Pain Management Nursing xxx (xxxx) xxx

Contents lists available at ScienceDirect

Pain Management Nursing

journal homepage: www.painmanagementnursing.org

Original Article

When It Hurts, a Positive Attitude May Help. The Moderating Effect of Positive Affect on the Relationship Between Walking, Depression, and Symptoms in Women with Fibromyalgia

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ARTICLE INFO

Article history:
Received 25 October 2021
Received in revised form 17 April 2022
Accepted 27 May 2022
Available online xxx

Keywords:
Fibromyalgia
Positive affect
Walking
Chronic pain
Emotional symptoms
Women

ABSTRACT

Background: Increased exercise is a marker of health in fibromyalgia (FM). However, patients frequently avoid physical activity as a way of minimizing the pain they feel. This deprives them of opportunities to obtain positive reinforcement, increasing functional impact. Aims: This study examines the mediating role of depressive symptoms between walking (as physical exercise), functional impact, and pain, at different levels of positive affect (PA) among women with fibromyalgia. Design: Cross-sectional correlational study. Settings: Mutual aid associations for fibromyalgia in Spain. Participants: 231 women diagnosed with FM. Methods: Moderate mediation analyses were conducted using PROCESS. Results: First, a simple mediation model showed that depression mediated the effect of walking on functional impact, but not on pain. Additionally, the moderated mediated model showed that this effect was significant at medium and high levels of PA, but not when levels of PA were low. Conclusions: Provision of resources focused on positive affect seem to increase the positive effects of walking on functional impact through the reduction of depressive symptoms. Nurses can improve adherence of patients with FM to walking behavior through increasing positive affect.

Fibromyalgia (FM) is a chronic condition with no well-established etiology, typified by widespread musculoskeletal pain throughout the body (Jobski et al., 2017; McDonald et al., 2016; Wolfe et al., 2010), that leads to changes in the individual's ability to function physically (Catala et al., 2021; Suso-Ribera et al., 2020). Studies have identified several psychological and physical factors as potential determinants of FM severity (Lee et al., 2017), having argued that functional impact should be conceptualized within a more comprehensive biopsychosocial perspective (Sturgeon & Zautra, 2010), where health care professionals play an essential role (Olivé Ferrer & Isla Pera, 2015).

An active lifestyle has been proposed as a resilience factor in FM (Pulido-Martos et al., 2020), and it has shown that increased exercise is a marker of health in FM (Castro-Piñero et al., 2017; Doerr et al., 2017; Esteve et al., 2017). One of the recommended primary treatments is to perform aerobic physical exercise, specifically walking (O'Connor et al., 2015), because of its low musculoskeletal impact (Gusi et al., 2009). Unfortunately, patients with FM rarely meet the guidelines for physical activity, including walking (Peñacoba et al., 2017), and patients frequently avoid walking as a way of minimizing the pain they feel (Lami et al., 2018). However, pain is not the only factor that explains adherence to walking in FM (Peñacoba et al., 2017), and avoidance of physical activity may also deprive women of opportunities to obtain positive reinforcement, increasing the functional impact of the illness (Cheng et al., 2018).

In this context, multidisciplinary research in FM, where nursing has an important role (Menzies, 2016), has shown that there is a subset of patients that do not complete treatment or fail to achieve satisfactory results in functioning during or after the treatment (Morley, Williams, & Eccleston, 2013). According to this, new emerging models focused on contextual variables have shown that the relationships are not linear per se and may be affected by ad-

Abbreviations: FM, Fibromyalgia.

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https://doi.org/10.1016/j.pmn.2022.05.007

ditional variables that give rise to complex models in chronic pain (Ecija et al., 2020; Ecija et al., 2021a; Ecija et al., 2021b; McCracken & Morley, 2014, Esteve, 2017). In this context, nursing researchers have widened their approach to pain, suggesting that contextual and personal variables could explain the inability of some individuals to implement adaptive coping methods in the presence of pain or related symptoms (Carvalho et al., 2019).

