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Title: 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.

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## ABSTRACT

**Background:** Chronic pain is prevalent among older adults and is usually associated with high levels of functional disability. Social support for the promotion of functional autonomy and dependence has been associated with pain-related disability and self-reported physical functioning. Nevertheless, these relationships need further inquiry.

**Aims:** Our aims were to investigate: (1) the relationship between perceived promotion of autonomy/dependence and pain-related disability and (2) the extent to which self-reported physical functioning mediated these relationships.

**Method:** 118 older adults (Mage=81.0) with musculoskeletal chronic pain completed the Portuguese versions of the revised Formal Social Support for Autonomy and Dependence in Pain Inventory, the pain severity and interference scales of the Brief Pain Inventory, and the physical functioning scale of the Medical Outcomes Study-Short-Form 36 v2.

**Results:** Higher levels of perceived promotion of autonomy were associated with lower pain-related disability; this relationship was partially mediated by self-reported physical functioning ( $B=-.767$ ,  $p<.001$  decreasing to  $B'=-.485$ ,  $p<.01$ ). Higher perceived promotion of dependence was associated with higher pain-related disability; this effect was also partially accounted for by self-reported physical functioning ( $B=.889$ ,  $p<.01$  decreasing to  $B'=.597$ ,  $p<.05$ ).

**Conclusion:** These results highlight the importance of perceived promotion of autonomy and dependence for managing older adults' experience of chronic pain.

**Key-words:** social support, functional autonomy, functional dependence, physical functioning, chronic pain, older adults, pain-related disability.

## 1. Introduction

Chronic pain, defined as persistent or intermittent pain that lasts longer than 3 months (Merskey & Bogduk, 1994), affects over 50% of older adults – aged 60 or above (United Nations, 2013) – in community settings (Azevedo, et al., 2012; Dellaroza, et al., 2007; Helme & Gibson, 1997; Pereira et al, 2004) and 80% in institutional settings (e.g., Ferrel, 1995; Helme & Gibson, 2001). Indeed, the prevalence of chronic pain is known to increase with age (e.g., Blyth et al., 2001; Johannes et al., 2010) and musculoskeletal chronic pain (in muscles, ligaments, tendons and/or bones) is one of the most prevalent pain conditions among older adults (e.g., Miranda et al., 2012). Furthermore, in this particular age group, chronic pain is often associated with depression, sleep disturbances, avoidance of social interactions and decreased physical activity (e.g., Lee, et al., 2015; Mort & Philip, 2014; Stubbs et al., 2013; Zimmerman, et al., 2015). Also, chronic (musculoskeletal) pain often strongly interferes with older adults' performance of their daily activities (Helme & Gibson, 1997; Mobily et al., 1994; Reyes-Gibby et al., 2002; Thomas et al., 2004); in other words, it is often associated with high levels of pain-related disability (e.g., Cleeland, 2009; Tait, et al., 1990). Pain-related disability has been shown to be associated with a decrease in healthy ageing (Wilkie, et al., 2013), i.e., the process of developing and maintaining the functional ability that enables well-being in older age (World Health Organization [WHO], 2015). Therefore, identifying protective factors that may minimize the impact of chronic pain on the healthy ageing process of older adults' is of paramount importance. This paper contributes to this aim by focusing on the role of social support. For many decades, social support - defined as the support that people perceive to be available or that has been received, within the context of formal/informal relationships (Cohen et al., 2000) - has been shown to play a protective role within the context of a wide variety of health related issues (e.g., Berkman & Syme, 1979; Cobb, 1976; Cohen, et al., 2015; Cohen & Wills, 1985; Uchino 2006, Uchino, et al., 2012). With regard to pain research, evidence also suggests that social support may be an important factor in overcoming pain-related disability (e.g., Evers et al., 2003; Lee et al.,

2015; Ziryanova et al., 2006). Nevertheless, evidence for the relationship between social support and pain-related disability is often inconsistent (see review by Campbell et al., 2011). Some studies have shown that high social support in chronic pain patients is associated with lower levels of pain-related disability and avoidance of daily activities (e.g., Cohen & Wills, 1985; Evers et al., 2003; Hughes et al., 2014; Jamison & Virts, 1990; Roberts, et al., 2015; Turk et al., 1992). Meanwhile, other studies have demonstrated a positive association between social support and pain-related disability, increased pain behavior and dependence (e.g., Boothby et al., 2004; Kerns et al., 1991; Raichle et al., 2011). For example, studies have shown that perceived frequency of solicitous behavior, like significant others providing constant help and attention regarding pain behaviors, was associated with chronic pain sufferers' higher pain-related disability and increased pain behavior (e.g., Boothby et al., 2004; Kerns et al. 1991; Raichle et al., 2011; Romano et al., 2009). Overall, these findings suggest that social support can also have a negative impact on recipients' well-being and health outcomes by adversely influencing their health behaviors and ability to deal with adversity (e.g., Cohen & Syme, 1985; Schwarzer & Knoll, 2007). Indeed, responses from significant others towards chronic pain patients' expressions of discomfort have the potential to reinforce, maintain and exacerbate pain behaviors (e.g., Newton-John, 2002; Romano et al., 2009). In order to account for the inconsistencies found in the role of social support with regard to pain experiences, we have argued (Matos & Bernardes, 2013; Matos, et al., 2015) that the impact of social support on pain-related disability might depend on the extent to which it 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 to carry out activities of daily living; e.g., Katz et al., 1963). Our argument was based on the assumption that pain-related social support might influence pain-related functioning, namely by supporting physical/social activity (dis)engagement (Fordyce, 1976; Vlayen et al., 1995). More specifically, social support for functional autonomy could reinforce activity engagement, whereas social support for functional dependence could reinforce activity disengagement. In addition, according to the Fear Avoidance

