Title Page

Buffer or amplifier? Longitudinal effects of social support for functional autonomy/dependence on older-adults' chronic-pain experiences.

Authors: Marta Matos, PhD[1,2], Sónia F. Bernardes, PhD[1,2], Liesbet Goubert, PhD[3] & Wim Beyers, PhD[4],

[1] Instituto Universitário de Lisboa (ISCTE-IUL), Lisbon, Portugal

[2] Centro de Investigação e Intervenção Social (CIS-IUL), Lisbon, Portugal

[3] Department of Experimental-Clinical and Health Psychology, Ghent University, Ghent, Belgium

[4] Department of Developmental, Personality and Social Psychology, Ghent University, Ghent, Belgium

Corresponding author: Marta Matos, ISCTE-IUL/CIS-IUL, marta.matos@iscte.pt

Avenida das Forças Armadas, 1649-026 Lisboa, Portugal,

00351 964 183 765

Disclosure:

Research funding: This study was funded by SFRH/BD/79145/2011 PhD grant from Fundação para a Ciência e Tecnologia (FCT).

Conflict of interest: There were no financial or other relationships that lead to conflicts of interest in the development of this piece of research.

ABSTRACT

Objective: This longitudinal study aimed to investigate: (1) the moderating role of formal social support for functional autonomy versus dependence on the relationship between pain intensity and pain-related disability among older adults with chronic pain, and (2) the mediating role of pain-related self-efficacy and pain-related fear in this moderation.

Methods: One hundred and seventy older adults (M_{age}=78.0; *SD*=8.7) with chronic musculoskeletal pain participated in a 3-month prospective study, with three measurement moments. Participants filled out the Formal Social Support for Autonomy and Dependence in Pain Inventory, the Portuguese versions of the Brief Pain Inventory, the Pain Self-Efficacy Questionnaire and the Tampa Scale of Kinesiophobia.

Results: Using Structural Equation Modelling, it was found that perceived promotion of autonomy, at Time 1, moderated the relationship between pain intensity (T1) and pain-related disability (T2); this moderation was fully mediated by pain-related self-efficacy (T2). Perceived promotion of dependence was not a significant moderator.

Conclusions: These findings highlight the importance of social support for functional autonomy in buffering the impact of pain intensity on older adults' pain-related disability. Also, they clarify the role of pain-related self-efficacy in this effect. Implications for the development of intervention programs, with formal caregivers, to reduce the impact of chronic pain, on older adults' healthy ageing process, are discussed.

Key-words: social support, chronic pain, functional autonomy and dependence, pain-related self-efficacy, pain-related fear, older adults.

Introduction

The ability to pursue new and challenging life goals as people get older is frequently hampered by their health status. Ageing often involves decreased physical abilities, which bear a great toll on individuals and their families, challenging the sustainability of health and social systems (World Health Organization [WHO], 2015).

Chronic musculoskeletal pain (*i.e.,* pain in muscles, joints, ligaments, tendons and/or bones) is one of the most prevalent and disabling conditions among older adults (over 60 years old; United Nations, 2013), being highly associated with increased difficulties in performing daily tasks and activities (*e.g.,* Miranda et al., 2012; Reyes-Gibby, Aday, & Cleeland, 2002; Thomas, Peat, Harris, Wilkie, & Croft, 2004). When pain-related disability disrupts the life of older adults, formal social support networks (*e.g.,* day-care centers, nursing homes, assisted living facilities) are sometimes their only regular source of support (Mort & Philip, 2014). Therefore, investigating the role of formal social support in the promotion of older adults' functional ability and healthy ageing, when in pain, is of paramount importance and is the main aim of the present study.

Social support comprises the social resources that people perceive to be available or that are provided within the context of informal or formal relationships (Cohen, Gottlieb, & Underwood, 2000). It can have a direct protective effect on individuals' psychological and physical health (direct effect model*, e.g.,* Cohen et al., 2000; Uchino 2006, Uchino et al., 2012; Thoits, 2011; Wills & Ainette, 2012) or it can buffer the harmful impact of stressful events on health (stress-buffering hypothesis, *e.g.,* Cohen et al., 2000; Lakey & Cohen, 2000; Thoits, 2011; Wills & Ainette, 2012). Most research on the relationship between social support and pain-related disability has investigated its direct effect, with inconsistent findings (*e.g.,* Campbell et al., 2011). While some studies showed that high levels of social support were associated with lower levels of pain-related disability (*e.g.,* Evers, Kraaimaat, Geenen, Jacobs, Bijlsma, 2003; Turk, Kerns, & Rosenberg, 1992, Hughes et al., 2014), other studies showed that solicitous support were associated with higher pain-related disability, increased pain behaviors (*e.g.,* Kerns et al. 1991; Romano, Jensen, Turner, Good, & Hops, 2000; Romano, Jensen, Schmaling, Hops, & Buchwald, 2009), and decreased well-being (*e.g.,* Coty, & Wallston, 2010). In an attempt to account for such inconsistencies, it has previously been argued (Matos & Bernardes, 2013; Matos, Bernardes, & Goubert, 2016) that the direction of the association between social

support and pain-related disability might depend on the extent to which social support promotes functional autonomy (*i.e.,* the ability to perform activities of daily living without assistance; *e.g,.* Pinsonnault et al., 2003) versus functional dependence (*i.e.,* the need for assistance in accomplishing activities of daily living; *e.g.,* Katz, Ford, Moskowitz, Jackson, & Jaffee, 1963). Indeed, previous studies with older adults attending day-care centers or nursing homes supported this contention, showing that: (1) pain-related support for functional dependence (henceforth, perceived promotion of dependence) was associated with higher pain-related disability, (2) pain-related support for functional autonomy (henceforth, perceived promotion of autonomy) was associated with lower pain-related disability, and (3) self-reported physical functioning partially accounted for these relationships (Matos & Bernardes, 2013; Matos, Bernardes, & Goubert, 2016). In sum, cross-sectional research has indeed shown that pain-related support is directly associated with different pain-related outcomes, depending on whether it promotes functional autonomy or dependence.

However, research on social support in pain contexts has focused much less on the stress-buffering hypothesis. While some studies did not find significant buffering effects (*e.g.,* Pjanic et al., 2013), a few others showed that social support buffered the effects of physiological stress responses on experimental pain sensitivity during the cold pressure task (Roberts, Klatzkin, & Mechlin, 2015) and the effect of pain disability on depression in people with end-stage joint disease (Roberts, Matecjyck, & Anthony, 1996). Moreover, recent studies (Ginting, Tripp, & Nickel, 2011a; Ginting, Tripp, Nickel, Fitzgerald, & Mayer, 2011b) showed that different types of pain-related social support may play different roles: distraction buffered the negative impact of pain intensity on pain disability and on mental quality of life, while solicitousness amplified the detrimental effect of pain intensity on pain disability. In sum, the evidence on the buffering role of social support in a pain context is scarce and inconsistent. Its inconsistency might, in part, be related to the fact that some studies have used general measures of social support rather than measures of pain-related social support (*e.g.,* Pjanic et al., 2013). However, the studies by Ginting and colleagues (2011a; 2011b) measured pain-related social support and were very innovative in suggesting that certain types of social support may have a buffering role while other types may amplify the deleterious relationship between pain intensity and pain disability. Knowing that pain intensity is one of the main predictors of pain disability (*e.g.,* Arnstein et al., 1999;

Denison et al., 2004), in the present study, we aimed to examine the buffering versus amplifying effects of different functions of pain-related support on such relationship. More specifically, we hypothesized that: (H1) perceived promotion of autonomy would act as a buffer against the negative effect of pain intensity on pain-related disability and (H2) perceived promotion of dependence would amplify the negative impact of pain intensity on pain-related disability.

