

Expression of Pain Behaviors and Perceived Partner Responses in Individuals With Chronic Pain

The Mediating Role of Partner Burden and Relationship Quality

Somayyeh Mohammadi, PhD,*† Christine T. Chambers, PhD,*†‡
and Natalie O. Rosen, PhD‡§

Objective: Expressions of pain by individuals with chronic pain may encourage solicitous and distracting responses from some partners and punishing responses from others. Partners' responses can impact the well-being of individuals with chronic pain. Yet information about factors that can explain the link between expression of pain behaviors and different partners' responses is scarce. The objective of this study was to investigate the role of perceived partner burden and relationship quality in the link between expressions of pain behaviors and perceived partner responses (ie, solicitous, distracting, and punishing responses).

Materials and Methods: Participants were 158 individuals with chronic pain (ie, experiencing pain on most days for at least 6 months before participating in the study) who completed questionnaires about pain behaviors, as well as perceptions of partner burden, relationship quality, and partners' solicitous, distracting, and punishing responses. The link between expressing pain and each type of partner response was investigated by serial mediation analysis. Partner burden and relationship quality were entered into all analyses as the first and the second mediator, respectively.

Results: Expressing more pain was related to higher levels of perceived partner burden, which in turn, was associated with poorer relationship quality. Poorer relationship quality was associated with reporting fewer solicitous and distracting partner responses and more punishing responses.

Discussion: Enhanced partner burden and reduced relationship quality may be one pathway through which pain behaviors relate to partner responses.

Key Words: chronic pain, partner responses, burden, relationship quality

(*Clin J Pain* 2018;34:927–935)

Received for publication November 5, 2017; revised February 3, 2018; accepted March 9, 2018.

From the *Centre for Pediatric Pain Research, IWK Health Centre; †Department of Pediatrics; ‡Department of Psychology and Neuroscience; and §Department of Obstetrics and Gynecology, Dalhousie University, Halifax, Canada.

S.M. was supported by a John J. Bonica Trainee Fellowship awarded from the International Association for the Study of Pain (IASP), Washington, DC and a Scotia Support Grant awarded to C.T.C. from the Nova Scotia Health Research Foundation (NSRHF), Halifax, Nova Scotia, Canada during the completion of this research. This research was supported by an operating grant awarded to N.O.R. from the Canadian Institutes of Health Research (CIHR; FRN#: 135870) Ottawa, ON, Canada and a New Investigator Award from the CIHR. C.T.C. is supported by a Canada Research Chair, Ottawa, ON, Canada. The authors declare no conflict of interest.

Reprints: Natalie O. Rosen, PhD, Departments of Psychology and Neuroscience and Obstetrics and Gynaecology, Dalhousie University, 1355 Oxford Street, P.O. Box 15000, Halifax, Nova Scotia, Canada, B3H 4R2 (e-mail: nrosen@dal.ca).

Copyright © 2018 Wolters Kluwer Health, Inc. All rights reserved.
DOI: 10.1097/AJP.0000000000000610

Pain behaviors are essential for estimating pain and necessary support by observers. From the perspective of the Social Communication Model of pain, pain is a subjective experience; however, pain manifestations and pain-related behaviors such as verbal communications, facial expressions, body gestures, and even paralinguistic cues (eg, moaning) can inform the observers (eg, spouses and romantic partners) of the pain experience.¹ These pain behaviors and expressions are adapted to encourage others, especially, family caregivers and partners to provide care and support for the person in pain.^{1,2} Partner responses to that pain may include (among others), solicitousness (eg, taking over chores and responsibilities), distraction (eg, encouraging the patient to work on a hobby), and punishing responses (eg, expressing anger and frustration).^{3,4} Several studies have shown that partners' responses play an essential role in the well-being of individuals with chronic pain.^{5–7} Specifically, some studies have shown that individuals with chronic pain report higher levels of pain intensity, disability, and more functional problems when their partners express more solicitous responses.^{4,8} Distraction and distracting responses have been shown to be related to lower levels of pain intensity and distress during painful procedures in some research.^{9,10} Finally, findings of some research on partners' punishing responses have indicated that punishing responses are related to higher levels of pain intensity and depression in individuals with chronic pain.^{11,12} Although there are still inconsistencies in the literature regarding the impacts of these responses on the patients' outcomes and the above-mentioned findings have not been observed uniformly¹³ or they have been observed in opposite directions^{14,15}; in general, partners' responses have been found to play a vital role in the well-being of individuals with chronic pain.¹⁶ Therefore, it is essential to understand factors that explain the link between the expression of pain behaviors and patients' perceptions of different types of partners' responses. Investigating these factors may help researchers and clinicians better understand the mechanisms that impact patients' perceptions of their partner responses to the pain, which may inform targets of intervention in pain management programs.