As a result, researchers have recently sought to better understand predictors of treatment outcomes by searching for them in a theoretical grounding, studying whether certain variables can indicate for whom, or under what circumstances, a treatment can have its best effect (Écija et al., 2020; Gilpin et al., 2017, 2019). In this context, depressive symptoms have been shown to have a profound negative impact on the ability to function physically in patients with chronic pain (Cane et al., 2016; Esteve et al., 2017; Pulido-Martos et al., 2020), interfering with their ability to achieve valued goals (Kroska, 2016). However, a recent study in chronic pain has also demonstrated that exercise can help relieve depressive symptoms in people with high pain intensity (Juan, Rui, & Wei-Wen, 2020). Interestingly, depression has been repeatedly associated with poorer functioning in FM, which explains why it was added as part of the newer diagnostic criteria published in 2010 by the American College of Rheumatology (Wolfe et al., 2010).

Similarly, apart from the interest on how psychological contextual variables as depression can influence the effect of walking on functioning, researchers have also insisted on the need to move from the exclusive focus on individual vulnerabilities ("fixing what's wrong") to an interest in what protects people in challenging circumstances ("building what's strong") (Hanssen et al., 2017; Ecija et al., 2021b). In this line, the positive psychology perspective has increased in the context of (chronic) pain, focusing on positive affect (PA). PA seems to be a resilience mechanism that buffers against stress and negative emotions, functioning as a resource for positive short- and long-term outcomes in multiple life domains (Finan & Garland, 2015; Goubert & Trompetter, 2017; Hassett & Finan, 2016; Molinari et al., 2018; Ong, Zautra, & Reid, 2015).

The buffering effect of positive emotions has been suggested to have an effect by means of behavioral mechanisms (i.e., carrying out a greater number of activities) (Rowe et al., 2007; Waugh & Fredrickson, 2006), which have long-term repercussions in greater personal resources and better health and quality of life (Kok et al., 2013). Specifically in FM population, the Dynamic Model of Affect developed by Zautra et al. (2001) (Davis et al., 2004; Reich et al., 2003; Sturgeon & Zautra, 2010) postulates that PA has the strongest beneficial effects under conditions of high stress situations, such as in the context of high levels of pain. According to this, positive emotions may be enhanced to act as a direct buffer for negative feelings (Ong et al., 2010; Zautra et al., 2001). Moreover, from the broaden-and-build model (Fredrickson, 2013), promoting positive emotions may broaden attention towards positive aspects of one's life that are still present. Hence, positive emotions potentially interfere with, or buffer against the downward spiral of negative feelings and disability, while they simultaneously support an upward spiral of goal-directed action based on personal values (Finan & Garland, 2015).

From this perspective, two meta-analyses have indicated that positive psychology interventions that include PA and exercise significantly increase well-being and decrease depressive symptoms (Bolier et al., 2013; Sin & Lyubomirsky, 2009). Moreover, a recent study in FM has shown that patients who walked despite pain reported significantly less impact of FM and depression, along with other outcomes (Catala et al., 2021).

According to recent literature, walking (as exercise) and PA have been recognized as resilience variables in chronic pain (Davis & Zautra, 2013; Goubert & Trompetter, 2017). However, there are no studies analyzing these variables together, or in relation to FM symptoms. Thus, following researchers that have focused on mediation and moderation analysis to better understand predictors of treatment outcome (Gilpin, Keyes, Stahl, Greig, & McCracken, 2017; Gilpin, Stahl & McCracken, 2019), the main purpose of this study has been to analyze the effect of walking on depressive symptoms, functional impact, and pain, taking into account the contextual effect of PA. Results from this study could be crucial for the nursing community to identify for whom or under what circumstances a treatment could produce its best effects, information that gives nurses the opportunity to do specific promotion of interventions focused on PA with women diagnosed with FM, teaching them how to live more successfully despite pain, looking to improve adherence to treatments (Dwarswaard, Bakker, van Staa, & Boeije, 2016).

Specific Aims

The main aim of this study was to analyze whether positive affect has a moderating effect on walking, functional impact, and pain, through depressive symptoms (see Fig. 1). As a preliminary step to the main aim, the role of depressive symptoms as a mediating variable between walking and both dependent variables (pain and functional impact) was tested (Fig. 2).

Methods

Participants

According to the American College of Rheumatology (ACR) criteria (Wolfe et al., 1990, 2010), a final sample of 231 women with FM was recruited from different FM mutual aid associations in Spain. Women were contacted via email and telephone, gave informed consent to take part in the project, and were given a booklet of questionnaires (this booklet contained questions from the measures noted below), which took 20-30 minutes to complete. The University Committee on Ethics [Reference number PI17/00858] approved this study.