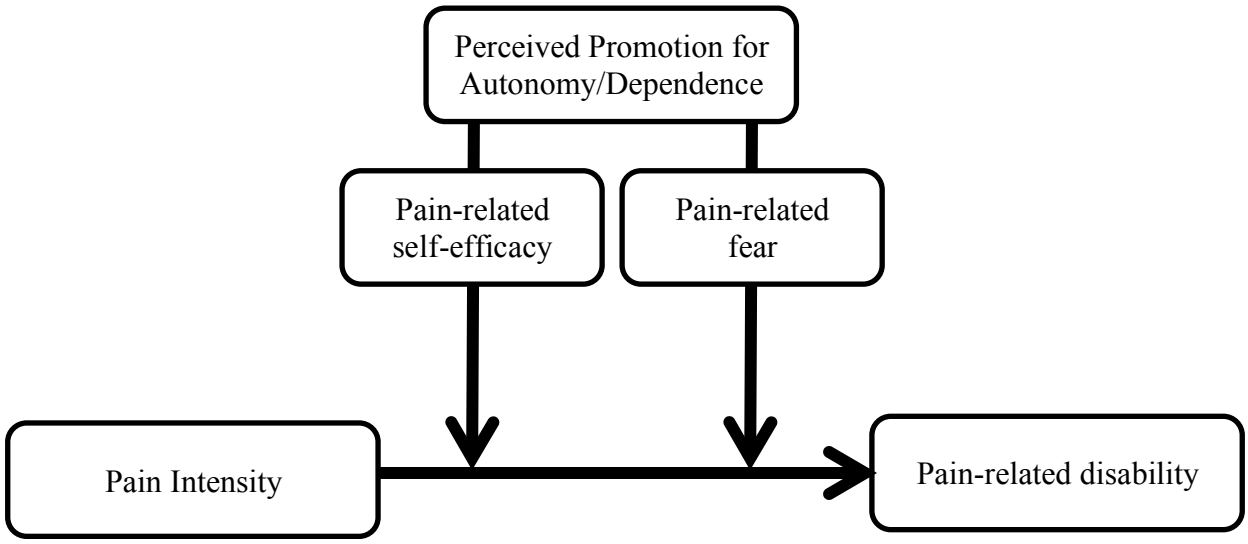
Besides investigating whether different types of pain-related social support act as stress buffers or amplifiers, there is also the pressing need to further investigate the psychological mechanisms through which such effects unfold (Thoits, 2011; Uchino, 2012). Therefore, the second aim of the present study was to investigate the extent to which pain-related self-efficacy and fear could account for the buffering/amplifying effects of pain-related support, as depicted in Figure 1. In the health psychology literature, self-efficacy has often been found as a mechanism through which social support operates upon health outcomes (Berkman et al., 2000), for example, by increasing treatment adherence (*e.g.,* Maeda et al., 2013) and healthier behaviors (*e.g.,* Duncan & McAuley, 1993; Gulliver et al., 1995). This relationship, however, has been mainly studied as a direct one. Specifically, social support has been described as a potential (dis)enabler of self-efficacy, which in turn would lead to positive or negative health outcomes (Benight & Bandura, 2004). Pain-related self-efficacy is a key determinant of pain behaviors and has been described as the degree of self-confidence to function despite pain and in expending efforts to persist in face of obstacles and aversive experiences (Nicholas, 2007; Turk & Monarch, 2013). High levels of pain-related self-efficacy have been associated with efforts to actively deal with pain (*e.g.,* Turk and Okifuji, 2002) and lower levels of pain intensity, disability, depression and anxiety (*e.g.,* Arnstein, 2000; Costa et al., 2011; Nicholas, 2007; Denison et al., 2007). Furthermore, it has been shown that pain intensity reduces pain-related self-efficacy, leading to higher levels of pain-related disability (*e.g.,* Costa et al., 2011; Schulz et al., 2015). Based on these findings, we hypothesized that pain-related self-efficacy would mediate the buffering/amplifying effects of perceived promotion of autonomy/dependence on the impact of pain intensity on pain-related disability (H3/4).

Another mechanism that could account for the moderator effect of pain-related social support is pain-related fear, *i.e.,* fear of pain, physical activity or (re)injury (Kori, Miller, & Todd, 1990). Pain-related fear is a key concept

n the Fear-Avoidance Model (*e.g.*, Leeuw et al., 2007; Lethem et al., 1983; Vlaeyen et al., 1995), which postulates hat low levels of pain-related fear lead to confrontation and recovery, while high levels of pain-related fear are ıssociated with avoidance of physical and social activities, thereby increasing disability. Research has indeed shown hat pain-related fear is associated with higher levels of pain-related disability (*e.g.,* Kori, Miller, & Todd, 1990; Vlaeyen et al., 1995) and maladaptive pain behaviors (*i.e.,* avoidance of activity), and has been described as more lisabling than pain itself (Waddell et al., 1993). Studies have found that social support has a beneficial effect on ɔain-related outcomes by inhibiting avoidance of physical and social activities (*e.g.*, Keefe et al., 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996) but to the best of our knowledge, the relationship between pain-related support ınd pain-related fear is yet to be explored. We propose that perceived promotion of autonomy might be associated with less pain-related fear, by promoting higher persistence and ability to function despite pain. On the other hand, ɔerceived promotion of dependence might be associated with higher levels of pain-related fear, by reinforcing ıvoidance and low ability to function with pain. As such, we hypothesized that pain-related fear would mediate the ɔuffering/amplifying effect of perceived promotion of autonomy/dependence on the impact of pain intensity on pain-elated disability (H5/6).

These hypotheses (depicted in Figure 1) were tested using a longitudinal approach, which contributed to clarify he temporal relationships between these variables, since most research on the topic has relied on cross-sectional ıpproaches.

Figure 1 – Buffering effect of perceived promotion of autonomy and amplifying effect of perceived promotion of dependence on the influence of pain intensity on pain-related disability



Method

Study Design and Participants

This study consisted of a prospective design, with three moments of measurement, with a 6-week lag in-between them. The time duration and lags were assumed appropriate, as longer lags might have resulted in increased dropout rates, considering participants' physical fragility. One hundred and seventy adults (67.6% women) aged between 50 and 99 years old (M=78.3; SD=8.7), attending nine day-care centers in urban areas in and around Lisbon, participated in this study at Time 1 (T1). Participants' years of formal education ranged from 2 to 20 years (M=4.9; SD=2.6) and 60.6% of them were widowed, 22.4% were married, 11.8% were divorced and 5.3% were single. Most participants lived alone (54.7%), and were users of the institution(s) for a duration of 6 months to 30 years (M=4.5 years; SD=5.5). All participants reported current musculoskeletal chronic pain, with a duration ranging from 3 months to 52 years (M=7.3 years; SD=10.1) and on 1 to 5 pain locations (M=1.5; SD=.8). Women (M=1.57; SD=.89) reported a higher number of pain locations than men (M=1.22; SD=.534), $t_{(168)}$=2.669, p=.008. Joints (39.4%) were the most frequently reported pain location, followed by bones (27.1%), muscles (20.6%), tendons (2.4%) and ligaments (1.2%). On average, participants reported low levels of pain intensity (M=3.0, SD=1.9) and pain disability

M=3.8, *SD*=3.3), on a scale ranging from 0 to 10. Participants, however, reported rather low levels of ability to perform daily activities (*e.g.,* climb stairs, walk, bathe and dress; *M*=35.4 out of 100; *SD*=34.2). Furthermore, 11.8% of the individuals were medically advised not to exercise, 42.9% reported having chest pain or dizziness on a frequent basis and 18.2% had high blood pressure.

At Time 2 (T2), two participants refused to participate and sixteen participants were unreachable due to disease (18 dropouts). Hence, 152 individuals participated in the second wave of data collection; they did not differ from the first sample in terms of their sociodemographic characteristics (67.1% women; M_{age}=78.0; SD_{age}=9.1) nor clinical and pain-related characteristics. At Time 3 (T3), twelve seniors were absent due to disease, three refused to participate and one person had deceased (17 dropouts). The sample at T3 (*n*=135; 69.6% women; M_{age}=78.2; SD_{age}=9.1) did not significantly differ from the samples at T1 or T2, regarding sociodemographic, pain and clinical characteristics.

Procedure

The present study was reviewed and approved by the Ethics Committee of the hosting institution - ISCTE-Instituto Universitário de Lisboa. Eleven institutions, with day-care centers, in Lisbon metropolitan area were invited to collaborate in the study. A request for approval of the study's procedure was sent to each institutional board along with a detailed written description of the purpose of the study, expected duration of individuals' participation, the procedures (e.g., how participants would be approached, a copy of data collection protocol), identification of potential risks, benefits and outcomes of the research, and contact details of the research team. Only nine (out of eleven) institutions accepted to take part in the study; one institution justified their denial due to the protocol length and the other declined immediately during the first contact because they had recently hosted a data collection procedure that had been very disruptive. Nine day-care centers formally accepted to participate and gave their consent to host the study. All day-care centers belonged to non-profitable organizations and offered several services for older adults, namely, social and cultural activities, physical exercise activities, counseling, meals, personal hygiene, clothes washing, house cleaning, and transportation. Most institutional support providers were women.