Partners of individuals with chronic pain may rely on the expression of pain behaviors as indicators that the person with pain needs help. To provide support, partners may make significant changes in their lives, such as reducing their social and professional activities.^{17,18} These changes along with caregiving tasks and responsibilities (eg, helping with dressing, walking stairs, providing emotional and motivational support) or even observing a loved one's pain, may contribute to partners' burden. Partner burden often manifests itself as lower levels of physical and psychological

well-being, loss of control over life, and higher levels of anger and distress in partners.^{19–22} Consequently, individuals with chronic pain who express more pain behaviors—intentionally or unintentionally—may be more likely to perceive higher levels of burden for their partners.

Partners' burden is negatively associated with the perceived relationship quality between individuals with chronic pain and their partners.²³ On the basis of social exchange theory,²⁴ in any given relationship, individuals strive to reduce the costs and maximize the benefits of the relationship; otherwise, dissatisfaction with the relationship will arise.²⁵ When individuals with chronic pain perceive burden in their partners (eg, they feel their partner is angry or have restricted their activities because of the pain), it might interfere with focusing on the positive aspects of their relationship and they may be more likely to perceive their partners as dissatisfied with the relationship. These perceptions may result in a negative way of interpreting partner responses, an increased expression of negative affect, and an increased dissatisfaction between individual with chronic pain and their partner.^{23,26} Therefore, in the couple context, when one member is experiencing disabling chronic pain and they also perceive their partner as suffering from feelings of burden, the room for engaging in positive activities and expressing positive affections may become more limited, as reflected by lower relationship quality between individuals with chronic pain and their partners.

The relationship quality between individuals with chronic pain and their partners plays an essential role in how they perceive their partners' responses.^{15,27} For example, when individuals with chronic pain are less satisfied with their relationship, they tend to perceive their partners' responses as more punishing and unsupportive, compared with those who are more satisfied.^{15,27} In a sample of individuals with chronic pain, Campbell et al²⁸ found that those with chronic pain who reported greater relationship quality with their partners also reported more solicitous and fewer punishing responses from their partners. In addition, based on the Social Support Model,²⁹ when individuals with chronic pain have a better relationship quality with their partners, they perceive partners' responses to be less punishing and more solicitous.¹⁵ The association between relationship quality and distracting responses in individuals with chronic pain has received less attention so far.²⁸ Both solicitous and distracting responses are typically considered as "helpful" responses by individuals with chronic pain.³⁰ Therefore, individuals with chronic pain who report better relationship quality may be more likely to report more solicitous and distracting responses and less punishing responses than individuals with chronic pain with poorer relationship quality. It should be noted that although viewed as supportive by individuals with chronic pain, solicitous partners' responses have actually been linked to more disability and pain.³¹ However, these responses along with distracting responses might still be the preferred responses of individuals with chronic pain because they communicate partners' empathy and concern.

The current study investigated the role of perceived partner burden and relationship quality in the link between pain behaviors and perceived partner responses. It was hypothesized that expressing more pain behaviors by individuals with chronic pain would be associated with greater perceived burden on their partners, which, in turn would be related to poorer self-reported relationship quality. Finally, poorer relationship quality would be associated with

reporting fewer solicitous and distracting, and more punishing partner responses.

