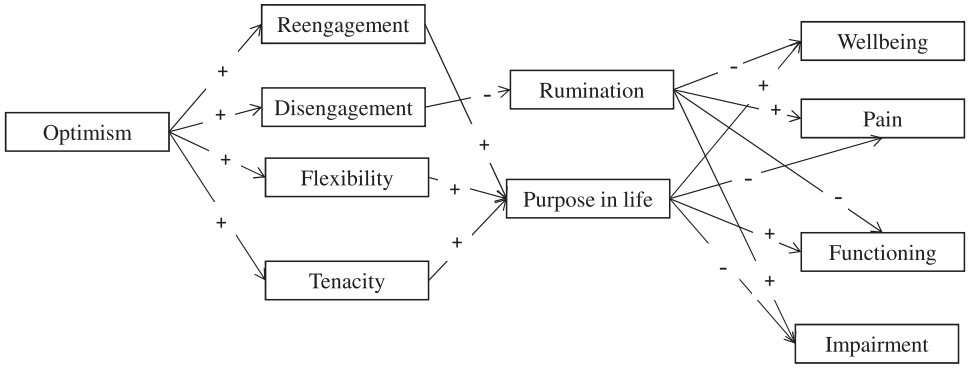

Fig. 1. Hypothetical model.

based on the situation, and the use of reengagement and disengagement.

Regarding the strategies included in the integrated model of goal management [15], we predicted that reengagement, flexibility, and tenacity would have a positive association with purpose in life [15], and that disengagement would have an association with lower levels of rumination [9].

In line with previous studies, we predicted that purpose in life would have a positive association with high levels of well-being and daily functioning and lower levels of pain intensity and impairment [38]. On the other hand, we predicted that rumination would have a positive association with pain intensity and impairment and a negative association with well-being and functioning.

Methods

Participants were patients with chronic musculoskeletal pain. All participants were fully informed of the aim of the study, and given guarantees of personal anonymity and the confidentiality of the survey. Subsequently, their consent was obtained to voluntarily participate in the study.

Procedure

This study was part of a larger research project which was approved by the University of Málaga Ethics Committee. Participants were recruited through two local associations of patients with fibromyalgia (N = 86; 33.3%), one physiotherapy unit (N = 90; 35%), and through doctors working at the Pain Unit of the Hospital Costa del Sol in Málaga (N = 82; 31.7%). Data were collected between March 2016 and December 2016. Individuals were considered eligible for inclusion if they met the following criteria: At the moment of participation in the study, they were experiencing musculoskeletal chronic pain, as defined by experiencing pain for at least the last 6 months, at least 3 days per week, at an intensity of 3 or more on a 0 to 10 scale; they were between 18 and 65 years old; they were not being treated for a malignancy, terminal illness, or psychiatric disorder; they were able to understand the Spanish language (spoken and written); and they were able to understand the instructions and questionnaires. Each participant had a semistructured interview with a psychologist to obtain demographic, social, and medical history data. The patients were always assessed in their usual health center or in the facilities of the associations.

Measures

Dispositional optimism

The Spanish version [39] of the *Life Orientation Test-Revised* (LOT-R) [40] was applied. The scale comprises 10 items: six scored items and four filler items. The response format for each item is a five-point Likert-type scale ranging from 0 (strongly disagree) to 4 (strongly agree). In the present study, the LOT-R total score had a Cronbach's α of 0.90. High scores reflect greater dispositional optimism. The Spanish LOT-R has shown adequate criteria validity [37].

Goal disengagement and goal reengagement

The goal disengagement and goal reengagement scale [16] is a 10-item instrument that measures how people usually react when they have to stop pursuing an important goal (responses are scored on a five-point Likert-type scales ranging from 1 = almost never true to 5 = almost always true). Four items measure the tendency to disengage from unattainable goals and six items measure the tendency to reengage with new goals. The Spanish version has adequate criteria validity, internal consistency, and stability, and its factor structure is in line with the original structure [41]. In this study, the goal disengagement and the goal reengagement scales had a Cronbach's α of 0.70 and 0.94, respectively.