Participants were recruited, with the help of institutions' clinical staff, on the basis of the following inclusion criteria - were able to read and write autonomously, neither presented nor were diagnosed with cognitive impairments and were users of the institution for at least 6 months. Afterwards, the first author (M.M.) individually screened the potential participants for the presence of constant or intermittent musculoskeletal pain (*i.e.,* pain on muscles, ligaments, tendons and/or bones) for at least three months. Older adults meeting all inclusion criteria were invited to participate. Prior to data collection participants read and signed a consent form in which they were informed about the purpose of the study and its expected duration, that all data were confidential and anonymous and that their participation was voluntary existing no penalties or consequences if they refused to participate or if they withdrew at any point. Then, data collection occurred on three different time points. At T1, all participants filled out the revised Formal Social Support for Autonomy and Dependence in Pain Inventory (FSSADI_PAIN), the Portuguese version of the Brief Pain Inventory (BPI) and a questionnaire on sociodemographic characteristics; at T2 and T3, participants filled out the revised FSSADI_PAIN, the Portuguese versions of the BPI, the Pain Self-Efficacy Questionnaire (PSEQ) and the Tampa Scale of Kinesiophobia (TSK). At T3, all participants and institutions were thanked and debriefed by providing them with simple and relevant information about the subject and nature of the study (APA, 2010; OPP, 2011; ISCTE, 2016). Neither participants nor institutions received any financial compensation for their participation.

Instruments

Formal Social Support for the Promotion of Functional Autonomy and Dependence.

Participants were presented with the revised FSSADI_PAIN at T1, T2 and T3. The revised FSSADI_PAIN measured the perceived frequency of social support received from the staff, for functional autonomy and dependence when in pain (Matos, Bernardes, Goubert, & Carvalho, 2015). The first subscale – perceived promotion of autonomy (4 items) - assessed instrumental support [that] consist of tangible/behavioral help that allows people in pain to accomplish their daily tasks by themselves, (…) [and] emotional/esteem support [that] reinforce people's self-esteem, their self-confidence to keep on functioning, and social/activity engagement. *E.g.*: When I am in pain, the

employees at this institution…: …"help me to deal with practical aspects so I can participate in activities/social outings"; …"encourage me to participate in leisure and fun activities". The second subscale – perceived promotion of dependence (4 items) – assessed instrumental support [that] consist of tangible/behavioral help that substitute the person in pain in his or her activities, (…) [and] emotional/esteem support that reinforce lower self-efficacy to keep on functioning and activity/social avoidance. E.*g.*: *When I am in pain, the employees at this institution…*: …*"bring me everything so that I don't need to move"; …"advise me to stop doing whatever I am doing"*. Participants were asked to rate each item on a rating scale from 1 (not at all frequent) to 5 (extremely frequent). The revised ESSADI_PAIN presented very good psychometric properties (Matos et al., 2015). In this study, both factors presented excellent internal consistency at all measurement points (all alphas above .95). The scores for perceived promotion of autonomy and perceived promotion of dependence were calculated by computing the average of the respective four items. Higher scores represented higher perceived promotion of autonomy and dependence, respectively.

Pain Intensity and Disability.

At Time 1, 2 and 3, participants completed the pain severity (4 items) and interference (7 items) subscales of the BPI (Cleeland, 1989), validated for the Portuguese population by Azevedo and colleagues (2007). Participants were asked to rate their pain severity in the last week on a scale from 0 (no pain) to 10 (pain as bad as you can imagine): *e.g. "Please rate your pain by circling the number that best describes your pain at: a) its worst, b) its least, c) its average and d) the moment* (…). Also, they were asked to rate how pain had interfered with their: *a) general activity, b) mood, c) walking ability, d) normal work, e) relations with other people, f) sleep and g) enjoyment of life*, from 0 (does not interfere) to 10 (completely interferes). The Portuguese version showed good psychometric properties (Azevedo et al., 2007). In the present study, both factors presented good internal consistency indices at all measurement points (all alphas above .88). The scores for pain intensity and for pain-related disability were obtained by averaging all item scores for each subscale; higher scores reflected higher pain intensity and higher pain-related disability.

Pain-related Self-Efficacy.

Participants were presented, at Time 2 and 3, with the PSEQ (Nicholas, 2007). The PSEQ has been validated for the European-Portuguese population by Ferreira-Valente, Pais-Ribeiro & Jensen (2011), and includes 10 items assessing participants' self-efficacy beliefs to engage in daily activities despite pain (*e.g., I can enjoy things, despite pain; I can cope with my pain in most situations*), on a scale ranging from 0 (not at all confident) to 6 (completely confident). The Portuguese version presented good psychometric properties (Ferreira-Valente et al., 2011). In the present sample the scale showed very good internal consistency indices at T2 and T3 (all alphas above .96). Scale scores were obtained by the sum of the 10 items (ranging from 0 to 60). Higher scores indicated stronger self-efficacy beliefs.

Pain-related fear.

Participants were presented, at Time 2 and 3, with the TSK (Miller, Kori, & Todd, 1991). The TSK was validated for the Portuguese population by Cordeiro and colleagues (2013), and assessed the excessive and debilitating fear of physical movement and activity (*i.e.,* kinesiophobia; Kori et al., 1990) with good psychometric properties (Cordeiro et al., 2013). This version is a 13-item questionnaire (*e.g., My body is telling me I have something dangerously wrong; it's really not safe for a person with a condition like mine to be physically active*), answered on a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). The scale showed excellent internal reliability in the present sample at T2 and T3 (all alphas above .96). A total score was calculated by averaging all items; higher scores indicated higher levels of fear of movement/(re)injury.

Data Analysis

First, using IBM SPSS v22 (IBM Corp., 2013), we examined the descriptive statistics of the sample and of the variables of the models to be tested (perceived promotion of autonomy, perceived promotion of dependence, pain intensity, pain-related disability, pain related self-efficacy and pain-related fear). Using ANOVA tests, t-tests, Chi-square tests and Spearman correlations, we investigated the relationship between the variables included in the models

o be tested and participants' clinical and pain-related characteristics (pain duration and diagnosed pain conditions) ınd sociodemographic characteristics (sex, age, education level, marital status, institution to which participant ɔelonged and duration of attendance). Given the considerable amount of tested relations, we reduced our critical p-/alue to .01 to prevent an inflated type I error. Since no significant relationships were found, pain and socio-lemographic characteristics were not included as covariates in the following analyses.

Second, missing data were analyzed. Missing estimations were ran using an estimating method [Little's MCAR test chi-square= 609.250, df=547, *p*=.033; normed chi-square = 1.11 (so <2)] that led to the conclusion that nissing data were most likely at random (MAR).Therefore, missing imputation was performed using maximum ikelihood estimations. Subsequently, four longitudinal moderation models, with centered predictors and moderators, were tested using M-Plus 7.1 (Muthén & Muthén, 1998–2012). First, the interaction effects of pain intensity with ɔerceived promotion of autonomy, measured at Time 1, on pain-related disability at Time 2 and Time 3 were :xamined. Second, the interaction effects of pain intensity with perceived promotion of dependence, measured at Time 1, on pain-related disability at Time 2 and Time 3 were tested. Subsequently, simple slope analyses were :onducted to decompose the significant interaction effects. More specifically, the slopes representing the relationship ɔetween pain intensity and pain-related disability were calculated at different conventional values of the moderator- -1*SD*, *M*, +1*SD* (e.g., Aiken & West, 1991; Cohen, 1983). The reason for testing the interaction effects between pain ntensity and perceived promotion of autonomy/dependence on pain-related disability at Time 2 (6 weeks after ɔaseline) and 3 (12 weeks after baseline) was to confirm if the effect persisted after a longer lag.