Measures

Walking

The walking behavior proposed by Gusi et al. (2009) for patients with FM was selected ("at least 60 minutes in bouts of 20 minutes, with a small rest between bouts, four times a week, over a minimum of six consecutive weeks"). However, the minimum daily time was reduced to 30 minutes and at least 2 days a week because the targeted population was highly sedentary and because of the difficulties in adherence to physical exercise in patients with FM (OĆonnor et al., 2015). An ad hoc self-report item was used to assess whether they adhered to walking according to the prescribed pattern (1 = "yes"/0 = "no"). Specifically, we asked participants to indicate whether, in the past month and a half, they adhered to the components of the minimum walking program: "to walk with the aim of doing exercise, for at least 30 minutes, in bouts of 15 minutes with a small rest between bouts, at least twice a week over a minimum of six consecutive weeks', as this is the recommended fixed program.

Positive affect

The positive affect subscale of the positive and negative affect scale (PANAS) (Watson et al., 1988) was used. The positive affect subscale includes 10 items that evaluate feelings that reflect a level of pleasurable engagement with the environment, such as joy, happiness, or enthusiasm (in a theoretical range of 0 to 40). The

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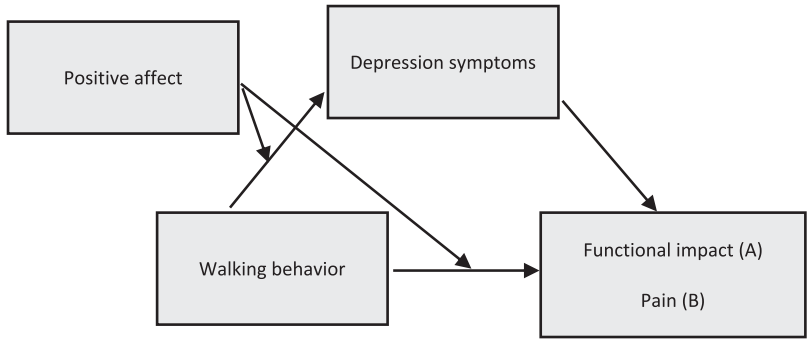

Figure 1. Hypothesized of model of the moderated mediated effect of walking behavior on functional impact (A) and pain (B), by depression symptoms at different levels of positive affect.

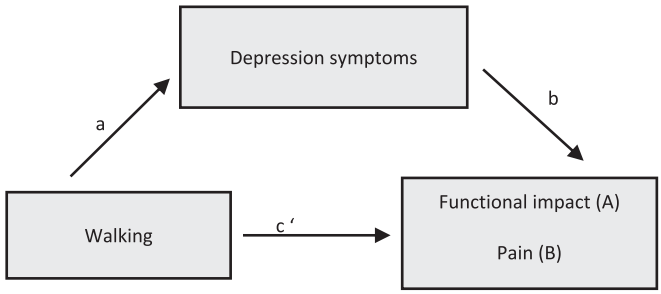

Figure 2. Hypothesized model of the mediation role. of depression symptoms among walking behavior and functional impact (A) and pain (B).

Spanish version of this subscale has demonstrated good reliability ($\alpha = 0.87$) (Sandín et al., 1999; 2003). Moreover, a recent study in chronic pain shows an excellent reliability ($\alpha = 0.92$) for positive affect (Ramírez-Maestre et al., 2020). In our study, the positive affect subscale obtained a high internal consistency score (0.91).

Depressive symptoms

The Depression subscale of the Spanish version of the Hospital Anxiety and Depression Scale (HADS) (Herrero et al., 2003) was administered. The HADS is a brief and widely used instrument to measure the possible presence of anxiety and depressive states in medical, non-psychiatric, outpatient clinic settings. High scores in this 7-item subscale, with a 4-point Likert response format, denote high depressive symptoms. Cronbach's alpha for this scale in previous research in FM was high ($\alpha = 0.85$) (Cabrera Perona et al., 2015), obtaining the same value in our research.