Model (e.g., Leeuw et al., 2007; Vlaeyen et al., 1995), avoidance behaviors increase pain-related disability while confrontation behaviors lead to recovery. Thus, activity engagement might be a crucial factor in suppressing pain-related disability and a facilitator of recovery; whereas activity disengagement would increase pain-related disability and inhibit recovery. In sum, our contention was that with regard to pain-related disability, the extent to which pain-related social support might constitute either a risk or a protective factor would depend on whether it is promoting functional autonomy or dependence.

In order to test this assumption, we began by developing, validating and revising the Formal Social Support for Autonomy and Dependence in Pain Inventory (FSSADI\_PAIN; Matos & Bernardes, 2013; Matos, et al., 2015). This instrument measures the frequency of supportive actions a person in pain perceives they receive from formal caregivers (i.e., formal support), within the context of formal networks (e.g., day-care centers and nursing homes; Gauler & Kane, 2001; Lafrenière et al., 2003). This measure comprises two dimensions: (1) Perceived Promotion of Autonomy, which concerns “the perception of actions of support that either provide tangible help (instrumental support) or reinforce self-esteem and self-confidence (emotional/esteem support) to keep on going despite pain” (Matos & Bernardes, 2013, p. 596); and (2) Perceived Promotion of Dependence, which entails “the perception of actions of support that either provide tangible help by substituting the person in his/her activities (instrumental support) or, by being understanding and empathic, reinforcing lower self-efficacy (emotional/esteem support) to keep on going despite pain ” (Matos & Bernardes, 2013, p. 596).

Our previous studies using the FSSADI\_PAIN have shown a positive association between perceived promotion of dependence and pain-related disability among older adults with chronic pain; however, no significant relationship was found for perceived promotion of autonomy (Matos & Bernardes, 2013). Although these findings provide preliminary support for our assumptions, further inquiry into the association between perceived promotion of autonomy and dependence and pain-related disability is necessary. As such, the first aim of the present study was to further

investigate the relationship between perceived promotion of autonomy and dependence and pain-related disability. In particular, we hypothesized that: (H1) higher perceived promotion of autonomy would be associated with lower pain-related disability and, that (H2) higher perceived promotion of dependence would be associated with higher pain-related disability.

In addition, it is important to investigate the mechanisms that might mediate the relationship between perceived promotion of autonomy and dependence and pain-related disability. To date, a large body of research has identified cognitive (e.g., catastrophizing, pain-related self-efficacy), affective (e.g. pain-related fear) and behavioral (e.g., activity dis/engagement) determinants of pain-related disability (e.g., Arnstein, 2000; Costa et al, 2011; Hasenbring et al., 2006; Nicholas, 2007; Nielson, et al., 2001; Philips & Rachman, 1996; Vlaeyen et al., 1995). The extent to which these determinants may act as mediators of the influence of perceived promotion of autonomy and dependence on pain-related disability is yet to be explored. However, since we depart from a behavioral perspective by arguing that social support could influence pain-related disability by reinforcing functional autonomy/dependence, we chose to start by exploring the mediating role of a proxy of the latter, namely, self-reported physical functioning. In our previous work (Matos, et al., 2015), we established that the ability to perform daily activities – physical functioning - was positively associated with perceived promotion of autonomy and negatively associated with perceived promotion of dependence. As low physical functioning has been associated with pain-related disability (e.g., Leeuw et al., 2007; Lethem et al., 1983; Martin et al., 2010; Turk, 2002; Vlaeyen et al., 1995), we wanted to investigate whether the level of physical functioning could be a mechanism through which perceived promotion of autonomy and dependence would be related to pain-related disability. Thus, the second aim of the present study was to explore the mediating role of self-reported physical functioning in the relationship between perceived promotion of autonomy and dependence and pain-related disability, in older adults with chronic pain. Accordingly, we hypothesized that: (H3) the negative association between perceived promotion of autonomy and pain-related disability would be mediated by self-reported physical functioning; and, (H4) the

positive relationship between perceived promotion of dependence and pain-related disability would be mediated by self-reported physical functioning.