Finally, only for the significant moderation models, the mediational effects of pain-related self-efficacy and ɔain-related fear were tested. Mediated moderation models were tested using maximum likelihood parameter :stimates with standard errors and a chi-square test statistic that are robust to non-normality – Maximum Likelihood Robust (MLR). Also, overall fit was assessed using established fit indexes – comparative fit index (CFI), the Tucker-Lewis index (TLI) and root mean square of approximation (RMSEA). Criteria for good fit were established by CFI>0.9; TLI>0.9; IFI>0.9; RMSEA <0.05 (Hu & Bentler, 1999; Schreiber, Nora, Stage, Barlow, & King, 2006). Furthermore, in order to corroborate the results, bootstrap confidence intervals were used from 5000 estimates, using

he cut-offs for the 2.5% highest and lowest scores of the empirical distribution. A bootstrapping approach was usefu lue to its inexistence of assumptions regarding distributions (Preacher & Selig, 2012). Using the statistical software M-Plus 7.1 (Muthén & Muthén, 1998–2012), the test of the mediated moderation models followed the procedures proposed by Muller, Judd, & Yzerbyt (2005). These procedures involved running a set of regression analyses in three steps:

Step 1 – Check for significant interaction effects of pain intensity x perceived promotion of autonomy or perceived promotion of dependence on the mediators (pain-related self-efficacy or pain-related fear), and for significant effects of the mediators on pain-related disability.

Step 2 – Check for significant interaction effects between the moderators (perceived promotion of autonomy or perceived promotion of dependence) and each mediator (pain-related self-efficacy or pain-related fear) on pain-related disability and for the significant effect of pain intensity on the mediator (pain-related self-efficacy or pain-related fear).

Step 3 – Check if the overall moderation effect was reduced, when at least one of the mediating processes described in step 1 and/or 2 were significant and controlled for.

According to Muller et al (2005), a mediated moderation was confirmed when the (1) the overall moderation effect was reduced and; (2) there was a significant interaction between intensity and perceived promotion of autonomy/dependence on pain-related self-efficacy or fear, and pain-related self-efficacy or fear was significantly associated with pain-related disability and/or; (3) there was a significant interaction between perceived promotion of autonomy/dependence and pain-related self-efficacy or fear, and pain intensity was significantly associated with pain-related self-efficacy or fear.

Results

Descriptive statistics

As shown in Table 1, participants reported low levels of pain intensity ($3.01<M<3.53$; the predictor) and pain disability ($3.80<M<3.28$; the outcome) across the three measurement times. Regarding the moderators, participants reported moderate levels of perceived promotion of autonomy ($2.84<M<2.96$) and low to moderate levels of perceived promotion of dependence across all measurement times ($1.80<M<2.05$). As for the mediators, participants reported moderate levels of pain-related self-efficacy at T2 and T3 ($32.41<M<33.80$) and high levels of pain-related fear at T2 and T3 ($2.29<M<2.39$).

Regarding the distributions, none of the variables in the hypothesized models followed a normal distribution – which was accounted for in further analyses. In fact, some variables – pain intensity, pain-related disability and perceived promotion of dependence – showed a quite asymmetric distribution (skewness/SE of skewness>1.96) indicating that participants' answers concentrated on the lower end of the rating scales. Other variables – pain-related disability, perceived promotion of autonomy and pain-related self-efficacy – showed a flat distribution (kurtosis/SE of kurtosis <-1.96).

Table 1 - Descriptives statistics and distribution of all variables at all time measurements

	Variable	Time	Mean	SD	Min	Max	Kurtosis/ KurtosisSE	Skewness/ SkewnessSE
Predictor	Pain intensity	T1	3.01	1.96	0	10	1.40	4.55
		T2	3.35	2.28	0	10	- .92	3.12
		T3	3.53	2.40	0	10	- .8	2.62
Outcome	Pain-related disability	T1	3.80	3.28	0	10	-2.65	2.59
		T2	3.84	3.23	0	10	-3.41	1.77
		T3	3.87	3.10	0	10	-2.37	2.55
Moderators	Perceived promotion of autonomy	T1	2.87	1.33	1	5	-3.29	-1.12
		T2	2.84	1.31	1	5	-3.33	-.63
		T3	2.96	1.27	1	5	-2.90	-1.30
	Perceived promotion of dependence	T1	1.80	.91	1	5	.41	4.95
		T2	1.99	.95	1	5	1.25	4.70
		T3	2.05	.96	1	5	.64	4.06
Mediators	Pain-related self-efficacy	T2	33.80	19.13	0	60	-3.18	-1.20
		T3	32.41	20.32	0	60	-3.36	- .85
	Pain-related fear	T2	2.29	.58	1	4	3.04	- .10
		T3	2.39	.60	1	4	1.83	.22

Simple Moderation Models: Perceived promotion of autonomy and dependence as moderators.

Pain intensity at T1 significantly predicted higher levels of pain-related disability at T2 and T3 (see Tables 2 and 3). Perceived promotion of autonomy at T1 did not have a direct effect on pain-related disability at T2 or T3, but significantly moderated the impact of pain intensity at T1 on pain-related disability at T2 (but not at T3). Further examination of the associations between pain intensity and pain-related disability at different levels of perceived

promotion of autonomy revealed that at higher levels of perceived promotion of autonomy (+1*SD*), the impact of pain intensity (T1) on pain-related disability (T2) was weaker (B=.819, t (169)= 5.571, p≤.001) than at lower levels of perceived promotion of autonomy (-1*SD*; B=1.067, t (169)= 7.671, p≤.001).

Table 2 – Perceived promotion of autonomy (T1) as moderator of the relationship between pain intensity (T1) and pain-related disability (T2 and T3).

Outcome variable: Pain-related disability (T2)					
	B	*SD B*	β	*p-value*	CI
Pain intensity (T1)	.943	.100	.573	.000	0.739; 1.145
Perceived promotion of autonomy (T1)	.074	.137	.030	.590	-0.199; 0.347
Pain intensity (T1) * Perceived promotion of autonomy (T1)	-.124	0.059	-.101	.035	-0.246; -0.002
Outcome variable: Pain-related disability (T3)					
	B	*SD B*	β	*p-value*	CI
Pain intensity (T1)	.575	.118	.363	.000	0.342; 0.809
Perceived promotion of autonomy (T1)	-.109	.164	-.046	.507	-0.437; 0.219
Pain intensity (T1) * Perceived promotion of autonomy (T1)	-.138	.084	-.116	.099	-0.310; 0.034

CI – bootstrap confidence intervals using the cut-offs for the 2.5% highest and lowest scores of the empirical distribution

With regard to perceived promotion of dependence, Table 3 shows that it independently predicted higher pain-elated disability at Time 3, but not at Time 2 and did not significantly moderate the relationship between pain ntensity and pain-related disability.

Table 3 – Perceived promotion of dependence (T1) as moderator of the relationship between pain intensity (T1) and pain-related disability (T2 and T3).

Outcome variable: Pain-related disability (T2)					
	B	*SD B*	β	*p-value*	CI
Pain intensity (T1)	.895	.108	.545	.000	0.677; 1.114
Perceived promotion of dependence (T1)	.448	.245	.127	.068	-0.043; 0.938
Pain intensity (T1)*Perceived promotion of dependence (T1)	-.109	.085	-.068	.200	-0.290; 0.072
Outcome variable: Pain-related disability (T3)					
	B	*SD B*	β	*p-value*	CI
Pain intensity (T1)	.488	.120	.308	.000	0.248; 0.728
Perceived promotion of dependence (T1)	.635	.279	.186	.023	0.081; 1.190
Pain intensity (T1) * Perceived promotion of dependence (T1)	-.165	.118	-.107	.160	-0.413; 0.082

CI – bootstrap confidence intervals using the cut-offs for the 2.5% highest and lowest scores of the empirical distribution

Mediated moderation models: Pain-related self-efficacy and fear as mediators.

The mediating mechanisms of pain-related self-efficacy and pain-related fear were only tested in the significant moderation model described above, *i.e.* the model in which perceived promotion of autonomy (T1) significantly moderated the relationship between pain intensity (T1) and pain-related disability (T2).

Pain-related self-efficacy

As shown in Table 4, the first step for testing a mediated moderation model (Muller et al., 2005) was met perceived promotion of autonomy (T1) significantly moderated the relationship between pain intensity (T1) and pain-related self-efficacy (T2, the mediator) (β=.177, $p \leq .01$), and pain-related self-efficacy (T2) significantly predicted pain-related disability (T2) (β=-.567, $p \leq .001$). The simple slope analysis of the interaction effect showed that higher levels of pain intensity (T1) strongly decreased older adults' pain-related self-efficacy (T2), but this relationship was stronger for older adults with low perceived promotion of autonomy (-1*SD*; *B*=-5.283, $t_{(169)}$=-5.331, $p \leq .001$) than for older adults with high perceived promotion of autonomy (+1*SD*; *B*=-2.697, $t_{(169)}$=-2.708, $p \leq .010$).