Tenacious goal pursuit and flexible goal adjustment

The tenacious goal pursuit and flexible goal adjustment scales [3] assess two distinct modes of coping with goal disruption, respectively: tenacious goal pursuit and flexible goal adjustment. Respondents rate the degree to which they agree with each statement on a five-point Likert scale ranging from "fully disagree" to "fully agree." The Spanish version of the scales show good levels of reliability and adequate criteria validity as demonstrated by correlations with measures of positive and negative affect and well-being [41]. In this study, the tenacious goal pursuit and the flexible goal adjustment scales had a Cronbach's α of 0.80 and 0.81, respectively.

Rumination

The pain catastrophizing scale (PCS) is a 13-item measure in which respondents indicate on a five-point scale the degree to which they experience various thoughts and feelings while in pain [42]. Respondents rate the degree to which they agree with each statement on a four-point Likert scale ranging from "never" to "always." The scale comprises three subscales that assess rumination, magnification, and helplessness, and also provides a total score on catastrophizing. The rumination score alone was used in this study. The Spanish version of the scale [43] shows appropriate reliability and validity. Internal consistency was high (rumination, α = 0.89; helplessness, α = 0.90; magnification, α = 0.79; total PCS, α = 0.95). In this study, the rumination scale had a Cronbach's α of 0.93.

Purpose in life

The psychological well-being scales (PWBS) were developed by Ryff [44]. The original version consists of six dimensions (autonomy, self-acceptance, positive relationships with others, environmental mastery, personal growth, and purpose in life), each of which comprises 20 items. We used the Spanish version of the scale [45], which was derived from the short version proposed by van Dierendonck [46], and only measured Purpose in life. As Ryff and Keyes [47] stated, high scores on this scale mean that the individual has goals that make their life purposeful. This scale comprises five items which are scored on a six-point scale ranging from 1 (*totally disagree*) to 6 (*totally agree*). The purpose in life subscales had a Cronbach's α of 0.70. In this study, the scale had a Cronbach's α of 0.89.

Personal well-being

The five-item World Health Organization Well-Being Index (WHO-5) is a short generic global rating scale that measures subjective well-being. Respondents rate the extent to which they agree with a set of statements regarding the frequency of their feelings during the previous 2 weeks on a six-point Likert scale ranging from "never" to "all the time." Bech et al. [48] found that the scale had a Cronbach's α of 0.84 and good levels of validity. The Spanish version shows good internal consistency reliability (Cronbach's α = 0.86) and good convergent validity. In this study, the WHO-5 had a Cronbach's α of 0.89.

Pain intensity

Patients were asked to rate their mildest, average, and worst pain during the past 2 weeks, as well as their current pain, on a scale ranging from 0 to 10, with a "0" indicating "no pain" and "10" indicating pain as "intense as you could imagine." A composite pain intensity score was calculated for each participant by calculating the mean of the mildest, average, worst, and current pain [49].

Functioning and impairment

Impairment and functioning were assessed using the Impairment and Functioning Inventory IFI-R [50], which consists of 30 items each referring to a specific activity associated with one of the following areas: household, autonomous behavior, leisure, and social relationships. Patients are asked if they performed an activity during the previous week. If they did not perform the activity, they are asked if they practiced this activity before the onset of their pain. The instrument provides an index of daily functioning, and an index of activity impairment. Both subscales showed good internal consistency (daily functioning, α = 0.93; impairment, α = 0.98) and good levels of convergent and criterion validity [50]. In this study, the global scales were both highly reliable (daily functioning, α = 0.87; impairment, α = 0.92).

Statistical Analysis

Firstly, we analyzed correlations between the observed variables included in the model. Then, multiple regression analyses were performed in order to determine the possible existence of an interaction between disengagement and reengagement. Thus, the effect of *disengagement* × *reengagement* interaction on rumination and purpose in life (criterion variables) was tested. The predictor variables were centered prior to entry to avoid the biasing effects associated with multicollinearity that can occur when examining interaction terms. All analyses were conducted using the SPSS version 22.0.