## 2. Method

### 2.1. Participants

The present sample (N=118) consisted of a sub-sample taken from a larger pool of individuals (N=250) who had participated in a previous study (Matos, et al., 2015), where the inclusion criteria were: (1) having attended a day-care center or a nursing home for at least six months; (2) being able to read and write autonomously; and (3) not presenting any kind of cognitive impairment (information provided by the institutions' clinical staff). More specifically, for the present study, a sub-sample of one hundred and eighteen participants (83.9% women) were selected based on the criteria of having reported continuous or intermittent pain for more than 3 months – chronic pain – felt in the last week. Older adults who did not report current pain or only reported acute pain were excluded from the present sample.

The 118 participants were users of four day-care centers (45.8%) and three nursing homes (54.2%) in the Lisbon area. All participants were retired and were aged between 53 and 95 years (Mage= 81.0 SD= 8.61). The vast majority had been widowed (71.2%), 14.4% were married, 9.3% were single and 5.1% were divorced. The participants' number of years of formal education ranged from 0 to 20 (M= 4.81; SD=4.33).

### 2.2. Instruments

**2.2.1. Social Support for Autonomy and Dependence in Pain.** The revised Formal Social Support for Autonomy and Dependence in Pain Inventory (FSSADI\_PAIN) is a measure, originally developed in Portuguese, that assesses the perceived frequency of formal social support actions for autonomy and dependence when in pain (Matos & Bernardes, 2013; Matos, et al., 2015). Confirmatory factor analyses have shown that this instrument comprises two underlying dimensions



– Perceived Promotion of Autonomy (4 items; 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*) and Perceived Promotion of Dependence (4 items; 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 rated the perceived frequency of autonomy and dependence support actions when in pain on a Likert scale, ranging from 1 (not at all frequent) to 5 (extremely frequent).

Both factors have shown very good internal consistency indices, in the original ( $\alpha_{PPA} = .88$ ;  $\alpha_{PPD} = .83$ ; Matos, et al., 2015) and in the present sample ( $\alpha_{PPA} = .86$ ;  $\alpha_{PPD} = .80$ ). The scores for perceived promotion of autonomy and dependence were obtained by computing the average of the corresponding four items. Higher scores represented higher perceived promotion of autonomy and dependence.

**2.2.2. Pain Disability and Severity.** Participants were presented with the pain severity and pain interference scales of the Portuguese version of the Brief Pain Inventory (BPI; Azevedo et al., 2007). Our initial intention was to use the pain interference scale to measure pain-related disability and, also, to assess and control for pain severity, which is often highly correlated with pain disability (e.g., Arnstein et al., 1999; Denison et al., 2004). Both scales of the Portuguese version, have shown good psychometric properties ( $\alpha_{\text{pain severity}} = .98$ ;  $\alpha_{\text{pain interference}} = .84$ ; Azevedo et al., 2007). It should be noted, however, that only some of the items on these subscales were presented. Given the clinical and sociodemographic characteristics of our sample (e.g., the participants' low educational level), we reduced the length of the data collection protocol by including the items with the highest factor loadings in previous studies. Also, items that were not relevant for the daily contexts and routines of institutionalized adults (e.g., pain interferes with housework) were excluded. Therefore, participants were asked to rate pain severity at its worst and on average, from 0 (no pain) to 10 (pain as bad as you can imagine) during the last week. Then, they were also asked to rate how pain had interfered with: a) their general activity, b) mood, c)

walking ability and d) sleep, from 0 (does not interfere) to 10 (completely interferes).

To assess the psychometric properties of these scales in the present sample, an exploratory factor analysis (principal axis factor analysis with oblique rotation) was conducted [ $KMO = .83$ ; Bartlett's  $\chi^2 (15) = 456, p = .000$ ]. Based on the Kaiser criterion, only one factor was extracted ( $n=6$  items; with pain interference items scoring higher) accounting for 61.2% of the total variance. This factor also showed a very high internal reliability ( $\alpha = .90$ ). Based on these results, we decided to use this factor as our outcome variable and termed it – pain disability/severity. The score for pain disability/severity was obtained by averaging all item scores, with higher scores reflecting a higher degree of chronic pain disability and severity.

**2.2.5. Self-reported Physical functioning.** To measure older adults' self-reported ability to perform daily physical activities, participants were presented with five items on the physical functioning scale of the Portuguese version of the Medical Outcomes Study - Short Form 36v2 (Ferreira, 2000 a; Ferreira, 2000 b). The Portuguese version of this scale has good psychometric properties ( $\alpha = .87$ ; Ferreira, 2000 b). Only the five items (out of 10) that were relevant to older adults' daily context and routines at nursing homes/day-care centers were administered. Participants were asked about their ability to a) do moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf; b) climb one flight of stairs; c) bend, kneel, or stoop; d) walk one block; e) bathe or dress. They answered on a scale ranging from 1 to 3 (1 = yes, limited a lot; 2 = yes, limited a little; 3 = No, not limited at all). An exploratory factor analysis (principal axis factor with oblimin rotation) was conducted [ $KMO = .85$ ; Bartlett's  $\chi^2 (10) = 466, p = .000$ ]. Based on the Kaiser criterion, one factor – self-reported physical functioning - was extracted, accounting for 72% of the total variance (5 items,  $\alpha = .93$ ). Following Ferreira's guidelines (Ferreira, 2000a), participants' answers to the items were transformed into a final score that ranged from 0 (lowest ability) to 100 (highest ability) to perform daily physical activities.