The second step was not fully confirmed because perceived promotion for autonomy (T1) did not significantly interact with pain-related self-efficacy (T2) on pain-related disability (T2); but pain intensity (T1) significantly predicted lower pain related self-efficacy at Time 2 (β=-.410, $p \leq .001$). Finally, the third step was met - the overall moderator effect of perceived promotion of autonomy on the relationship between pain intensity and pain-related disability disappeared in the presence of the interaction effect.

In sum, a mediated moderation was confirmed because the first and third steps, established by Muller et al. (2005), were met. Specifically, a significant interaction effect of pain intensity x perceived promotion of autonomy on pain-related self-efficacy was found; pain-related self-efficacy was significantly associated with pain-related disability; and the overall moderation effect was reduced. Furthermore, the fit of the mediated moderation model to the data was excellent ($\chi 2$=.072, p=.788, df=1, $\chi 2/df$=.072; CFI=1.0, TLI=1.1, RMSEA=.000).

Table 4 – Pain-related self-Efficacy (T2) mediates the moderator effect of perceived promotion of autonomy (T1) on the relationship between pain intensity (T1) and pain-related disability (T2).

Outcome variable: Pain-related self-efficacy (T2)					
	B	*SD B*	β	*p-value*	CI
Perceived promotion of autonomy (T1)	.938	1.013	.065	.354	-1.047; 2.923
Pain Intensity (T1)	-3.990	.740	-.410	.000	-5.441; -2.539
Perceived promotion of autonomy (T1)*Pain intensity (T1)	1.293	.505	.177	.011	0.303; 2.284
Outcome variable: Pain-related Disability (T2)					
	B	*SD B*	β	*p-value*	CI
Pain-related self-efficacy (T2)	-.096	.010	-.567	.001	-0.116; -0.075
Perceived promotion of autonomy (T1)	.172	.104	.071	.096	-0.043; 0.387
Pain Intensity (T1)	.575	.096	.350	.001	0.380; 0.771
Perceived promotion of autonomy (T1)*Pain intensity (T1)	-.033	.062	-.027	.595	-0.163; 0.097
Perceived promotion of autonomy (T1)*Pain-related self-efficacy (T2)	-.007	.006	-.055	.253	-0.020; 0.006

CI – bootstrap confidence intervals using the cut-offs for the 2.5% highest and lowest scores of the empirical distribution.

Pain-related fear

As shown in Table 5, the first step to test a mediated moderation model was not fully confirmed: perceived promotion of autonomy did not significantly interact with pain intensity on pain-related fear (β=.028, ns); however, pain-related fear was significantly associated with higher pain-related disability (β=.251, $p \leq .001$).

The second step was also not fully confirmed since perceived promotion of autonomy did not interact with pain-related fear on pain disability (β=.027, ns); but, pain intensity had a positive effect on pain-related fear (β=.307, $p \leq .001$). In sum, the mediated moderation model was not significant.

Table 5 – Pain-related fear (T2) as mediator of the moderator effect of perceived promotion of autonomy (T1) on the relationship between pain intensity (T1) and pain-related disability (T2).

Outcome variable: Pain-related fear (T2)					
	B	*SD B*	B	*p-value*	CI
Perceived promotion of autonomy (T1)	-.070	.037	-.159	.057	-0.142; 0.002
Pain intensity (T1)	.091	.027	.307	.001	0.037; 0.146
Perceived promotion of autonomy (T1)*Pain intensity (T1)	.006	.022	.028	.778	-0.038; 0.050
Outcome variable: Pain-related Disability (T2)					
	B	*SD B*	B	*p-value*	CI
Pain-related fear (T2)	1.384	.381	.251	.000	0.608; 2.160
Perceived promotion of autonomy (T1)	.164	.138	.068	.232	-0.115; 0.442
Pain intensity (T1)	.815	.105	.496	.000	0.600; 1.030
Perceived promotion of autonomy (T1)*Pain intensity (T1)	-.145	.068	-.118	.018	-0.287; -0.003
Perceived promotion of autonomy (T1)*Pain-related fear (T2)	.102	.237	.027	.563	-0.395; 0.599

CI – bootstrap confidence intervals using the cut-offs for the 2.5% highest and lowest scores of the empirical distribution.

Discussion

Perceived promotion of autonomy/dependence: buffers or amplifiers?

The first aim of this study was to test the buffering/amplifying effects of perceived promotion of autonomy/dependence on the relationship between pain intensity and older adults' pain-related disability. First, perceived promotion of autonomy at T1 buffered the deleterious effect of pain intensity (T1) on pain-related disability at T2, confirming the first hypothesis (H1). Indeed, at higher levels of perceived promotion of autonomy, the impact of pain intensity (T1) on pain-related disability (T2) was weaker than at lower levels of perceived

promotion of autonomy. This result is consistent with Ginting and colleagues (2011a, 2011b) findings, which showed that significant others' distracting responses, buffered the negative impact of pain intensity on pain disability and on mental quality of life of chronic pain patients. On the whole, these findings suggest that pain-related support that aims at the distraction and encouragement to function despite pain can be a protective factor of the detrimental effects of pain intensity on pain-related disability. It seems that, in order to be effective in its protective function, this type of support needs to be perceived by the person in pain as very salient and/or frequent. This idea may also account for the fact that, in the present study, this buffering effect was no longer significant from T1 to T3, indicating that it may dissolve as time goes by. In other words, to be effective, pain-related support for functional autonomy may need to be consistently and openly provided to pain sufferers.

Second, the present study aimed to explore whether perceived promotion of dependence amplified the effect of pain intensity on pain-related disability, therefore being a risk factor (H2). This hypothesis was not confirmed. Similarly, the role of solicitous support as an amplifier of the effects of pain intensity on pain-related outcomes has not been consistently supported (Badr & Milbury, 2011; Ginting et al., 2011a; Ginting et al., 2011b). Indeed, the idea that social support may amplify the effect of a stressor is at odds with the dominant theoretical models, where social support is mostly described as having a protective role and to buffer the harmful impact of aversive situations (*e.g.,* Thoits, 2011; Uchino, 2006). It seems that empirical findings, so far, favor the stress-buffering hypothesis.

However, rather than being an amplifier, perceived promotion of dependence influenced pain-related outcomes directly, as postulated by the direct effect hypothesis that states that social support influences health outcomes regardless of the levels of stress (*e.g.,* Wills, & Ainette, 2012). The present study not only replicated the negative association between perceived promotion of dependence and pain-related disability, found in previous cross-sectional studies (Matos & Bernardes, 2013; Matos, Bernardes & Goubert, 2016), but also clarified the temporal relationship between these constructs, by using a longitudinal design. These findings are also in line with research that has consistently shown that more significant other solicitousness is associated with more pain-related disability, more pain behaviors and lower well-being of individuals with chronic pain (*e.g.,* Coty & Wallston, 2010; Kerns et al., 1991; Romano et al., 1995, 2000, 2009). If these findings clarify the relationship between perceived promotion of

dependence and pain-related disability, the relationship between such type of support and pain intensity is still unclear. Indeed, it is plausible to assume that perceived promotion of dependence might partially mediate the relationship between pain intensity and pain disability. Future research should aim at disentangling the relationship between pain intensity and perceived promotion of dependence, because it is possible that, in the face of increased pain intensity, caregivers might promote higher functional dependence which, in turn, might lead to adverse outcomes.

In sum, present findings suggest that pain-related support for functional autonomy and dependence – perceived promotion of autonomy and perceived promotion of dependence – influence pain-related disability in opposite directions and, also, through different pathways. On the one hand, perceived promotion of autonomy consists of an adaptive function of pain-related social support by being a buffer against the detrimental effects of pain intensity on pain-related disability. On the other hand, perceived promotion of dependence consists of a maladaptive function of pain-related social support, which directly and negatively influences pain-related disability, regardless of pain intensity.

Pain-related self-efficacy mediates the buffering effects of perceived promotion of autonomy

The second aim of this study was to investigate potentially underlying psychological mechanisms – pain-related self-efficacy and pain-related fear – accounting for the previously described buffering effects of perceived promotion of autonomy. First, pain-related self-efficacy totally accounted for the buffering effect of perceived promotion of autonomy on the impact of pain intensity on pain-related disability, thus confirming hypothesis 3. In other words, for older adults who reported higher levels of perceived promotion of autonomy pain intensity had a weaker negative effect on their pain-related disability because, in those circumstances, their self-efficacy was also protected against the negative effects of pain intensity. In sum, to the best of our knowledge, our study is one of the first demonstrating that pain-related self-efficacy is a psychological mechanism that explains why pain intensity may have a weaker detrimental effect on pain-related disability when older people perceive high social support for functional autonomy.