MATERIALS AND METHODS

Procedure and Participants

The data for this cross-sectional study were collected over a 6-month period. Advertisements promoting this study were shared online using social media platforms (ie, Twitter and Facebook) and by asking pain-related organizations, patient advocates, and individuals with chronic pain to share the study with their online followers and members of their pain-related groups. Individuals who were interested in participating were asked to click on a link that directed them to an introductory page on our laboratory website that provided more information pertaining to the study as well as its inclusion and exclusion criteria. Inclusion criteria were: (1) at least 18 years of age; (2) experiencing pain on most days for the previous 6 months; (3) experiencing pain that was not caused by a terminal illness, such as cancer; (4) involved in a current romantic relationship for at least 6 months; (5) living with a romantic partner; (6) a resident of Canada or the United States; and (7) able to read and understand English. Interested individuals were invited to click on a link that directed them to another page in which they answered eligibility questions. (Except for the introductory page, the rest of the pages and the main survey were hosted on Qualtrics.com). Those who were not eligible were directed to another page on which they were thanked for their interest in the study and it was explained to them that they were not eligible. Conversely, eligible individuals were directed to an informed consent form and were asked to read the form and indicate their consent by clicking on "I agree." In total, 315 individuals answered the eligibility questions. Of those, 38 were not eligible for the following reasons: not living with a romantic partner ($n = 26$), not being a resident in either Canada or the United States ($n = 7$), having a terminal illness ($n = 6$), not being involved in a romantic relationship ($n = 5$); and not being able to read and understand English ($n = 1$). Of those who were eligible ($n = 276$), 225 individuals provided their consent and started the survey. The data of 55 participants were removed because they had completed <20% of the survey. In addition, the data of 12 participants were removed because they had answered incorrectly to > 1 (of a possible 3) attention check items. Each attention check item (embedded throughout the survey) asked participants to select a specific response. For example, the attention check item that was embedded among the items of the Revised Dyadic Adjustment Scale was "This is an attention check, please select 0 (All of the time)." Participants responded to an online survey assessing their pain behaviors, perceived partner burden, relationship quality, and perceived partner responses to their pain. Participants who completed the study were entered into a prize draw for 1 of 3 \$50 (Canadian) e-gift cards. This research was approved by our institution's Research Ethics Board (REB #: 2016-3935).

Measures

Demographic Variables

A demographics questionnaire was used to collect information on participants' age, sex, country of residence, marital status, ethnicity, pain condition, and duration.

Pain Behaviors

To assess pain behaviors, participants completed the Pain Behavior Check List.³² This measure included the instruction “How often do you do each of the following?” followed by 17 items describing 4 domains of pain behaviors. These 4 domains included distorted ambulation (eg, walk with a limp), affective distress (eg, express anger), facial/audible expressions (eg, clench teeth), and seeking help (eg, talk about the pain). Items were scored on a 7-point scale with endpoints of 0 (never) and 6 (very often). Responses were averaged and could range from 0 to 6, with higher scores reflecting greater pain behaviors. This measure showed good reliability and validity in previous studies of chronic pain.³² The Cronbach α for the total score of the pain behavior check list in the current study was 0.89.

Perceived Partner Burden

To assess participant perceptions of partner burden, they completed the Zarit Burden Interview (ZBI).²² The ZBI was originally developed to study the burden among different caregivers’ population.^{17,33} In previous studies, this measure has been administered both as an interview³⁴ and as a questionnaire.³³ To assess participant perception of partner burden, the wording of some items was slightly adapted (eg, “Do you feel that your social life has suffered because you are caring for your relative?” was changed to “Do you feel that your romantic partner’s social life has suffered because s(he) is caring for you?”). For each question (eg, “Do you feel, your romantic partner is angry when s(he) is around you?” or “Do you feel that because of the time your romantic partner spends with you, your romantic partner has not enough time for her/himself?”), participants were asked to respond on a 4-point Likert scale ranging from 0 (never) to 4 (nearly always). The total score of the ZBI was averaged and could range from 0 to 4. Higher scores indicated more perceived burden in partners. The Cronbach α for the ZBI in this study was 0.90.

Relationship Quality

To assess relationship quality, participants completed the well-validated Revised-Dyadic Adjustment Scale.³⁵ This measure consisted of 14 items describing 3 domains of relationship quality; these domains included consensus (6 items), satisfaction (4 items), and cohesion (4 items). Participants rated all items on a 6-point Likert scale with endpoints of 0 (always disagree; all of the time; never; never) and 5 (always agree; never; more often) or 4 (every day). An example item asked, “How often do you and your partner quarrel?” Responses were averaged and could range from 0 to 5, with higher scores indicating better relationship

quality. This measure had acceptable internal consistency and construct validity in previous studies.^{35,36} In the current study, the Cronbach α was 0.87.