## 2.2. Procedure

This study followed the ethical guidelines established by the ethical review of research at the host institutions (CIS-IUL, 2013). Furthermore, it also complied with the code of conduct of psychologists concerning research (American Psychological Association, 2010) and with the ethical standards as set out in the 1964 Declaration of Helsinki and its later amendments. Also, boards of all the participating institutions (where data collection took place) approved the research protocol. First, four day-care centers and three nursing homes were invited to collaborate. No institution refused or disapproved the research protocol. Second, all participants were informed about the purpose of the study, informed consent was obtained from all individual participants included in the study, and they were guaranteed anonymity and confidentiality. No participants refused to take part in the study.

Prior to data collection, participants were screened for present pain experiences. Screening followed the methodological strategy of several (chronic) pain epidemiological studies (e.g., Breivik, et al., 2006; Torrance, et al., 2006), by using yes-or-no questions. More specifically, the questions were the same as those used in our previous study (e.g., Matos & Bernardes, 2013): (1) ‘Have you ever had constant or intermittent pain for more than three consecutive months?’ (2) ‘Did you feel this pain during the last week?’ and (3) ‘Did you feel any pain in the last week?’. Participants were deemed to have current chronic pain if they answered positively to questions 1 and 2. Participants who only answered positively to question 3 were considered as having current acute pain. Finally, all participants who answered negatively to questions 2 and 3 were considered as having no current pain.

The data collection protocol included several questionnaires in the following order: the revised FSSADI\_PAIN, the Portuguese versions of the pain severity and pain interference subscales from the BPI; the Portuguese version of the physical functioning scale of the MOS-SF-36 v2 and, finally, socio-demographic questions (sex, marital status, age, former profession, cohabitation

status, years of formal education and how long participants had attended the institution).

The protocols were mostly applied individually and in face-to-face interviews. This was done in order to facilitate the participation of people with a low level of education, visual impairment and, often, at the request of participants. Few participants read it and filled it out by themselves (2.5%). Data collection took place at the institutions the participants were attending, and generally in a quiet and isolated location. All participants and institutions were thanked and orally debriefed. Debriefing was an opportunity to provide participants and institutions with simple and relevant information about the subject and the nature of the study (APA, 2010; CIS-IUL, 2013).

### **2.3. Data Analysis**

First, using IBM SPSS v20, we analyzed the descriptive statistics of the sample and the distribution of the variables in the model to be tested (perceived promotion of autonomy, perceived promotion of dependence, self-reported physical functioning and pain disability/severity).

Second, we tested the relationship between the variables in the model and socio-demographic variables, using t-tests and Pearson correlations. By using the Bonferroni correction, in order to control for Type I error, a lower significance level was adopted ( $p = .05/12 = .004$ ). Since no significant relationships were found, socio-demographic variables were not included in the remaining analyses.

Third, two mediation models were tested, using 1) perceived promotion of autonomy and 2) perceived promotion of dependence, as predictors respectively; pain disability/severity as the criterion variable; and reported physical functioning as the mediator. Due to the lack of a normal distribution for most variables (see Table 1), a non-parametric approach (bootstrap) was used to test the mediation models. Preacher and Selig (2012) state that the benefits of using a bootstrapping approach are the inexistence of assumptions regarding distributions and its applicability to small samples. In this approach the effects are tested directly, rather than step-by-step (like the traditional approach of Baron & Kenny (1986)), by using a confidence interval derived by bootstrap that

allows the significance of the effects to be inferred without the assumption of a normal distribution. Therefore, both mediation models were investigated by directly testing the significance of the indirect effect of the predictors (perceived promotion of autonomy and perceived promotion of dependence) on the criterion variable (pain disability/severity) through the mediator (self-reported physical functioning). Following Preacher and Hayes' (2008) guidelines, a bootstrapping approach was used to test indirect effects from a 5000 estimate and 95% percentile-based confidence intervals, using the cut-offs for the 2.5% highest and lowest scores of the empirical distribution. The indirect effects were considered significant when the interval did not include zero.

### 3. Results

#### 3.1. Descriptive analysis and distribution

As shown in Table 1, participants reported a moderate level of perceived promotion of autonomy and this score showed a near normal distribution. Participants reported low perceived promotion of dependence; this score was particularly skewed and did not follow a normal distribution. Older adults reported moderately disabling/severe pain, with pain disability/severity normally distributed. Finally, participants reported having a low level of physical functioning; the distribution of this score was highly skewed and deviated from normality.