Finally, the hypothetical model (Fig. 1) was then tested via structural equation modeling (SEM) using LISREL 8.30 software. We checked the data prior and found that some variables were not normally distributed. Thus, we

used the maximum likelihood estimation method because this is effective for any data distribution if the analyses are performed on covariance matrices, and the matrix of fourth-order moments is provided [51]. The following goodness-of-fit indexes were used: the Satorra–Bentler chi-square, the root mean-square error of approximation (RMSEA), the comparative fit index (CFI), and the nonnormed fit index (NNFI). The Satorra–Bentler chi-square is a chi-square fit index that corrects the statistic under distributional violations. To reduce the sensitivity of chi-square to sample size, the index is divided by the degrees of freedom [52]. Ratios of 2 or less are indicative of an acceptable fit of the model [53]. The RMSEA is an absolute misfit index: the closer to zero, the better the fit. Values less than 0.08 indicate an adequate fit [54, 55]. The CFI and the NNFI range between 0 and 1, where the closer to 1, the better the fit [55].

Optimism was the exogenous variable in the model (Fig. 1). Endogenous variables were tenacious goal pursuit, flexible goal adjustment, goal disengagement, goal reengagement, rumination, purpose in life, intensity of pain, well-being, functioning, and impairment.

Results

Participants

A total of 388 patients with chronic musculoskeletal pain were invited to take part in the study. Of these patients, 98 refused participation, and 32 did not meet the inclusion criteria. The final sample comprised 258 chronic pain patients (209 women and 49 men). The average age was 52 years (*SD* = 9.75). At the time of the study, 71.30 per cent were married or cohabiting. Regarding employment, 38.80 per cent were active workers, 24 per cent were retired, 21.30 per cent were unemployed, and 14.40 per cent were homemakers. A total of 13.20 per cent had completed a college degree, 32.80 per cent had completed high-school education, and 39.80 per cent had completed primary education. Generalized pain conditions were the most frequent (44.52%), and the main pain sites were the back (26.14%) and knees (14.13%). Mean pain duration was 12.38 years (*SD* = 11.05), and mean pain intensity was 6.49 (*SD* = 1.40).

Descriptive Statistics

Table 1 shows the mean scores, standard deviations, and correlation coefficients for all measures.

The guidelines proposed by Cohen [56] were used to assess correlations. Low correlations range from 0.10 to 0.29, moderate correlations from 0.30 to 0.49, and high correlations from 0.50 to 1. As shown in the table, optimism had high positive correlations with reengagement,

Table 1 Descriptive statistics and correlations among measures

	M	*SD*	Range	1	2	3	4	5	6	7	8	9	10	11
1. Optimism	14.66	5.7	0–24	1										
2. Reengagement	17.12	4.0	5–25	0.65**	1									
3. Disengagement	9.58	2.7	4–18	−0.54**	−0.51**	1								
4. Flexibility	24.05	5.4	8–35	0.60**	0.48**	−0.31**	1							
5. Tenacity	42.68	8.3	21–62	0.55**	0.40**	−0.59**	0.54**	1						
6. Rumination	11.59	5.8	6–24	−0.60**	−0.55**	0.52**	−0.37**	−0.41**	1					
7. Purpose in life	20.21	5.9	5–30	0.67**	0.51**	−0.51**	0.52**	0.52**	−0.44**	1				
8. Well-being	11.04	5.5	0–25	0.65**	0.55**	−0.48**	0.48**	0.47**	−0.59**	0.71**	1			
9. Pain	6.49	1.4	0–10	−0.23**	−0.15*	−0.02	−0.19**	−0.05	0.12	−0.25**	−0.32**	1		
10. Functioning	47.8	13.9	18–105	0.45**	0.28**	−0.30**	0.33**	0.32**	−0.25**	0.52**	0.52**	0.12	1	
11. Impairment	3.82	3.7	0–16	−0.50**	−0.45**	0.42**	−0.28**	−0.33**	0.59**	−0.43**	−0.60**	0.29**	−0.64**	1