Pain severity

To assess pain severity, we used the mean score of the four pain severity items from the Brief Pain Inventory (Cleeland & Ryan, 1994): maximum, minimum, overall pain intensity during the last 7 days, and pain intensity at the current time. Each rating is evaluated using an 11-point numerical scale (0 = "no pain" and 10 = "the worst pain you can imagine"). This procedure to measure pain severity has been widely used in pain literature (Jensen et al., 1996). Studies have shown an excellent internal consistency in previous studies in Spanish population with chronic pain ($\alpha = 0.93$) (de Andrés Ares et al., 2015). In this study, the internal consistency of this scale was high (0.86).

Functional impact

The Spanish adaptation of the Revised Fibromyalgia Impact Questionnaire (FIQ-R) has been used to evaluate the impact of FM on functioning (Bennett et al., 2009). In the FIQ-R, dimensions are answered on an 11-point numerical rating scale from zero to 10, with different verbal anchors depending on the item. The FIQ-R assesses both physical (fatigue, pain, or muscular stiffness among others) and psychological symptoms (anxiety, depression) of fibromyalgia and their interference in daily living tasks and in quality of life. Higher scores represent higher impact perception. The Validation of a Spanish version of the Revised Fibromyalgia Impact Questionnaire (FIQ-R) showed a high internal consistency score ($\alpha = 0.95$) (Salgueiro et al., 2013). This was also found in our study ($\alpha = 0.92$).

Data Analysis

All analyses in this study were conducted using SPSS 27 (Windows). First, descriptive, bivariate Pearson correlation and *t* tests analyses with Cohen's d effect sizes (Rosnow, Rosenthal, & Rubin, 2000) were performed. Second, the mediation role of depressive symptoms among walking behavior and functional impact (A) and pain (B) were tested (Fig. 2) using the SPSS macro-PROCESS (model 4). These models were tested using regression (to calculate statistics for specific paths) and bootstrapping (to generate a confidence interval [CI] for the mediation effects). All variables were centered before the analyses, and statistical significance was set at an alpha level of 0.05. Correlation analyses were evaluated, showing that the preconditions for this mediation analysis were fulfilled (Hayes, 2009). Third, based on these results, a moderated mediation analysis was run by model 7 of SPSS macro-PROCESS (Fig. 1) to test if the indirect effect of walking on functional impact, by way of depression symptoms, depended on the level of PA. Product terms of waking (centered) x PA (centered) were added to the regression model predicting depressive symptoms and functional impact. Simple slope analyses were subsequently performed to illustrate significant interaction effects (Aiken et al., 1991). An index of moderated mediation, which is a measure of the association between an indirect effect and a moderator, was estimated, together with a 95% CI, from bootstrapping 10,000 samples (Hayes, 2015).

Results

Participant Characteristics

In our sample of women diagnosed with FM, aged from 30 to 78 years, with a mean age 56.91 years (standard deviation [SD] = 8.9 years). In relation to educational level, 53.2% of them had completed primary studies, and 26.4% had secondary studies. Regarding their employment status, 12% of the women were employed, 33.8% were homemakers, 32% were retired (of them 18.8%

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Table 1
Means, Standard Deviations, and Pearson Correlations Between Study Variables.

	Mean (SD)	Theoretical range	1	2	3	4
1. Depression (D)	9.22 (4.27)	0-21		-.52[b]	.49[b]	.13[a]
2. Positive affect (PA)	20.88 (9.02)	0-40			-.18[b]	.05
3. Functional impact (FI)	72.35 (17)	0-100				.50[b]
4. Pain	7.15 (1.52)	0-10				

[a] p <.05.
[b] p < .01.

due to chronic pain), and 12.1% were unemployed. A small percentage (10%) was on sick leave. Finally, more than half of the women (53%) were married or in a stable relationship, 36% were divorced or widowed, and 11% were single. Regarding the clinical variables, women had experienced fibromyalgia for an average of 12.14 years (SD = 8.45; 146 years range).