Perceived Partner Responses

To assess participant perceptions of their partners’ responses to their pain, the “Significant Other Response” subscale of the West Haven-Yale Multidimensional Pain Inventory (WHYMPI)³⁷ was used. This section had 14 items and consisted of 3 subscales including solicitous responses (6 items; eg, “gets me to rest”), distracting responses (4 items; eg, “encourages me to work on a hobby”), and punishing responses (4 items; eg, “ignores me”). Participants were asked to indicate how often (in general) their partner responded to their pain in that particular way on a Likert scale ranging from 0 (never) to 6 (very often). In the current study responses to each subscale were averaged and could range from 0 to 6, with higher scores indicating more solicitous, distracting, or punishing responses. Previous research indicates that the reliability and validity estimates for the solicitous, distracting, and punishing subscales in the WHYMPI were acceptable.³⁷ In the current study, the α s for solicitous, distracting, and punishing subscales were 0.78, 0.68, and 0.90, respectively.

Statistical Analyses

To investigate the associations among the variables in this study, Pearson product-moment correlations were conducted. Demographic variables that were significantly correlated >0.30 with the study variables (ie, the predictor, the mediators, or the dependent variables) were controlled for in the mediation analyses. As Figure 1 displays, in the conceptual model, the independent variable (ie, pain behaviors) was related to each dependent variable (ie, partner responses: solicitous, distracting, and punishing responses) through 2 mediators (M_1 = perceived partner burden and M_2 = relationship quality), which were operating in serial. To test this model, model 6 of the SPSS PROCESS macro was used. Model 6 allowed for the investigation of conceptual models with 2 mediators in serial.³⁸ Three separate serial mediation analyses were used for each dependent variable (ie, solicitous, distracting, punishing responses). As Tables 2–4 show, in each serial mediation analysis the total effect of the independent variable on the dependent variable is shown by weight c (total effect shows the association between the independent and the dependent variables). The direct effect of the dependent variable on the independent variable is shown by weight c' . The direct effect shows the extent to which the dependent variable varies when there is a 1-unit increase in the

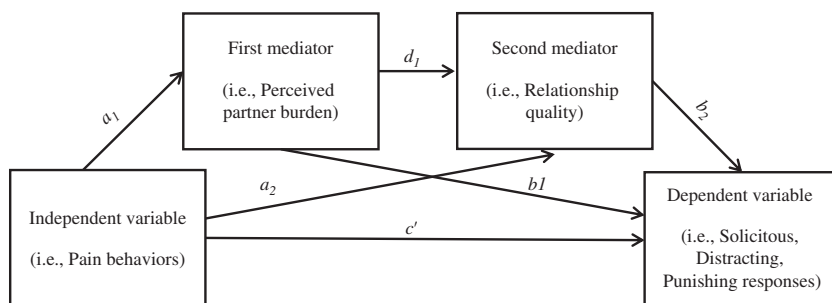


FIGURE 1. The conceptual model.

independent variables and the mediators is kept constant. In addition, in the current study, because there were 2 mediators in the model, the output consisted of 3 indirect effects: Weight a_1b_1 represents the indirect effect of the independent variable on the dependent variable solely through perceived partner burden (meaning that relationship quality was excluded; indirect effect 1; $X \rightarrow M_1 \rightarrow Y$). Weight a_2b_2 represents the indirect effect of the independent variable on the dependent variable only through relationship quality (meaning that perceived partner burden was excluded; indirect effect 2; $X \rightarrow M_2 \rightarrow Y$), and weight $a_1d_2b_2$ represents the indirect effect of the independent variable on the dependent variable through both perceived partner burden and relationship quality (indirect effect 3; $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$).