M means; *SD* standard deviations; *range* minimum and maximum scores; Pearson's correlations: *$p < .05$; **$p < .001$.

flexibility, purpose in life, and well-being, but negative correlations with rumination. Reengagement had high positive correlations with purpose in life and well-being, and negative correlations with disengagement and rumination. Disengagement had a positive association with rumination and a negative correlation with purpose in life and tenacity. Flexibility and tenacity had high positive correlations with purpose in life. Well-being had high negative correlations with rumination and a positive correlation with purpose in life. Daily functioning had a high correlation with purpose in life and well-being. Finally, impairment had a high positive correlation with rumination and a high negative correlation with well-being.

Regression Analyses

Disengagement and reengagement should not be understood as opposite poles of a continuum, but as independent constructs, as research has found small- to moderate-size correlations between them ($r = -0.51$ in the current study). The moderate correlation between disengagement capacity and reengagement capacity raises the possibility that the two dimensions might interact [7, 16]. The results of multiple regression analysis showed that reengagement and disengagement contributed significantly to the prediction of purpose in life (R^2 change = 0.34; $p = .000$; reengagement: $\beta = 0.34$, $p = .000$; disengagement: $\beta = -0.34$, $p = .000$) and rumination (R^2 change = 0.38; $p = .000$; reengagement: $\beta = -0.35$, $p = .000$; disengagement: $\beta = 0.36$, $p = .000$). However, *disengagement* × *reengagement* interaction did not make an additional significant contribution to the prediction of rumination ($\beta = 0.07$, $p = .19$) and purpose in life ($\beta = 0.03$, $p = .60$), being excluded from the model in both cases.

Structural Equation Modeling

Table 2 shows the standardized coefficients of the initial model. Table 3 shows the goodness-of-fit indexes of the initial and final models.

To obtain a parsimonious model of the relationship between the variables, and following the recommendations of the Lagrange multiplier test [51], we deleted all the nonstatistically significant paths of the initial model. Thus, paths from rumination to pain and from rumination to functioning were excluded.

Figure 2 represents the final model. All path coefficients were statistically significant ($p < .05$). The goodness-of-fit indexes calculated for the SEM indicate that the estimated model provides a good fit to the data (χ^2(df) = 61.91 (39), $p = .08$; RMSEA = 0.048; NNFI = 0.99; CFI = 0.99). Figure 2 shows the standardized beta (β) and gamma (γ) coefficients. The β and γ coefficients can be interpreted as follows: β indicates that a change unit in an endogenous variable is associated with β-change units in another endogenous variable, whereas all other variables remain constant. γ indicates that a change unit in an exogenous variable (optimism) is associated with γ-change units in an endogenous variable.

As expected, optimism had a significant positive association with reengagement, tenacity, and flexibility, but, surprisingly, it had a negative association with disengagement. In addition, the increased use of reengagement, flexibility, and tenacity as strategies to manage goals was associated with higher levels of purpose in life. Although a negative association between disengagement and rumination was expected, the positive association was found between these variables, with patients characterized by higher levels of disengagement showing higher

Table 2 Initial model

	Optimism	Reengagement	Disengagement	Flexibility	Tenacity	Rumination	Purpose in life
	γ	β	β	β	β	β	β
Reengagement	0.52						
Disengagement	−0.64						
Flexibility	0.63						
Tenacity	0.86						
Rumination			0.51				
Purpose in life		0.29		0.24	0.27		
Well-being						−0.36	0.59
Pain						0.01	−0.25
Functioning						−0.02	0.51
Impairment						0.51	−0.21

Standardized γ and β coefficients.

Empty cells correspond to relationships not included in the hypothetical model.

levels of rumination. Rumination had a negative association with well-being and a positive association with impairment; thus, patients with higher levels of rumination reported lower levels of well-being and higher levels of impairment. Finally, purpose in life yielded four significant path coefficients: two negative paths to pain intensity and to impairment, and two positive associations with well-being and daily functioning. Regarding pain intensity, the participants had high levels of pain with little difference between levels, which may explain the low variance accounted for in the pain outcome in the SEM analyses.