Second, pain-related fear did not account for the buffering effect of perceived promotion of autonomy on the impact of pain intensity on pain-related disability, thus not confirming hypothesis 5. Still, pain-related fear at T2 was significantly predicted by pain intensity at T1 and associated with higher pain-related disability at T2, which is congruent with previous research (*e.g.,* Arnstein, 2000; Costa et al., 2011; Kori, et al., 1990; Vlaeyen et al., 1995). However, perceived promotion of autonomy was not a buffer of the negative effect of pain intensity on pain-related fear or of pain-related fear on pain-related disability. Although pain-related support can convey the belief that activity might or might not be dangerous to the person in pain, it is more likely that direct activity experiences are more effective in reducing pain-related fear (*e.g.,* Vlaeyen & Crombez, 1999). Therefore, perhaps a behavioral intervention, rather than an interpersonal intervention based on the provision of pain-related support for autonomy, may be more effective in reducing the impact of pain intensity on pain-related fear and of pain-related fear on pain-related disability.

Finally, it should be noted that our findings are in line with other studies (*e.g.,* Costa et al., 2011) that highlight the larger impact of pain-related self-efficacy (vs. fear) in predicting better pain-related outcomes, and stress that interventions should aim at increasing the former rather than decreasing the latter.

Limitations and directions for future research

This study is innovative by exploring the buffering and amplifying effects of two types of pain-related support - perceived promotion of autonomy and dependence. It has its merits by using longitudinal data with structural equation modelling, which allows drawing conclusions about the causality of these relationships. Nevertheless, some limitations should be pointed out, which may indicate directions for future research. First, participants were all attendants at day-care centers in urban areas, only using formal social support facilities part-time. This means that other sources of support (*e.g.,* family, friends, and neighbors) that are not being considered might also play an important role. Therefore, further investigations could be conducted on the role of informal pain-related social support on older adults' pain experiences. Second, due to sampling limitations it was not possible to account for the nested nature of the data of individuals within institutions. As a consequence, the potential effect of the institution

was not properly addressed. Although our preliminary bivariate tests showed no significant institution effects on the variables of the models, future research should make possible to take into account the nested nature of the data. Third, measures of mood and distress (*e.g.,* depression and anxiety) were not included. Since mood has been shown to influence the assessment and recall of others behaviors (*e.g.,* Forgas, Bower, & Krantz, 1984), it may have influenced individuals' perceptions of received social support. The inclusion of mood measures would have at least allowed controlling for its effects. As for not measuring distress, it might have left out a significant part of older adults' pain experiences since both pain and social support are often linked to distress (*e.g.,* Pjanic et al., 2013). It is known that receiving social support might lead to worse psychological outcomes, by undermining individuals' sense of efficacy, self-esteem and autonomy and causing feelings of indebtedness and inequity (*e.g.,* Bolger et al., 2000; Rafaeli & Gleason, 2009). This most often occurs when support signals that the recipient is incapable of coping independently with a stressful situation and is dependent on the provider for help (Rafaeli & Gleason, 2009), *i.e.,* when support promotes functional dependence. In other words, perceived promotion of autonomy and dependence could also be differentially associated with distress. This hypothesis is yet to be tested.

Fourth, data collection was done by interviews inside the institutions, which might have increased social desirability bias, eventually accounting for the very low levels of perceived promotion of dependence that may be perceived as less socially desirable. In the future, research protocols should be filled out autonomously by older adults in other settings outside the institution (for example at home).

Finally, it would have been interesting to have collected information on formal caregivers and service/facilities characteristics (e.g., provider/attendant ratio), as they may to some extent influence older adults' experiences and reports of received social support.

Theoretical and practical implications

The present findings confirm that different types of pain-related social support, depending on whether it promotes functional autonomy or dependence, are associated with different pain-related outcomes (Matos & Bernardes, 2013; Matos, Bernardes & Goubert, 2016). Findings also show that these different functions work through different pathways. Perceived promotion of autonomy is a protective factor and has a buffering role, while

perceived promotion of dependence is a risk factor and directly influences higher pain-related disability. Promoting functional autonomy encompasses providing behavioral help and emotional/esteem support that aims to increase one's confidence to keep on functioning and to engage in (social and physical) activity despite pain. The present findings provide support to the argument that pain-related support for functional autonomy, within the context of chronic pain in older adults, is a more adaptive path in order to reduce the toll of chronic pain experiences. As such, it has the potential to contribute to a healthy aging process, despite chronic pain. On the other hand, promoting functional dependence is maladaptive within a chronic pain context, since it has been consistently associated to higher pain-related disability.

From a practical perspective, these findings could inspire the development of training programs with formal caregivers. Such training programs could aim to raise caregivers' awareness about present practices, increase their knowledge and skills to promote functional autonomy and to minimize the promotion of functional dependence among older adults with chronic pain. Also, regarding interventions with older adults with chronic pain, they should aim to increase individual's knowledge and self-management skills to rely on others support to improve functional autonomy, in order to endure in physical and social activities despite pain.

In sum, due to the high prevalence of musculoskeletal chronic pain in older populations, formal caregivers are important sources to help older adults overcome the functional obstacles posed by pain. Social support for functional autonomy despite pain is a way to promote older adults' healthy ageing and well-being.

References

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Sage.

American Psychological Association. (2010). Ethical principles of psychologists and code of conduct. Retrieved from http://www.apa.org/ethics/code/principles.pdf

Arnstein, P. (2000). The mediation of disability by self-efficacy in different samples of chronic pain patients. *Disability and rehabilitation*, *22*(17), 794-801. http://dx.doi.org/10.1080/09638280050200296

Arnstein, P., Caudill, M., Mandle, C. L., Norris, A., & Beasley, R. (1999). Self-efficacy as a mediator of the relationship between pain intensity, disability and depression in chronic pain patients. *Pain*, *80*, 483-491. http://dx.doi.org/10.1016/S0304-3959(98)00220-6

Azevedo, L.F., Pereira, A.C., Dias, C., Agualusa, L., Lemos, L., Romão, J., . . . Castro-Lopes, J.M. (2007). Tradução adaptação cultural e estudo multicêntrico de validação de instrumentos para rastreio e avaliação do impacto da dor crónica. *Dor, 15*(4), 6-56.

Badr, H. & Millbury, K. (2011). Associations between depression, pain behaviors, and partner responses to pain in metastatic breast cancer. *Pain, 152*, 2596-2604. http://dx.doi.org/10.1016/j.pain.2011.08.002

Benight, C., & Bandura, A. (2004). Social cognitive theory of posttraumatic recovery: The role of perceived self-efficacy. *Behaviour Research and Therapy, 42*, 1129–1148. http://dx.doi.org/10.1016/j.brat.2003.08.008

Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of personality and social psychology*,*79*(6), 953-961. http://dx.doi.org/10.1037/0022-3514.79.6.953

Brock, R. L., & Lawrence, E. (2009). Too much of a good thing: underprovision versus overprovision of partner support. *Journal of Family Psychology*,*23*(2), 181-192. http://dx.doi.org/10.1037/a0015402

Campbell, P., Wynne-Jones, G., & Dunn, K.M. (2011). The influence of informal social support on risk and prognosis in spinal pain: a systematic review. *Eur J Pain, 15*(5), 444.e1-444.e14. http://dx.doi.org/10.1016/j.ejpain.2010.09.011

Cleeland, C.S. (2009). The Brief Pain Inventory – User guide. Retrieved from http://www.mdanderson.org/education-and-research/departments-programs-and-labs/departments-and-divisions/symptom-research/symptom-assessment-tools/BPI_UserGuide.pdf

Cleeland, C.S. (1989). Measurement of pain by subjective report. In: C.R. Chapmen & J.D. Loeser (Eds.). *Advances in Pain Research and Therapy* (pp. 391-403). New York, NY: Raven Press.

Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, 38, 300-314. http://dx.doi.org/10.1097/00006842-197609000-00003

Cohen, J. (1983). The cost of dichotomization. Applied psychological measurement, 7(3), 249-253.