Descriptive Data and Correlations

Table 1 shows means, SDs, and Pearson correlations between continuous variables. Depression was positively correlated with functional impact (p < .001) and pain (p = .05), and negatively with PA (p < .001). PA was found to be negatively correlated with functional impact (p = .004). In relation to walking, 58.1% of the women reported walking, while 41.9% did not. Moreover, when the participants were compared based on walking (walking vs not walking), differences from t-tests analyses (using Cohen's d effect sizes) showed impact significant in relation to function [walk: mean 68.97 (SD 17.48), no walk: mean 76.74 (SD 15.45); t = 3.46; p = .001; d = 16.66], pain [walk: mean 6.94 (SD 1.54), no walk: mean 7.45 (SD 1.48); t = 2.51; p = .013; d = 1.51] and depression [walk: mean 8.39 (SD 4.49), no walk: mean 10.33 (SD 3.68); t = 3.45; p < .001; d = 4.17]. However, differences related to positive affect were not significant (t = -.812; p = .418).

Test of the Models

Mediation model of walking on functional impact and pain by depressive symptoms

In line with the main aim of this study, the mediating role of depression between walking and both outcomes was first tested (Fig. 2). Functional impact and pain were used as covariates in each model, depending on the outcome variable. Results showed that depression significantly mediated the relationship between walking and functional impact because the bootstrap CI was above zero while controlling for demographic variables and pain. The total effect model was significant (c = -4.72, t = -2.49, p < .01, [95% CI = -8.4687/-.9875]). However, related to pain, depression did not mediate this relationship and total effect of walking on pain was not significant (c = -.11, t = -.66, p = .50, [95% CI = -0.4616/0.2289]). The regression coefficient estimated (based on the use of a 95% bias-corrected CI as evidence of the mediation of total indirect effect) was also calculated for both outcomes (functional impact ß = -3.70, SE = 1,22; [95% CI= -6.3282/-1.5369]); pain ß=-.06, standard error [SE] =.04; [95% CI = -.0029/.1626]). Total amount of variance accounted for by the overall models was 34% (F = 58.95; p < .0001) for functional impact, and 32% (F = 54.48; p < .0001) for pain.

Moderation mediation model of walking on functional impact by depression, at different levels of PA

Based on the results of the mediation models, only the indirect effect of walking on functional impact by way of depressive symptoms, depending on the level of PA, was tested. Pain was used as a covariate in the model. Results showed that the contribution of walking to depression varied at different values of PA, after controlling the covariates. Specifically, walking was significantly associated with depressive symptoms when PA was medium (value: .15; ß = -1.52, p = .001) and high (value: 10.15; ß = -2.92, p = .0001). The index of moderated mediation using Hayes' algorithm was estimated for functional impact (ß= -.23 [95% CI = -.43/-.05]). This result (Table 2, Fig. 1) showed that the strength of the relationship between walking and functional impact was increased at higher levels of PA. Specifically, walking was significantly associated with functional impact, mediated by depressive symptoms, when PA was medium (PA value: .15: ß = -2.50) and high (PA value: 10.15: ß = -4.81). Thus, the indirect effect of walking on functional impact via depression was higher in individuals with higher PA.

Discussion

The main purpose of this study was to analyze the effect of walking on depressive symptoms, functional impact, and pain, taking into account the contextual effect of PA. In general, results have shown that the effect of walking on functional impact was mediated by depression. Interestingly, results also found that effects were significant at medium and high levels of PA, but not when levels of PA were low.

In line with the main aim of this study, results confirm that levels of PA play a moderating role in the influence of walking on depressive symptoms and functional impact. First, these results are in concordance with the Dynamic Model of Affect (Davis et al., 2004; Reich et al., 2003; Zautra et al., 2001), in which the beneficial role of PA has been well recognized in chronic pain conditions. According to this, our results show that, specifically, medium or high levels of PA may be enhanced to act as a direct buffer for depressive symptoms (Fredrickson et al., 2008; Ong et al., 2010; Zautra et al., 2001). Second, our study confirms recent studies about the moderating effect of walking on functional impact through depressive symptoms (Écija et al., 2020), and studies where PA has also had a moderating effect on depression (Thong et al., 2018). Although to our knowledge there are no studies such as ours, results point to the fact that PA may constitute a contextual variable of interest when understanding the complex relationships that walking may have with functional impact, considering depressive symptoms as some of the most frequent in FM. Different studies have shown emotional symptoms as one of the main inhibitors of walking, and its adherence, preventing patients from obtaining the beneficial results of the behavior.