Discussion

The aim of this study was to investigate the relationship between optimism, goal adjustment, and adaptation in patients with chronic pain. The results show a positive and significant association between optimism and reengagement, flexibility, and tenacity. Therefore, in line with previous studies [26, 29, 30], patients high in optimism seem to be flexible when negotiating competition between goals, reengage with new attainable goals, and behave tenaciously with valuable ones. However, surprisingly, a negative association was found between optimism and disengagement.

This result could be explained by the strong association between optimism and tenacity. As Carver et al. [19, 21] stated, dispositional optimism is a personality trait that reflects the extent to which people hold generalized favorable expectations concerning their future. These positive expectations are associated with pursuing goals tenaciously, because they can probably be reached. Therefore, positive expectations about the future could lead patients high in optimism to reengage in new valuable goals without losing hope of reaching other goals that are more difficult to achieve.

Another unexpected finding was a positive association between disengagement and rumination. As mentioned, Arends' theory [15] states that successful disengagement could contribute to quality of life by preventing the stress of repeated failure and continued rumination concerning the unattainable goal [7–9]. In the present study, it was found that higher levels of disengagement were associated with higher levels of rumination; this result is the opposite of the hypothesis formulated. It could be the case that patients, who abandon some important goals, even if they are unreachable, may continue to ruminate on the issues involved. It is also noteworthy that high disengagement was not accompanied by reengagement in alternative goals. Goal adjustment theory [7, 16] proposes that goal adjustment entails both disengaging from the unattainable goal and reengaging in alternative goals. Therefore, disengagement may only be beneficial if it is accompanied by reengagement. However, multiple regression analyses showed that since both disengagement

Table 3 Goodness-of-fit indexes

	χ^2 (df)	RMSEA	NNFI	CFI
Initial model	59.08 (37)	0.048	0.99	0.99
Final model	61.91 (39)	0.048	0.99	0.99

RMSEA root mean-square error of approximation; *NNFI* non-normed fit index; *CFI* comparative fit index.

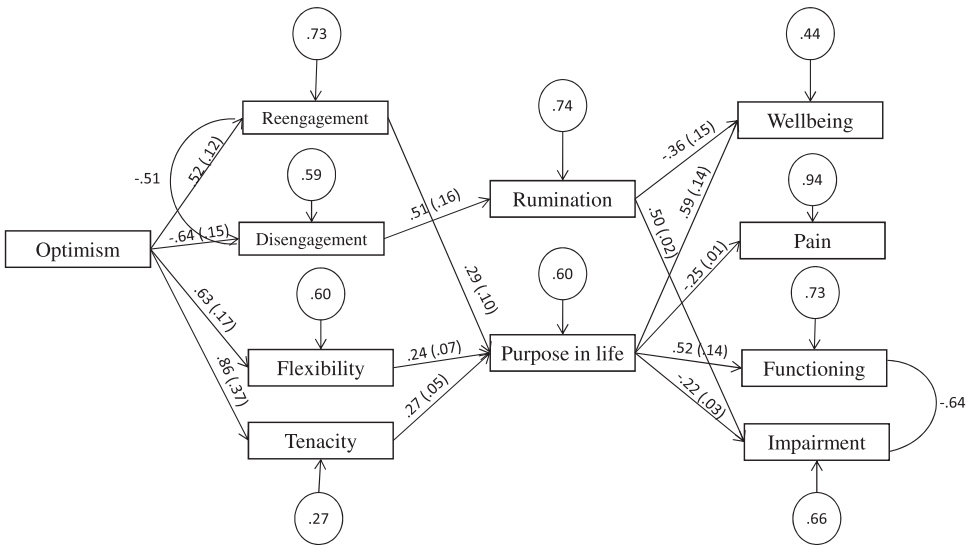

Fig. 2. Final model. Rectangles are observed variables, circles are standardized error variances, straight lines with arrows represent presumed causal paths, values above the arrows represent standardized γ and β coefficients ($p < .05$), values in parentheses are standard errors, and the curved line represents the correlation between the variables. Goodness-of-fit indexes of the tested models: χ^2(df) = 61.91 (39), p =.08; RMSEA = 0.04; NNFI = 0.99; CFI = 0.99.