Table 1 – Descriptive statistics and distribution of PPA, PPD, Pain-related disability/severity and self-reported physical functioning ( $n=118$ ).

Variable	Min-Max	<i>M</i>	<i>SD</i>	Kurtosis/Std	Skewness/Std	K-S
				error of kurtosis	error of skewness	
PPA	1-5	2.80	1.17	-2.55	-.17	.021
PPD	1-5	1.66	.84	2.37	5.73	.000
Pain disability/ severity	.17-9.33	4.46	2.58	-2.31	.48	.200
Self-reported Physical functioning	0-100	33.2	33.2	1.41	3.07	.000

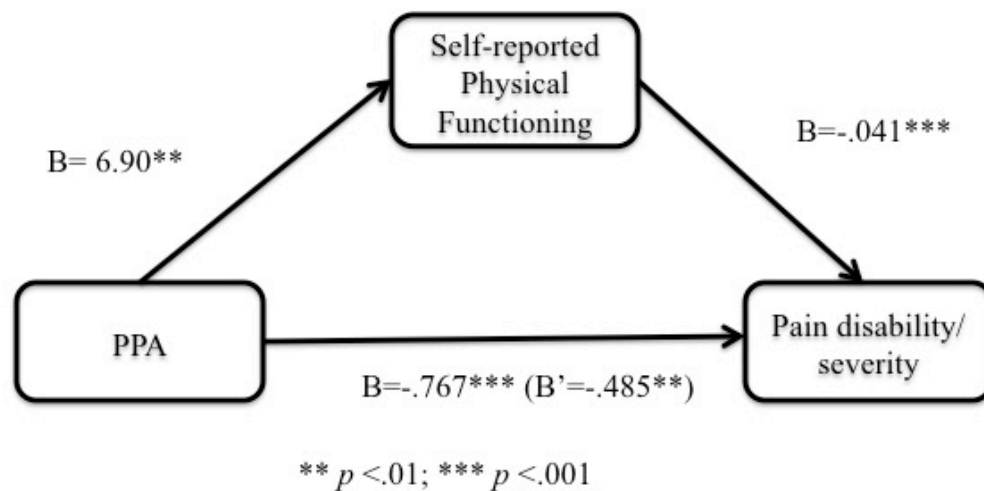
PPA - Perceived Promotion for Autonomy; PPD - Perceived Promotion for Dependence

### 3.2. The relationship between perceived promotion of autonomy and pain disability/severity: the mediating role of physical functioning

Figure 1 represents the mediation model in which perceived promotion of autonomy is the predictor, pain disability/severity is the criterion variable, and self-reported physical functioning is the mediator. As can be seen in Figure 1, perceived promotion of autonomy is negatively associated with pain disability/severity and it accounts for 11.3% of its variance ( $R^2_{adj} = .11$ ,  $F(1, 117) = 15.9$ ,  $p < .001$ ), as hypothesized in H1. This relationship was partially mediated by self-reported physical functioning, as shown by the decrease in the unstandardized regression coefficients ( $B = -.77$ ,  $p < .001$  to  $B = -.49$ ,  $p < .01$ ), corroborating H3. The percentile-based confidence interval of the empirical distribution  $[-.483; -.060]$  corroborated the significance of the indirect effect. More specifically, perceived promotion of autonomy was positively associated with self-reported physical functioning which, in turn, was negatively associated with pain disability/severity. The mediation

model accounted for 37% of the explained variance in pain disability/severity ( $R^2_{adj} = .37$ ,  $F(2, 117) = 35.2$ ,  $p < .001$ ).

Figure 1 –The relationship between PPA and pain disability/severity, partially mediated by self-reported physical functioning



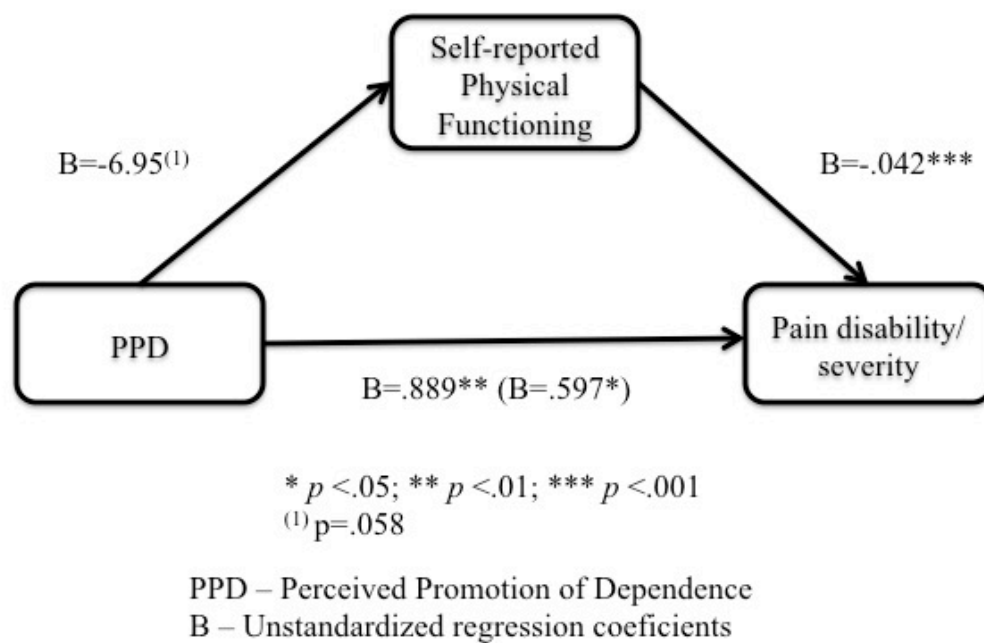
PPA – Perceived Promotion of Autonomy  
B – Unstandardized regression coefficients