RESULTS

Descriptive Characteristics

The final sample of the current study consisted of 158 individuals with chronic pain. The mean age of the participants was 38.1 (SD=9.42) years. The majority of participants were women (88%; n=139). In addition, most participants were married (67.7%; n=107) and the rest were residing with their partner (29.1%; n=46). The average length of the relationship between participants and their partners was 9.6 (SD=9.02) years. The number of participants that were from the United States (51.3%; n=81) were only slightly more than the number of participants who were from Canada (48.7%; n=77). Participants identified as English Canadian (44.3%; n=70), American (44.3%; n=70), French Canadian (1.3%; n=2), First Nation Canadian (1.3%; n=2), and the rest were comprised of other ethnicities (6.9%; n=11). About one fifth of the participants (20.9%; n=33) indicated that they have no diagnosis for their chronic pain, 20.3% (n=32) indicated that they had only 1 diagnosis for their chronic pain, and the remaining participants (58.8%; n=92) reported >1 diagnosed pain condition. The most common pain condition among participants was migraine headache (45.6%; n=72). The other reported diagnosed pain conditions included tension headache (21.5%; n=34), irritable bowel syndrome (25.9%; n=41), chronic low back pain (36.7%; n=58), fibromyalgia (32.9%; n=52), musculoskeletal pain (31%; n=49), interstitial cystitis (1.9%; n=3), dyspareunia (8.2%; n=13), and endometriosis (11.4%; n=18). As participants could indicate >1 pain diagnosis, these numbers represent the total number of pain diagnoses that were reported by patients and not the total number of patients. In addition, participants were asked to select the location(s) of their pain on a body map. They could select up to 10 locations. The main pain locations that were selected by the participants were feet and legs (93%; n=147), pelvic and gluteal (68%; n=108), neck (76%; n=107), shoulders (51%; n=82), head (54%; n=94), lower back (47%; n=75), upper back (28%; n=45), hands (47%; n=75), abdomen (19%; n=31), and thorax (.05%; n=9). The average pain duration was 9.42 years (SD=8.73).

Participants' sex was not associated with any of the main variables in the study. Age was negatively associated with reporting of partners' solicitous ($r=-0.23$; $P<0.01$) and distracting responses ($r=-0.27$; $P<0.01$). Furthermore, pain duration was only associated with expression of pain behaviors ($r=-0.20$; $P<0.01$). Country (residing in Canada vs. the United States) was positively related to partner burden ($r=0.25$; $P<0.01$); living in Canada was related to reporting less partner burden; mean of partner

TABLE 1. Means, SDs, and the Associations Among Study Variables

	Mean (SD)	1	2	3	4	5	6
(1) Pain behaviors	4.07 (1.14)	1					
(2) Perceived partner burden	2.15 (0.79)	0.48*	1				
(3) Relationship quality	3.37 (0.69)	-0.30*	-0.52*	1			
(4) Solicitous responses	4.63 (1.28)	0.13	0.003	0.44*	1		
(5) Distracting responses	3.41 (1.16)	0.27*	0.025	0.37*	0.54*	1	
(6) Punishing responses	2.65 (1.70)	0.37*	0.56*	-0.71*	-0.45*	-0.24*	1

* $P<0.001$.

burden in Canada=1.94, mean of partner burden in the United States=2.35; $t=-3.25$; $P=0.001$). Finally, country was also related to reporting more solicitous responses ($r=0.17$; $P<0.05$); residing in Canada was related to reporting less solicitous responses; mean of solicitous responses in Canada=4.40, mean of solicitous responses in the United States=4.85; $t=-2.10$; $P=0.02$). Because none of the correlations between the demographic variables and the main variables in the model were >0.30 we did not include any covariates in the analyses. Table 1 presents the associations between the study variables.

Mediating Effects of Perceived Partner Burden and Relationship Quality in the Associations Between Pain Behaviors and Perceived Partner Responses

Solicitous Partner Responses

The results presented in Table 2 show that the total effect (weight c) was not significant (coefficient=0.16; $P=0.09$), whereas the direct effect (weight c') was significant (coefficient=0.24; $P=0.01$). The indirect effect 1 (pain behaviors→partner burden→solicitous responses) was significant (coefficient=0.11; confidence interval [CI], 0.02 to -0.23), meaning that partner burden mediated the link between the expression of pain behaviors and perceived solicitous partner responses. However, the indirect effect 2 (pain behaviors→relationship quality→solicitous responses) was not significant (coefficient = -0.06; CI, -0.18 to -0.04), suggesting that relationship quality alone did not mediate the link between pain behaviors and reporting solicitous responses. Finally, the indirect effect 3 (pain behaviors→partner burden→relationship quality→solicitous responses) was significant (coefficient = -0.14; CI, -0.23 to -0.08) indicating that higher pain behaviors was related to higher levels of perceived partner burden, which in turn, was related to poorer relationship quality, and then to reporting less partner solicitous responses.