In this line, a novel aspect of the current study is that it indicates the mechanisms of action (in this case through depression) of the improvement that physical exercise (walking) produces in functional impact (Hassett & Finan, 2016; Lee et al., 2017). Specifically, it is interesting that the effect of walking on functional impact is through depression, but only at medium or high levels of PA. In this line, White and colleagues (2012) observed significantly higher daily activity (measured by the number of steps) in os-

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Table 2
Moderate Mediation Model: Regression of Depression Symptoms (Mediator) on Functional Impact and Positive Affect (Moderator).

	B (SE)	t	*p*	[LLCI-ULCI]
VD: Walking behavior (WB)	-1.50(.47)	-3.17	.001	[-2.43 /-.05]
M: Positive affect (PA)	-.24(.02)	-9.67	.000	[-.29 /-.19]
WB x PA (interaction)	-.14(.05)	-2.70	.007	[-.24 /-.03]
Pain (covariate)	.43(.15)	2.84	.004	[.13/.73]
Conditional effects of the focal predictor (WB) at values[a] of the moderator (PA)				
-9.84	-.11(.69)	3.36	.862	[-1.48/1.24]
.15*	-1.52(.47)	6.53	.001	[-2.45/-.59]
10.15*	-2.92(.71)	7.12	.0001	[-4.33/-1.52]
Regression of depression on functional impact and PA				
	B (SE)	t	*p*	[LLCI-ULCI]
Walking behavior (WB)	-1.86(1.69)	-1.10	.271	[-5.19/1.46]
Depression (D)	1.64(.19)	8.41	.000	[1.25/2.02]
Pain (covariate)	5.49(.53)	10.22	.000	[4.43/6.55]
Model summary	R^2: .50			
Indirect effects at values[b] of PA				
-9.84	-.19 (1-10)			[-2.38/1.94]
.15*	-2.50 (.88)			[-4.37/-.92]
10.15*	-4.81 (1.48)			[-7.98/-2.21]
Indexes of moderated mediation	-.23(.09)			[-.43/-.05]
Pairwise contrast between conditional indirect effects (Effect 1 minus Effect2)				
	Effect 1	Effect2	contrast	[LLCI/ULCI]
	-2.50	-.19	-2.30	[-4.30/-.58]
	-4.81	-.19	-4.61	[-8.61/-1.16]
	-4.81	-2.50	-2.30	[-4.30/-.58]

Models include controls for age, sex, education level, employment status; conditional effects of the focal predictor at values[a] of the moderator (PA); Indirect effects of Walking on Functional impact at values[b] of PA; * statistically significant results.
LLCI = bootstrapping lower limit confidence interval; ULCI = bootstrapping upper limit confidence interval; SE = standard error.

teoarthritis patients with high PA as opposed to low PA, showing that patients with high PA walked an equivalent number of steps per day regardless of their pain levels (White et al., 2012). Following this evidence, the fact that in our study the moderated mediation model is significant in functional impact but not related to pain could be in accordance with studies that have suggested that PA might reduce engaging rigidly in specific action tendencies and create behavioral flexibility (Vlaeyen, Crombez, & Linton, 2016), and enhance (continued) engagement in valued activities despite the experience of pain (Pastor et al., 2021).

The results obtained have, in our opinion, important clinical repercussions. In accordance with the notion that a neural process is disturbed in FM (de la Coba et al., 2018; Montoro et al., 2016), research suggests that patients diagnosed with FM may be at higher risk for a deficit in PA and an inability to sustain PA in the face of pain (Finan & Garland, 2015; van Middendorp et al., 2008; Zautra et al., 2005). Extrapolating these findings into a clinical context, it has been suggested that patients diagnosed with FM could have better pain-related outcomes if they would reliably engage their PA resources (Hassett & Finan, 2016). From this perspective, many psychosocial interventions for pain such as cognitive behavioral therapy (CBT), acceptance and commitment therapy (ACT) (Hassett & Finan, 2016), or behavioral activation (BA) (among others) have targeted PA as resilience to one degree or another, focusing on increasing positive feelings, positive cognitions, or positive behavior (Sin & Lyubomirsky, 2009). A common aspect of these treatments is that patients are guided to choose valued activities for which they set graduated goals for their participation (Hassett & Finan, 2016).