### 3.3. The relationship between perceived promotion of dependence and pain disability/severity: the mediating role of physical functioning

Figure 2 represents the mediation model in which perceived promotion of dependence is the predictor, pain disability/severity the criterion variable and self-reported physical functioning the mediator. As can be seen in Figure 2, perceived promotion of dependence was positively related to pain disability/severity, accounting for 8% of its variance ( $R^2_{adj} = .08$ ,  $F(1, 117) = 10.5$ ,  $p < .01$ ), as hypothesized in H2. This relationship was partially mediated by self-reported physical functioning, as shown by the decrease in the unstandardized regression coefficients ( $B = .89$ ,  $p < .01$  to  $B = .60$ ,  $p < .01$ ), hence, corroborating H4. More specifically, perceived promotion of dependence was negatively associated with physical functioning. The percentile-based confidence interval of the empirical distribution [.023;.593] allowed us to sustain the significance of the indirect effect. In

addition, self-reported physical functioning was negatively associated with pain disability/severity. The mediation model accounted for 36% of pain disability/severity ( $R^2_{adj} = .36$ ,  $F(2, 117) = 33.82$ ,  $p < .001$ ).

Figure 2 –The relationship between PPD and pain-related disability/severity, partially mediated for by self-reported physical functioning.



#### 4. Discussion

Our first goal was to investigate the relationship between perceived promotion of autonomy and dependence and pain-related disability among older adults with chronic pain, who attended day-care centers or nursing homes. We hypothesized that (H1) higher perceived promotion of autonomy would be associated with lower pain-related disability; and (H2) higher perceived promotion of dependence would be related to higher pain-related disability. Our second aim was to explore the mediating role of self-reported physical functioning in the relationship between perceived promotion of autonomy and dependence and pain-related disability. It was expected that (H3) the positive relationship between perceived promotion of autonomy and pain-related disability would be accounted for by self-reported physical functioning. The negative relationship between perceived



promotion of dependence and pain-related disability would also be accounted for by self-reported physical functioning (H4).

Concerning the first aim, our findings confirmed that higher perceived promotion of autonomy was associated with lower pain disability/severity, and that higher perceived promotion of dependence was associated with higher pain disability/severity. Thus, the first two hypotheses were confirmed. These results support our contention that pain-related social support may be associated with different pain-related outcomes, depending on whether it promotes functional autonomy or dependence (Matos & Bernardes, 2013). More specifically, this pattern of findings – by supporting this direct association – indicates that perceiving the social context as providing pain-related support for functional autonomy is associated with less disabling/severe pain. In contrast, when support for functional dependence is perceived, it is related to more disabling/severe pain. These findings come partially in line with our previous results, which showed a significant association between higher perceived promotion of dependence and higher pain-related disability but a non-significant association between the latter and perceived promotion of autonomy (Matos & Bernardes, 2013). The difference between the previous and the present results might be accounted for, on one hand, by the usage of different versions of the FSSADI\_PAIN. For the present work, we used the revised version of the FSSADI\_PAIN (Matos et al., 2015) rather than the preliminary version used in Matos & Bernardes, 2013. On the other hand, there is also the possibility that the direct association between pain-related disability and perceived promotion of dependence might be more consistent than the association with perceived promotion of autonomy. Indeed, our findings on the role of perceived promotion of dependence come in line with accumulating evidence on the deleterious effects of solicitous support on pain-related disability (e.g., Boothby et al., 2004; Kerns et al., 1991; Raichle et al., 2011; Romano et al., 2009). However, the lack of current empirical evidence on the role of a more adaptive function of pain-related social support, like perceived promotion of autonomy, does not allow us to draw any firm conclusions on the nature of its

relationship with pain-related disability. If anything, our findings highlight the need to further explore the role of perceived promotion of autonomy on pain-related disability.