Distracting Partner Responses

Table 3 shows the results of the serial mediation analysis with distracting partner responses as the outcome. The total effect (weight c ; coefficient=0.29; $P<0.01$) and the direct effect (weight c' ; coefficient=0.38; $P<0.01$) were

TABLE 2. Results of the Serial Mediation Analysis for Solicitous Partner Responses

Outcome of Each Step	Predictors	Coefficient*	SE	t	P	95% LLCI	95% ULCI
Burden	Pain behavior (weight a_1)	0.33	0.04	6.95	<0.01	0.23	0.42
	Partner burden (weight d_1)	-0.39	0.07	-5.07	<0.01	-0.54	-0.24
Relationship quality	Pain behaviors (weight a_2)	-0.05	0.05	-1.07	0.28	-0.15	0.04
	Partner burden (weight b_1)	0.35	0.15	2.28	0.023	0.04	0.66
Solicitous responses	Relationship quality (weight b_2)	1.11	0.14	7.91	<0.01	0.83	1.38
	Pain behaviors (weight c')	0.24	0.11	2.39	0.01	0.04	0.4
	Coefficient*		Bootstrapped SE*		Bootstrapped LLCI†		Bootstrapped ULCI†
Indirect effect 1 (weight a_1b_1)‡	0.11	0.05		0.02			0.23
Indirect effect 2 (weight a_2b_2)§	-0.06	0.05		-0.18			0.04
Indirect effect 3 (weight $a_1d_1b_2$)	-0.14	0.03		-0.23			-0.08

Total effect (weight c) was not significant (coefficient = 0.16; SE = 0.10; $P = 0.09$).

*The unstandardized coefficient.

†Bootstrapped with 5000 resamples.

‡The mediating effect of partner burden: $X \rightarrow M_1 \rightarrow Y$.

§The mediating effect of relationship quality: $X \rightarrow M_2 \rightarrow Y$.

||The mediating effects of partner burden and relationship quality: $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$.

LLCI indicates lower level confidence interval; ULCI, upper level confidence interval.

both significant. The indirect effect 1 (pain behaviors→partner burden→distracting responses; coefficient = 0.06; CI, -0.01 to -0.16) and indirect effect 2 (pain behaviors→relationship quality→distracting responses; coefficient = -0.04; CI, -0.14 to -0.03) were not significant. Results showed that indirect effect 3 (pain behaviors→relationship quality→distracting responses) was significant (coefficient = -0.11; CI, -0.18 to -0.06). This significant, indirect effect indicated that a greater expression of pain behaviors was related to higher levels of perceived partner burden. In turn, higher perceived partner burden was related to lower relationship quality. Finally, lower relationship quality was related to reporting fewer partner distracting responses.

Punishing Partner Responses

The results of the serial mediation analysis with punishing partner responses as the outcome are presented in Table 4. The results indicate that the total effect was

significant (weight c ; coefficient = 0.54; $P < 0.01$), whereas the direct effect did not reach a significant level (weight c' ; coefficient = 0.13; $P = 0.16$). The mediating effect of partner burden on the link between pain behaviors and reporting partner punishing responses was significant (indirect effect 1; coefficient = 0.14; CI, 0.04 to -0.26), indicating that partners' burden mediates the link between pain behaviors and partners' punishing responses. Similar to the findings of the previous analyses, relationship quality alone had no mediating effect on the association between pain behaviors and reporting punishing partner responses (coefficient = 0.07; CI, -0.05 to -0.22). Finally, the indirect effect 3 (pain behaviors→partner burden→relationship quality→punishing responses) was also significant (coefficient = 0.18; CI, 0.11 to -0.28). This result specifies that higher levels of pain behaviors were associated with greater perceived partner burden. In turn, higher perceived partner burden was related to lower relationship quality, which was then associated with greater punishing partner responses.