Cohen, S., & McKay, G. (1984). Social support, stress and the buffering hypothesis: A theoretical analysis. In A. Baum, S.E. Taylor, & J.E. Singer (Eds.), *Handbook of Psychology and Health* (253-267). Hillsdale, NJ, England: Lawrence Erlbaum Associates

Cohen, S., Gottlieb, B.H., & Underwood, L.G. (2000). Theorectical and historical perspectives. In: S. Cohen, L.G. Underwood & B.H. Gottlieb (Eds.). *Social support measurement and intervention. A guide for health and social scientists* (3-25). New York, NY*:* Oxford University Press.

Cordeiro, N., Pezarat-Correia, P., Gil, J., & Cabri, J. (2013) Portuguese language version of the Tampa Scale for Kinesiophobia [13 items]. *Journal of Musculoskeletal Pain, 21*(1), 58-63. http://dx.doi.org/10.3109/10582452.2012.762966

Costa, L. D. C. M., Maher, C. G., McAuley, J. H., Hancock, M. J., Herbert, R. D., Refshauge, K. M., & Henschke, N. (2009). Prognosis for patients with chronic low back pain: inception cohort study. BMJ, 339, b3829. http://dx.doi.org/10.1136/bmj.b3829

Costa, L.C., Maher, C.G., McAuley, J.H., Hancock, M.J., & Smeets, R.J.E.M. (2011). Self-efficacy is more important than fear of movement in mediating the relationship between pain and disability in chronic low back pain. *European Journal of Pain, 15*(2), 213-209. http://dx.doi.org/10.1016/j.ejpain.2010.06.014

Coty, M. B., & Wallston, K. A. (2010). Problematic social support, family functioning, and subjective well-being in women with rheumatoid arthritis. *Women & health, 50*(1), 53-70. http://dx.doi.org/10.1080/03630241003601079

Denison, E., Åsenlöf, P., Sandborgh, M., & Lindberg, P. (2007). Musculoskeletal pain in primary health care: subgroups based on pain intensity, disability, self-efficacy, and fear-avoidance variables. The Journal of Pain, *8*(1), 67-74. http://dx.doi.org/10.1016/j.jpain.2006.06.007

Denison, E., Åsenlöf, P., & Lindberg, P. (2004). Self-efficacy, fear avoidance, and pain intensity as predictors of disability in subacute and chronic musculoskeletal pain patients in primary health care. *Pain*, *111*(3), 245-252. http://dx.doi.org/10.1016/j.pain.2004.07.001

Evers, A., Kraaimaat, F., Geenen, R. Jacobs, J., Bijlsma, J. (2003). Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. *Behaviour Research and Therapy, 41*, 1295-1310. http://dx.doi.org/10.1016/S0005-7967(03)00036-6

Forgas, J. P., Bower, G. H., & Krantz, S. E. (1984). The influence of mood on perceptions of social interactions. *Journal of Experimental Social Psychology, 20*(6), 497-513. http://dx.doi.org/10.1016/0022-1031(84)90040-4

Ferreira-Valente, M.A., Pais-Ribeiro, J-L, Jensen, M.P. (2011). Psychometric properties of the Portuguese version of the pain self-efficacy questionnaire. *Acta Reumatol Port, 36*, 260-267.

Ferrel, B.A. (1995). Pain evaluation and management in the nursing home. *Ann Intern Med, 123*, 681-87. http://dx.doi.org/10.7326/0003-4819-123-9-199511010-00007.

Ginting, J. V., Tripp, D. A., & Nickel, J. C. (2011a). Self-reported spousal support modifies the negative impact of pain on disability in men with chronic prostatitis/chronic pelvic pain syndrome. *Urology, 78*(5), 1136-1141. http://dx.doi.org/10.1016/j.urology.2011.03.073

Ginting, J. V., Tripp, D. A., Nickel, J. C., Fitzgerald, M. P., & Mayer, R. (2011b). Spousal support decreases the negative impact of pain on mental quality of life in women with interstitial cystitis/painful bladder syndrome. *BJU international,* 108(5), 713-717. http://dx.doi.org/10.1111/j.1464-410X.2010.09846.x

Helme, R.D., & Gibson, S.J. (2001). The epidemiology of pain in elderly people. *Clin Geriatr Med,* 17, 417-431. http://dx.doi.org/10.1016/S0749-0690(05)70078-1

Hughes, S., Jaremka, L. M., Alfano, C. M., Glaser, R., Povoski, S. P., Lipari, A. M., ... & Malarkey, W. B. (2014). Social support predicts inflammation, pain, and depressive symptoms: Longitudinal relationships among breast cancer survivors. *Psychoneuroendocrinology, 42*, 38-44. http://dx.doi.org/10.1016/j.psyneuen.2013.12.016

IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

ISCTE – Instituto Universitário de Lisboa (2016). Ética na investigação.

Johannes, C. B., Le, T. K., Zhou, X., Johnston, J. A., & Dworkin, R. H. (2010). The prevalence of chronic pain in United States adults: results of an Internet-based survey. *The Journal of Pain, 11*(11), 1230-1239. http://dx.doi.org/10.1016/j.jpain.2010.07.002

Katz, S., Ford, A.B., Moskowitz, R.W., Jackson, B.A., Jaffee, M.W. (1963). The index of ADL: a standardized measure of biological and psychosocial function. *JAMA, 185*, 914-919. http://dx.doi.org/10.1001/jama.1963.03060120024016

Keefe, F. J., Smith, S. J., Buffington, A. L., Gibson, J., Studts, J. L., & Caldwell, D. S. (2002). Recent advances and future directions in the biopsychosocial assessment and treatment of arthritis. *Journal of Consulting and Clinical Psychology, 70*(3), 640. http://dx.doi.org/10.1037/0022-006X.70.3.640;

Kerns, R.D., Southwick, S., Giller, E.L., Haythornthwaite, J.A., Jacob, M.C., Rosenberg, R. (1991). The relationship between reports of pain-related social interactions and expressions of pain and affective distress. *Behavior Therapy, 22*, 101-111. http://dx.doi.org/10.1016/S0005-7894(05)80248-5

Kori, S. H., Miller, R. P., & Todd, D. D. (1990). Kinesiophobia: a new view of chronic pain behavior. *Pain management, 3*(1), 35-43.

Lafrenière, S.A., Carrière, Y., Martel, L., & Bélanger, A. (2003). Dependent seniors at home-formal and informal help. *Health Reports, 14*, 31-40. http://dx.doi.org/10.1007/s10865-006-9085-0

Lakey, B., & Cohen, S. (2000). Social Support Theory and Measurement. In Cohen, S., Underwood, L. G., & Gottlieb, B. H. (Eds.), *Social support measurement and intervention: A guide for health and social scientists*. (29-52). New York, NY: Oxford University Press.

Leeuw, M., Goossens, M.E., Linton, S.J., Crombez, G., Boersma, K., & Vlaeyen, J.W. (2007). The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. *Journal of Behavioral Medicine, 30*, 77–94. http://dx.doi.org/10.1007/s10865-006-9085-0

Lethem, J., Slade, P.D., Troup, J.D., Bentley, G. (1983). Outline of a Fear-Avoidance Model of exaggerated pain perception-I. *Behavioral Research Therapy, 21*, 401–08. http://dx.doi.org/10.1016/0005-7967(83)90009-8

Maisel, N.C., & Gable, S.L. (2009). The paradox of received social support. The importance of responsiveness. *Psychological Science, 20*(8), 928-932. http://dx.doi.org/10.1111/j.1467-9280.2009.02388.x

Martire, L. M., Stephens, M. A. P., & Schulz, R. (2011). Independence centrality as a moderator of the effects of spousal support on patient well-being and physical functioning. *Health Psychology, 30*(5), 651-655. http://dx.doi.org/10.1037/a0023006

Matos, M., Bernardes, S. F., & Goubert, L. (2016). The relationship between perceived promotion of autonomy/dependence and pain-related disability in older adults with chronic pain: the mediating role of self-reported physical functioning. *Journal of Behavioral Medicine*, 1-12. http://dx.doi.org/10.1007/s10865-016-9726-x

Matos, M., & Bernardes, S.F. (2013). The Portuguese Formal Social Support for Autonomy and Dependence in Pain Inventory (FSSADI_PAIN): a preliminary validation study. *British Journal of Health Psychology, 18,* 593-609 http://dx.doi.org/10.1111/bjhp.12006

Matos, M., Bernardes, S.F., Goubert, L., & Carvalho, H. (2015). The revised Formal Social Support for Autonomy and Dependence in Pain Inventory (FSSADI_PAIN): Confirmatory factor analysis and validity. *The Journal of Pain,16*, 508-517. http://dx.doi.org/10.1016/j.jpain.2015.02.006

McWilliams, L. A., Saldanha, K. M., Dick, B. D., & Watt, M. C. (2009). Development and psychometric evaluation of a new measure of pain-related support preferences: The Pain Response Preference Questionnaire. *Pain Research and Management*, *14*(6), 461-469. http://dx.doi.org/10.1155/2009/429767

Miller, R.P., Kori, SH., Todd, D.D. (1991). The tampa scale for kinesiophobia. Unpublished report, Tampa.