The second aim of the present study was to uncover underlying processes of the relationship between pain-related support for functional autonomy and dependence and pain-related disability, by testing the mediation effect of self-reported physical functioning. In line with a previous study (Matos et al., 2015), higher perceived promotion of autonomy was associated with higher self-reported physical functioning, and higher perceived promotion of dependence was associated with lower self-reported physical functioning. Like other studies, these findings show that social support is an important predictor of physical functioning, within the context of chronic diseases (e.g. Luszczynska, Sarkar, & Knoll, 2007; Shen, McCreary & Myers, 2004). Furthermore, following the predictions of the Fear Avoidance Model (e.g., Leeuw et al., 2007; Vlaeyen et al., 1995) and as shown in previous research (Crook & Moldofsky, 1994; Vlaeyen et al., 1995), self-reported physical functioning was significantly associated with pain-related disability. Finally, our findings have shown that self-reported physical functioning partially accounted for the relationships between perceived promotion of autonomy and dependence and pain disability/severity, thus supporting H3 and H4.

This pattern of findings could possibly be an indication that perceptions about pain-related support might act as reinforcement of physical functioning, hence, they may lessen pain disability/severity. If this were so, it would show that social support might influence health-related outcomes by influencing individuals' behaviors, like physical activity (e.g., Cohen & Syme, 1985). It would also indicate that social support provides more than just a "protective cushion" against stress (Benight & Bandura, 2004, p.1134). Indeed, as put forward by Schwarzer & Knoll (2007), (received) social support might constitute a vicarious experience in dealing with a stressor, thus enabling individuals' skills to deal with adversity.

Our findings also show that pain-related social support may be either adaptive or maladaptive. In a chronic pain context, support for functional autonomy seems to be adaptive by being associated

with higher physical functioning and lower interference of pain in older adults' daily lives.

Conversely, support for functional dependence seems to be maladaptive by being associated with lower physical functioning and higher pain disability/severity. It should be noted, however, that the extent to which these two functions of social support might be adaptive could depend on the specificities of pain experiences. For example, as we have argued before (Matos & Bernardes, 2013), it is possible that at the start of an acute pain episode, the most adaptive social response could be to promote functional dependence to hasten healing and recovery. Clearly, more research is needed to identify in which circumstances pain-related social support for functional autonomy and dependence is adaptive or maladaptive.

It should also be noted that due to the cross-sectional nature of the present study, we should also consider the possibility that the level of pain disability/severity or physical functioning might have influenced the kind of pain-related support received. As we have previously discussed (Matos & Bernardes, 2013), it is possible that people with higher disabling pain or lower physical functioning would display more pain behaviors, therefore eliciting more support actions promoting dependence instead of autonomy. This idea is congruent with Sullivan et al.'s (2004) Communal Coping Model of Catastrophizing showing that the presence of others might act as a cue to elicit pain behaviors, which in turn, would lead to more solicitous social responses. However, the impossibility of clarifying the causal relationship between these variables stresses the need to interpret our findings with caution.

Nevertheless, these results stress the importance of social support within the context of pain-related functioning, indicating that it can fulfill different functions and have different repercussions on behaviors and pain-related outcomes. Furthermore, present results corroborate the negative association between solicitous social support and higher pain-related disability/severity (e.g., Boothy et al., 2004; Kerns et al. 1991; Raichle et al., 2011; Romano et al., 2009), by showing the association between perceived promotion of dependence and higher pain disability/severity.

Moreover, our findings add a more positive view of the influence social support has on pain by

showing the association between higher perceived promotion of autonomy and less pain disability/severity.

### **Limitations, implications and directions for future research**

Some limitations of this study should, however, be pointed out. First, given the cross-sectional nature of the design, no conclusions can be drawn regarding the direction of causality. In future research, longitudinal studies should examine the impact of pain-related support on pain-related outcomes, over time.

A second limitation relates to the use of a self-report scale to measure physical functioning. Self-report measures only give information about participants' perceived ability to perform certain daily tasks. Despite the importance of measuring participants' views about their ability, this measure might be biased by recall or social desirability. More importantly, it does not provide information about actual/observed physical functioning concerning mobility, agility or strength to accomplish physical tasks. Indeed, perceived physical functioning might be poorly linked to real activity levels (Stubbs et al., 2013). In future research, physical functioning should also be assessed using observational measures.

Third, since self-reported physical functioning only accounted for part of the relationship between perceived promotion of autonomy and dependence and pain disability/severity, it would be interesting to explore other potential mediation mechanisms in future research, namely, cognitive and affective mediators. For example, one potential mediator could be fear of movement/(re)injury, which has been shown to be a strong predictor of pain-related disability in chronic pain patients (e.g., Vlaeyen et al., 1995); another potential mediator could be an individual's activity patterns (e.g., avoidance, overdoing and pacing), which also play an important role in the development and maintenance of chronic pain (Hasenbring et al., 2006; Nielson, et al., 2001; Philips & Rachman, 1996); a final potential mediator could be pain-related self-efficacy, which has been associated with lower levels of pain intensity, disability, depression and anxiety (e.g., Arnstein, 2000; Costa et al.,