TABLE 3. Results of the Serial Mediation Analysis for Distracting Partner Responses

Outcome of Each Step	Predictors	Coefficient*	SE	t	P	95% LLCI	95% ULCI
Burden	Pain behavior (weight a_1)	0.32	0.04	6.88	<0.01	0.23	0.42
	Partner burden (weight d_1)	-0.39	0.07	-5.02	<0.01	-0.54	-0.23
Relationship quality	Pain behaviors (weight a_2)	-0.05	0.05	-1.06	0.28	-0.15	0.04
	Partner burden (weight b_1)	0.21	0.13	6.82	0.11	-0.05	0.48
Distracting responses	Relationship quality (weight b_2)	0.87	0.12	6.82	<0.01	0.62	1.12
	Pain behaviors (weight c')	0.38	0.08	4.37	<0.01	0.21	0.55
	Coefficient*		Bootstrapped SE*		Bootstrapped LLCI†		Bootstrapped ULCI†
Indirect effect 1 (weight a_1b_1)‡	0.06	0.04		-0.01			0.16
Indirect effect 2 (weight a_2b_2)§	-0.04	0.04		-0.14			0.03
Indirect effect 3 (weight $a_1d_1b_2$)	-0.11	0.02		-0.18			-0.06

Total effect (weight c) was significant (effect = 0.29; SE = 0.08; $P < 0.01$).

*The unstandardized coefficient.

†Bootstrapped with 5000 resamples.

‡The mediating effect of partner burden: $X \rightarrow M_1 \rightarrow Y$.

§The mediating effects of partner burden and relationship quality: $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$.

||The mediating effect of relationship quality: $X \rightarrow M_2 \rightarrow Y$.

LLCI indicates lower level confidence interval; ULCI, upper level confidence interval.

TABLE 4. Results of the Serial Mediation Analysis for Punishing Partner Responses

Outcome of Each Step	Predictors	Coefficient*	SE	t	P	95% LLCI	95% ULCI
Burden	Pain behavior (weight a_1)	0.33	0.04	6.95	<0.01	0.23	0.42
	Partner burden (weight d_1)	-0.39	0.077	-5.07	<0.01	-0.54	-0.24
Relationship quality	Pain behaviors (weight a_2)	-0.05	0.05	-1.07	0.28	-0.15	0.04
	Partner burden (weight b_1)	0.44	0.17	2.63	<0.01	0.11	0.78
Punishing responses	Relationship quality (weight b_2)	-1.38	0.16	-8.62	<0.01	-1.71	-1.06
	Pain behaviors (weight c')	0.13	0.11	1.38	0.16	-0.05	0.33
		Coefficient*	Bootstrapped SE*	Bootstrapped LLCI†		Bootstrapped ULCI†	
Indirect effect 1 (weight a_1b_1)‡	0.14	0.05	0.04		0.26		
Indirect effect 2 (weight a_2b_2)§	0.07	0.07	-0.05		0.22		
Indirect effect 3 (weight $a_1d_1b_2$)	0.18	0.04	0.11		0.28		

Total effect (weight c) was significant (effect = 0.54; SE = 0.11; $P < 0.01$).
 *The unstandardized coefficient.
 †Bootstrapped with 5000 resamples.
 ‡The mediating effect of partner burden: $X \rightarrow M_1 \rightarrow Y$.
 §The mediating effects of partner burden and relationship quality: $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$.
 ||The mediating effect of relationship quality: $X \rightarrow M_2 \rightarrow Y$.
 LLCI indicates lower level confidence interval; ULCI, upper level confidence interval.

DISCUSSION

The current research examined 2 factors—perceived partner burden and relationship quality—that may explain the link between pain behaviors of individuals with chronic pain and their partners’ responses to the pain. First, the results showed that when perceived partner burden was entered into the model as the only mediator, expressing more pain behaviors was related to higher perceived partner burden, which in turn, was related to reporting less solicitous and more punishing responses. However, relationship quality alone did not have any mediating effect. Importantly, the results supported our main hypothesis that the indirect effects of perceived partner burden and relationship quality would sequentially explain the link between expression of pain behaviors by individuals with chronic pain and perceived partner responses to their pain. Specifically, expressing more pain behaviors was related to higher levels of perceived partner burden, which was associated with lower relationship quality. Lower relationship quality was, in turn, related to reporting fewer solicitous and distracting, and more punishing partner responses by individuals with chronic pain. Consistent with Social Exchange Theory²⁵ and the Social Support Model,²⁹ the findings highlight how perceived partner burden and relationship quality may be one pathway by which the pain behaviors of the individuals with chronic pain relate to perceptions of their partners’ solicitous, distracting, and punishing responses.