Miranda, V. S., de Carvalho, V. B. F., Machado, L. A. C., Dias, J. M. D. (2012). Prevalence of chronic musculoskeletal disorder in elderly Brazilians: a systematic review of the literature. *Musculoskeletal Disorders, 13(*82), 1-11. http://dx.doi.org/10.1186/1471-2474-13-82

Mort, A., & Philip, L. J. (2014). Social isolation and the perceived importance of in-person care amongst rural older adults with chronic pain: a review and emerging research agenda. *Journal of Pain Management, 7*(1), 13-21.

Muller, D., Judd, C. M., & Yzerbyt, V. Y. (2005). When moderation is mediated and mediation is moderated. *Journal of Personality and Social Psychology, 89*(6), 852-863. http://dx.doi.org/10.1037/0022-3514.89.6.852

Muthén, L. K., & Muthén, B. O. (1998–2012). *M*plus user's guide (7th ed.). Los Angeles, CA: Muthén & Muthén.

Nicholas, M. (2007). The pain self-eficaccy questionnaire: taking pain into account. *European Journal of Pain, 11*, 153-163. http://dx.doi.org/10.1016/j.ejpain.2005.12.008

Pinsonnault, E., Desrosiers, J., Dubuc, N., Kalfat, H.,Colvez, A., Delli-Colli, N. (2003). Functional autonomy measurement system: development of a social subscale. *Archives of. Gerontology and Geriatrics, 37*, 223-233. http://dx.doi.org/ 10.1016/S0167-4943(03)00049-9

Pjanic, I., Messerli-Bürgy, N., Bachmann, M. S., Siegenthaler, F., Hoffmann-Richter, U., & Znoj, H. (2014). Predictors of depressed mood 12 months after injury. Contribution of self-efficacy and social support. *Disability and rehabilitation, 36*(15), 1258-1263. http://dx.doi.org/10.3109/09638288.2013.837971

Preacher, K. J., & selig, J. P. (2012). Advantages of monte carlo confidence intervals for indirect effect. *Communication Methods and Measures, 6*, 77-98. http://dx.doi.org/10.1080/19312458.2012.679848

Rafaeli, E., & Gleason, M. E. (2009). Skilled support within intimate relationships. *Journal of Family Theory & Review*, *1*(1), 20-37. http://dx.doi.org/10.1111/j.1756-2589.2009.00003.x

Reyes-Gibby, C.C., Aday, L.A., Cleeland, C.S. (2002). Impact of pain on self-related health in the community-dwelling older adults. *Pain, 95*, 75-82. http://dx.doi.org/10.1016/S0304-3959(01)00375-X

Roberts, M. H., Klatzkin, R. R., & Mechlin, B. (2015). Social support attenuates physiological stress responses and experimental pain sensivity to cold pressor pain. *Ann Behav Med, 49*, 557-569. http://dx.doi.org/10.1007/s12160-015-9686-3

Roberts, B. L., Matecjyck, M. B., & Anthony, M. (1996). The effects of social support on the relationship of functional limitations and pain to depression. *Arthritis & Rheumatism*,*9(*1), 67-73. http://dx.doi.org/10.1002/art.1790090112

Romano, J. M., Jensen, M. P., Turner, J. A., Good, A. B., & Hops, H. (2000). Chronic pain patient-partner interactions: Further support for a behavioral model of chronic pain. *Behavior Therapy, 31*(3), 415-440. http://dx.doi.org/10.1016/S0005-7894(00)80023-4

Romano, J. M., Turner, J. A., Jensen, M. P., Friedman, L. S., Bulcroft, R. A., Hops, H., & Wright, S. F. (1995). Chronic pain patient-spouse behavioral interactions predict patient disability. *Pain, 63*(3), 353-360. http://dx.doi.org/10.1016/0304-3959(95)00062-3

Romano, J. M.; Jensen, Schmaling, K. B., Hops, H., & Buchwald, D. S. (2009). Illness behaviors in patients with unexplained chronic fatigue are associated with significant other responses. *Journal of Behavioral Medicine, 32,* 558-569. http://dx.doi.org/10.1007/s10865-009-9234-3

Schulz, S., Brenk-Franz, K., Kratz, A., Petersen, J. J., Riedel-Heller, S. G., Schäfer, I., ... & Bickel, H. (2015). Self-efficacy in multimorbid elderly patients with osteoarthritis in primary care—influence on pain-related disability. *Clinical rheumatology, 34*(10), 1761-1767. http://dx.doi.org/10.1007/s10067-014-2766-0

Schwarzer, R., Boehmer, S., Luszczynska, A., Mohamed, N. E., & Knoll, N. (2005). Dispositional self-efficacy as a personal resource factor in coping after surgery. *Personality and Individual Differences, 39*(4), 807-818. http://dx.doi.org/10.1016/j.paid.2004.12.016

Tait, R. C., Chibnall, J. T., & Krause, S. (1990). The pain disability index: psychometric properties. *Pain, 40*(2), 171-182. http://dx.doi.org/10.1016/0304-3959(90)90068-O

Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of health and social behavior, 52*(2), 145-161. http://dx.doi.org/10.1016/0304-3959(90)90068-O

Thomas, E., Peat, G., Harris, L., Wilkie, R., & Croft, P.R. (2004). The prevalence of pain and pain interference in a general population of older adults: cross-sectional findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain, 110*, 361-368. http://dx.doi.org/10.1016/j.pain.2004.04.017

Turk, D. C., & Okifuji, A. (2002). Psychological factors in chronic pain: evolution and revolution. *Journal of Consulting and Clinical Psychology, 70*(3), 678. http://dx.doi.org/10.1037/0022-006X.70.3.678

Turk, D. C., & Gatchel, R. J. (Eds.). (2013). *Psychological approaches to pain management: A practitioner's handbook*. New York, NY: Guilford Publications.

Turk, D. C., Kerns, R. D., & Rosenberg, R. (1992). Effects of marital interaction on chronic pain and disability: examining the down side of social support. *Rehabilitation Psychology, 37*, 259-275. http://dx.doi.org/10.1037/h0079108

Uchino, B. N., Bowen, K., Carlisle, M., & Birmingham, W. (2012). Psychological pathways linking social support to health outcomes: a visit with the "ghosts" of research past, present, and future. *Social Science & Medicine, 74*, 949-9757. http://dx.doi.org/10.1016/j.socscimed.2011.11.023

Uchino, B.N. (2006). Social support and health: a review of physiological processes potentially underlying links to disease outcomes. *Journal of Behavioral Medicine, 29,* 377-387. http://dx.doi.org/10.1007/s10865-006-9056-5

Vlaeyen, J.W., Kole-Snijders, A.M., Rotteveel, A.M., Ruesink, R., & Heuts, P.H. (1995). The role of fear of movement/(re)injury in pain disability. *J Occup Rehab, 5*, 235-252. http://dx.doi.org/ 10.1007/BF02109988

Waddell, G., Newton, M., Henderson, I., Somerville, D., & Main, C. J. (1993). A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain, 52*(2), 157-168. http://dx.doi.org/ 10.1016/0304-3959(93)90127-B

Wilkie, R., Tajar, A., & McBeth, J. (2013). The onset of widespread musculoskeletal pain in associated with a decrease in healthy ageing in older people: a population-based prospective study. *PLoS ONE, 8*(3), 1-11. e59858. http://dx.doi.org/10.1371/journal.pone.0059858

Wills, T. A., & Ainette, M. G. (2012). Social Networks and Social Support. In A. Baum, T. A. Revenson & J. Singer (Eds.), *Handbook of Health Psychology*, 465-492. New York, NY: Taylor & Francis.

World Health Organization. (2015). World report on ageing and health. Luxembourg.