2011; Nicholas, 2007). Indeed, from a biopsychosocial perspective on chronic pain (e.g., Gatchel, 2013; Turk & Gatchel, 2013) the present study only addresses how social and physical variables influence pain disability/severity. In future research, it would be interesting to explore the relationship between pain-related social support and cognitive and affective mechanism that have been shown as important predictors of pain-related disability (e.g., Turk & Gatchel, 2013). This new avenue of research would also contribute to the integration of a social and interpersonal dimension to the dominant models on pain-related disability, like the Fear Avoidance Model (e.g., Leeuw et al., 2007; Vlaeyen et al., 1995)

A fourth limitation relates to the measurement of pain-related disability in this study. The original pain severity and pain interference subscales were only partially presented. As a consequence, the extracted factor – pain disability/severity – included items related to pain severity and pain interference in daily activities. In future work, we ought to measure pain severity and disability independently and with more extensive measures, since they represent two different dimensions of the pain experience which, despite being highly correlated, might have different associations with perceived promotion of autonomy and dependence.

Lastly, concerning the generalization of the results, there are two features of the present sample that should be discussed. First, the participants' low educational level was one of the reasons for collecting data in face-to-face interviews. This, however, may have led to social desirability having a greater influence on participants' responses. Second, because all participants lived in urban areas, with family and friends generally living nearby, informal support might have higher relevance than in rural areas. That is to say, urban older adults might rate lower with regard to pain-related support received from formal sources because they may be getting more support from informal sources. These features might raise the question of whether such results could be generalized to a more heterogeneous sample of older adults. Therefore, future research should include older adults living in rural areas, with more years of formal education.

Despite its limitations, this work has several theoretical and practical implications. Firstly, from a theoretical perspective, its results highlight that pain-related social support, depending on whether it promotes functional autonomy or dependence, is associated with different pain-related outcomes for older adults living with chronic pain. Our contribution is innovative in that it proposes two different functions of social support that are specific to pain contexts. Furthermore, we show that these functions may have different associations with pain experiences, resulting in lesser or worse pain disability/severity. In other words, in a chronic pain context, pain-related social support might be adaptive as well as maladaptive, depending on the extent to which it promotes functional autonomy or dependence. We also begin to uncover one of the possible mechanisms that account for the relationship between pain-related support and pain-related outcomes.

From a practical point of view, in order to reduce pain-related disability, we would argue that autonomy and dependence promotion are functions of formal social support that could be targeted in training programs for the staff of day-care centers or nursing homes. For example, interventions could be developed to increase formal caregivers' knowledge and skills regarding which kinds of supportive behaviors are more adaptive for older adults with chronic pain. Thus increasing supportive behaviors that promote functional autonomy rather than functional dependence. Indeed, such supportive behaviors may even help promote older adults' physical activity, which is an important non-pharmacological strategy for managing chronic pain in older adults (e.g., Haneweer, et al., 2009; Hendrick et al., 2011; Stubbs et al., 2013).

Nonetheless, this is a line of research that it is still in its infancy and many features of pain-related support should stimulate future research and enlighten future interventions. Besides further exploring the mediating mechanisms of the relationship between perceived promotion of autonomy and perceived promotion of dependence, future research should also identify potential moderators of such relationships. Individuals' preferences for pain-related social support, the extent to which support actions are (in)visible or how the intentions behind those actions are perceived by the recipient are just some examples of potential moderators. Studies have shown that individuals'

responses to social support actions may depend on the extent to which these actions address their needs or preferences (e.g., Maisel & Gable, 2009). Therefore, the relationship between perceived promotions of autonomy and dependence and pain disability might depend on the extent to which older adults' prefer receiving pain-related support for autonomy or dependence (Bernardes, Matos & Goubert, under review). Research carried out by Bolger and colleagues (2000; 2007) showed that invisible support is far more beneficial than visible support. Further to that, and because receiving support has an emotional cost, the most effective support is that which is not perceived as support (Bolger, et al., 2000). In our present work, we are only assessing visible support for promotion of autonomy and dependence. We feel, however, that it would be interesting to explore whether part of the support provided by staff at institutions is not being perceived, and the extent to which such invisible support may also have an effect on older adults' pain related disability. Finally, would perceived promotion of autonomy still have a positive association with pain-related outcomes if older adults' considered such support behaviors neglectful or demanding? More research is needed to explore the moderating role of perceived intentions of support actions on the relationship between perceived promotion of autonomy/dependence and pain disability.

In conclusion, perceived promotion of autonomy and dependence are two important features of social support when managing older adults' chronic pain experiences. Future research on such functions of social support, but more specifically on perceived promotion of autonomy, can contribute towards preventing/reducing the deleterious effect of chronic pain on an older adult's healthy ageing process.

Ethical approval: All procedures carried out in this study, which involved human participants, were approved by the boards of the participating institutions, where data collection took place. Also, this research was carried out in accordance with the ethical standards as set out in the 1964 Declaration of Helsinki and its later amendments, or comparable ethical standards.

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