Focusing on nursing, a recent study in women with FM has shown that, for these women, exercise self-efficacy, perceived barriers, and intention to exercise are important constructs for increasing physical activity (Kaleth et al., 2022). The need to reduce barriers and promote more facilitators to help patients' pain management have promoted the inclusion of non-pharmacologic treatments in nursing care plans (Liu, 2022). Nurse's advice in relation to walking is easy to follow by patients, and this intervention changes patients' perception of chronic pain management, learning that it can be improved with self-management (Nomiko, et al., 2022). Thus, the roles nurses play in chronic pain can strongly influence a positive outcome and should provide quality patient care, being one of the most important aspects related to adherence (Liu, 2022).

In this line, following the interest mentioned regarding what protects people in challenging circumstances, our results show that interventions specifically targeting increasing PA might be a promising complementary alternative for existing interventions (Flink et al., 2015; Galvez-Sánchez et al., 2018). For example, two meta-analyses of positive activity interventions (PAIs) based on the premise that simple cognitive and/or behavioral strategies can improve people's resources (Layous et al., 2011), found that increasing PA resulted in improvements in pain intensity, pain interference, PA, and depression (Müller et al., 2016), and that these benefits could persist for up to 6 months (Bolier et al., 2013; Sin & Lyubomirsky, 2009). In the same line, a recent study conducted by nurses showed that music therapy increases PA, and it was very popular among patients with chronic pain. Nursing can implement noninvasive techniques with their patients to help make their stay at the hospital more acutely comforting, which may help reduce any future emotional symptoms related to pain (Hardy, 2022; Atta et al., 2022).

Taking all the above into account, our study may be another step toward recognizing that effective actions to improve adherence could be delivered by nursing staff (Kizza and Muliria, 2015; Jacq et al., 2018; Atta et al., 2022). With noninvasive, safe, and low-cost nonpharmacologic interventions fo-

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cused on increase PA, nursing could promote physical activity in chronic pain (Otmanowski & Chase, 2022; Hardy, 2022), allowing patients to find ways to reduce pain levels without having to visit their doctors for a prescription, or spending more time and money on medications. Access to positive psychology interventions prior to, during, or post nursing intervention might offer solutions to problems such as long waiting lists, passive treatment participation, or difficulties to maintain long-term treatment effects.

Additionally, treatment interruptions for patients with chronic pain due to the COVID-19 pandemic have included adjustments to the patient care model, and emergent technologies such as telemedicine have included PA as an important resilience variable (Micó Segura, 2020) that has generated promising results (de Moraes et al., 2021; APA, 2020a, 2020b). These results open up other possibilities to increase positive affect in nursing interventions and could provide low-cost internet-based treatment with or without guidance of a therapist though PA interventions (Peters et al., 2017; Hausmann et al., 2014; Muller et al., 2016). PA could easily be introduced in any treatment to enhance the effects of interventions or to prevent dropout (by means of shaping participants' motivation or treatment expectations).

Limitations

Some limitations of this study need to be mentioned. First, the results were obtained from self-reported data, this limitation being especially relevant in the case of walking. It should be noted in this regard that the current study is part of a larger project that previously assessed this same behavior by means of self-administered questionnaires and pedometers, and a high consistency was found between measures (Pastor-Mira et al., 2021; Lopez-Roig et al., 2021). Moreover, the cross-sectional design prevents the establishment of cause-effect relationships. Second, since the findings are based on women with FM, more research is needed in men (even though FM in men is scarce) and, especially, in other populations with pain to explore whether the findings are generalizable. Third, sampling through pain associations may have introduced a sampling bias towards women who are already relatively well adjusted to their chronic pain, which may not reflect typical presentations in secondary care settings. Finally, even though several clinical and psychosocial factors potentially relevant for adherence to walking were investigated, the list is of course incomplete. For instance, it has been shown that clinical conditions that often coexist with FM, might impose difficulties in walking (Costa et al., 2017; Mahgoub et al., 2020).