and reengagement contribute significantly to the prediction of rumination and purpose in life, the interaction of disengagement and reengagement does not make an additional significant contribution to the prediction of those criterion variables. Besides, the present study found a negative correlation between disengagement and reengagement, which suggests that patients disengaging from goals were in general not able to reengage in alternative goals. In the clinical setting, the concept of acceptance is associated with orientating the patient's attention toward positive everyday activities and other rewarding goals [1, 57]. It could also be the case that the beneficial effects of disengagement may also be dependent on the types of goals given up. In the case of pain patients, when pain persists and attempts to resolve it have repeatedly failed, they may need to give up the goal of pain relief to achieve adjustment [1]. Nevertheless, it should be borne in mind that the present study measured disengagement as the capacity to give up goals in general rather than to only give up the goal of pain relief. This aspect is demonstrated by two items on the disengagement subscale: *If I have to stop pursuing an important goal in my life: It's easy for me to reduce my effort toward the goal; I don't stay committed to the goal for a long time; I can let it go.* On the other hand, as expected, a positive association was found between rumination and impairment and a negative one between rumination and well-being, although no association was found among rumination, functioning, and intensity of pain. We assessed rumination using the pain catastrophizing scale (rumination subscale) [42]. Several studies on the role of catastrophizing in chronic pain have suggested that there is an association between rumination and disability [58, 59]. The present study found that rumination, understood as being an aspect of catastrophizing, seems to play a negative role in the levels of activity of patients with chronic pain. In summary, patients with high levels of optimism have high levels of tenacity and low levels of disengagement. In addition, those who disengage also have higher levels of rumination, which is associated with poor levels of adaptation. Therefore, these results do not support Arends' theory, because the role of disengagement appears to be very similar to the role of avoidance as described in the fear-avoidance model of pain [1, 2]. Thus, in patients with chronic pain, rather than disengagement being used as a flexible way to manage goals, it is used as an avoidance strategy.

In any case, more studies are needed to address this issue.

On the other hand, the results of the present path analysis showed that reengagement, flexibility, and tenacity were associated with patients' adaptation through purpose in life. As expected, and in line with several studies [12, 14–16], patients high in optimism who reported higher flexibility, tenacity, and reengagement with new goals also had higher scores on purpose in life. We found that purpose in life plays a central role between goal adjustment strategies (reengagement, flexibility, and tenacity) and multiple aspects of adaptation to chronic pain: higher levels of well-being and daily functioning, less impairment, and decreased pain intensity. Purpose in life addresses the extent to which individuals see their lives as having meaning, a sense of direction, and goals to live for [38]. Thus, the effective management of goals is associated with higher levels of purpose in life which, in turn, is associated with patients' adaptation and well-being.

In summary, as Mens et al. [7] suggested, it is relevant to identify the factors that facilitate goal adjustment processes. Although there is considerable evidence linking optimism and favorable outcomes, additional research is needed to better understand the mechanisms that explain how optimism exerts its effects on subjective well-being and health [60]. The results of the present study suggest that optimism is associated with the goal adjustment process, and that the relationship between optimism and the successful adaptation of patients with chronic pain could be mediated by the effectiveness of goal adjustment strategies, and levels of purpose in life. However, in the present study, disengagement appeared to be an ineffective goal adjustment strategy. In the study participants, disengagement from goals was associated with high levels of pain rumination which is ultimately associated with higher levels of impairment and lower levels of well-being. Based on the perspective of the fear-avoidance model of pain [1, 2], it could be suggested that disengagement is a way to avoid valuable activities that are associated with impairment and low levels of subjective well-being due to persistent negative thinking about pain (pain rumination). Probably, there are functional similarities and differences between healthy disengagement behavior and unhealthy avoidance behavior. It is probably difficult for people to distinguish and report on the differences. Therefore, it could be the case that measures fail in detecting these differences with precision. Further research is needed to investigate this aspect.