Despite these limitations, walking is the treatment of choice for these patients, and our results indicate a positive influence on functional impact through a decrease in depression levels. However, to achieve these effects, behavioral continuity is required. In this sense, assuming that adherence in these populations is very low, and considering that the women with FM are mostly sedentary (Esteve et al., 2017), it is especially advisable to start walking gradually (Sanz-Baños et al., 2018). Specifically for this population, the initial goal is to walk a minimum of 30 minutes daily (in two sets of 15 minutes each) and at least twice a week (World Health Organization WHO, 2018; Brosseau et al., 2008; Bidonde et al., 2017). Based on the evidence found, interventions in promoting positive affect would improve the effects of walking on functional impact as an important component of contemporary multidisciplinary interventions. In this context, within the medical recommendation of walking, nursing professionals are the main ones involved in the initiation and follow-up of walking behavior in these patients. Results suggest that when women with FM are dealing with depressive symptoms, interventions should be focused by health care professionals on increasing PA through positive activities such as walking, rather than being overly focused on reducing pain symptoms.

Knowing that Positive Activity Interventions (PAIs) are non-stigmatizing, and do not require a mental health professional for their provision, this study gives professionals, and specifically nurses, the opportunity to better understand which domains of activity management are most closely associated with which symptoms (i.e., depression and functional impact). This study supports the need to analyze positive psychology variables such as PA in more comprehensive models, to better understand how these variables may be used to define FM profiles, understanding specifically the role that these variables could have on FM multicomponent interventions. Nevertheless, more studies are needed to unequivocally establish the causal relationships between these variables, and future research should include longitudinal designs with several waves with carefully spaced-out intervals to test moderated mediation and reverse causation simultaneously.

Taking all the above into account and based on recent studies in which PA influences individual differences in FM symptomatology and, ultimately, in overall functioning (i.e., mediators) (Catala et al., 2021; Écija et al., 2020; Suso-Ribera et al., 2020); this study may be another step towards finding evidence that explicitly promoting PA and behavioral activation (as walking) are important targets so that nursing interventions in chronic pain can fulfill a comprehensive role (Dwarswaard, Bakker, van Staa, & Boeije, 2016).

Conclusions

Firstly, because the experience of FM differs among people and within the same individual over time, adopting patient-centered approaches, such as in this study, is highly recommended for this disease (Esteve et al., 2017). We have tested a sophisticated and dynamic model that supports the notion that a more flexible treatment approach may be warranted, with individual treatments tailored to individual affective profiles. For patients with deficits in positive affectivity, such as those with FM, interventions aimed at increasing PA are crucial for restoring function in the face of chronic pain.

Secondly, research focusing on factors associated with the discordance between how people feel and how they actually perform (Larsen et al., 2001) has called for increased attention to mechanisms for maintaining patients' functioning despite ongoing pain (Burns et al., 2015). Our results suggest that cognitive-emotional factors such as PA and positive behaviors can control neural processes underlying the feeling of being physically impaired, being key aspects within the interdisciplinary approach in FM.

Finally, walking is safe, well tolerated by most patients with FM, and recommended by national and international guidelines for pain management, demonstrating meaningful improvements in symptoms (Clauw, 2014; Häuser et al., 2010). Moreover, researchers have argued that strategies such as walking have to be included in nursing care practices in chronic pain (Hardy, 2022). By enhancing awareness of positive experiences such as walking, PA may increase access to new contextual information with which to reappraise current circumstances and reframe them as benign, meaningful, or even beneficial (Flink et al., 2015). Navigating adversity through this "positive attitude" may ameliorate chronic negative emotionality, enhance self-efficacy of walking, and promote well-being by establishing a sense of coherence and meaning in life (Hassett & Finan, 2016), all of which are important components of any treatment that may be included in nursing domains to improve treatment adherence in chronic pain (Kaleth et al., 2022).

Please cite this article as: C. Ecija, P. Catala, L. Velasco et al., When It Hurts, a Positive Attitude May Help. The Moderating Effect of Positive Affect on the Relationship Between Walking, Depression, and Symptoms in Women with Fibromyalgia, Pain Management Nursing, https://doi.org/10.1016/j.pmn.2022.05.007

Acknowledgments

The authors gratefully acknowledge all participants for their collaboration.

This study was funded by the Health Research Fund (Fondo de Investigación en Salud), grant number PI17/00858 from the Instituto de Salud Carlos (Spain), co-financed by the European Union through the Fondo Europeo de Desarrollo Regional (FEDER). Mª Angeles Pastor-Mira's contribution was supported by a research grant from MINECO (PSI2016-79566-C2-1-R).

All procedures performed in studies involving human participants were 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. The study was approved by the Bioethics Committee of Rey Juan Carlos University (Reference PI17/00858).

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