Given these results, the role of dispositional variables such as optimism should be taken into account in clinical contexts. In relation to pain, recent clinical and experimental evidence suggests that positive affect and optimism are two of the most important resilient resources for successful adaptation to acute and chronic pain [19, 31–36].. It seems that optimistic expectancies are quite flexible [16, 23, 25, 26]. This flexibility allows people to be realistic when they need to be, but optimistic when they do not [61]. The positive contribution optimism entailing the clinical setting has led to the development of optimism interventions. Peters et al. [62] used

the "Best Possible Self" (BPS) manipulation as a positive future thinking technique based on the work of King [63]. According to King, the BPS manipulation helps people to have a clearer view of the goals they want to reach. The results of the BPS manipulation in patients with pain [64] showed that the use of an online positive psychology intervention increased positive emotions and optimism in patients with chronic pain, which led to higher levels of happiness, optimism, positive future expectancies, positive affect, self-compassion, and the ability to live the life they wanted despite pain, and lower scores on pain catastrophizing, depression, and anxiety. Positive effect may also increase access to memories of other positive experiences and facilitate the ability to think creatively and flexibly. Therefore, training in optimism [62] could increase the probability of using effective goal adjustment strategies, thus leading to improvements in levels of purpose in life, and ultimately, to improvements in well-being and functioning.

This study has several limitations. Firstly, the participants had high levels of pain with little difference between levels. New studies using participants with different levels of pain would provide more information on the association between psychological variables and the intensity of perceived pain. The results of the study are also limited by its exclusive reliance on self-report measures. In addition, the cross-sectional study design means that causal associations cannot be identified and nature of the data leave open the possibility that directions of the causal paths could be different from those described. Longitudinal methods could be used in future studies to investigate the predictive value of dispositional variables, as well as the role of goal adjustment in the adaptation of patients with chronic pain.

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Compliance with Ethical Standards

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards Authors Carmen Ramírez-Maestre, Rosa Esteve, Alicia E. López-Martínez, Elena R. Serrano-Ibáñez, Gema T. Ruiz-Párraga, and Madelon Peters declare that they have no conflict of interest. All the procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Primary Data This study was part of a larger research project (Esteve, López-Martínez, Peters, Serrano-Ibáñez, Ruíz-Párraga, González-Gómez, and Ramírez-Maestre, 2017; Esteve, Ramírez-Maestre, Peters, Serrano, Ruiz-Párraga, and López-Martínez, 2016). This is an original analysis and it was neither published nor sent anywhere. However, part of the analyses was presented as a poster in 10th Congress of European Pain Federation (EFIC), in Copenhagen, September 6–9, 2017. Recently, the *Pain Research and Management* journal has accepted another paper title *Optimism, positive and negative affect, and goal adjustment strategies: their relationship to activity patterns in patients with chronic musculoskeletal pain.* This and the current manuscript are both part of the same research project (PSI2013-42512-P), although the analyses are different. The authors have full control of all primary data and that they agree to allow the journal to review their data if requested.

Authors' Contributions Authors whose names appear on the submission have contributed sufficiently to the scientific work and therefore share collective responsibility and accountability for the results. Upon request authors should be prepared to send relevant documentation or data in order to verify the validity of the results. This could be in the form of raw data, samples, records, etc. Sensitive information in the form of confidential proprietary data is excluded.

Ethical Approval The Ethics Committee of the University of Málaga approved this study (CEUMA 2013-0016-H). This article does not contain any studies with animals performed by any of the authors. The data were collected in a manner consistent with ethical standards for the treatment of human subjects, approved by the University of Málaga Ethics Committee.

Informed Consent All the procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national) and with the 1975 Declaration of Helsinki (revised 2000). Informed consent was obtained from all individual participants included in the study.

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