The findings revealed an association between pain expressions of individuals with chronic pain and perceived partner burden, and, that greater perceived partner burden, was in turn, related to reporting less solicitous and more punishing responses. The association between greater pain behaviors and higher perceived partner burden is in line with findings in other caregiver studies.^{39,40} Partners who are dealing with caregiving responsibilities may have to adjust their lives because of the support that their partners in pain needs. At times, this adjustment may mean that they sacrifice their own personal and professional goals to be able to provide support to individuals with chronic pain. When individuals with chronic pain express more pain behaviors, these behaviors may encourage their partners to stop their

current activities and shift their attention to the pain. Therefore, individuals with chronic pain who express higher levels of pain behaviors may perceive more interruptions in their partners’ personal, social, and professional goals, which are associated with experiencing higher levels of burden in their partners.^{39,41} Thus, those with chronic pain may know—based on their own experiences or the feedback that they receive from their partners—that seeing them suffer from pain can be burdensome for their partners, especially when partners’ efforts in reducing pain are not successful.⁴² In addition, individuals with pain can observe the various tasks and caregiving responsibilities (eg, doing grocery shopping, taking them to their medical appointment, and doing household chores) that their partners perform daily. These activities and tasks which are labeled by previous research as objective burden⁴³ can provide an estimation for individuals with pain regarding the burden that their partners may experience. Furthermore, individuals with chronic pain may perceive other manifestations of burden in their partners including anger, strain, and psychological distress. In turn, perceiving that their partners are angry or strained when they are around them, individuals with pain may be more likely to label their partners’ responses as less solicitous and more punishing.

Furthermore, findings showed that expressing more pain behaviors was associated with perceived partner responses to their pain via a serial mediational path that consisted of both perceived partner burden and relationship quality. Perceiving a higher level of burden in partners (eg, higher levels of anger and strain, lower levels of psychological well-being) may reduce the opportunities or the inclinations for shared positive exchanges and activities between individuals with chronic pain and their partners.⁴⁴ According to Social Exchange Theory,²⁵ perceiving higher burden in partners may reinforce the belief that partners are benefiting less from their relationship with their partner in pain and that there are more costs to their relationship, resulting in a lower relationship quality. Another possibility is that individuals with chronic pain feel guilty and anxious because they believe that their pain causes many difficulties for their partners, and these negative cognitions and

emotions interfere with their overall evaluation of the relationship, regardless of partners' actual experience of burden. Although the current study investigated partner burden based on the perceptions of the individuals with chronic pain, such perceptions are likely to be influenced by the actual burden level and behaviors that are expressed by their partners.

Finally, findings showed that lower relationship quality was associated with individuals with chronic pain reporting fewer solicitous and distracting responses and more punishing partner responses. When individuals with chronic pain are less satisfied in their relationship, they are more likely to label their partners' responses as negative or they are prone to ignore their partners' solicitous or distracting responses, compared with when they are more satisfied in their relationships.¹⁵ In addition, lower relationship quality may discourage partners from showing more solicitous or distracting responses and increase their punishing responses such as showing anger and frustration.

One important issue that should be addressed here is that higher relationship quality was linked to perceiving more partner solicitous responses. Partner solicitous responses convey partners' care and sympathy to individuals with chronic pain, and these responses might be the preferred responses of individuals with chronic pain. However, because these responses reinforce the avoidance of pain as well as negative cognitions such as pain catastrophizing, they have been found to be related to higher levels of pain intensity and pain-related disability in individuals with chronic pain.^{45,46} Therefore, solicitous responses are considered to be associated with both positive (eg, better relationship quality) and negative (eg, higher disability levels) outcomes. As suggested by previous studies,⁴⁷ one solution that may contribute to maintaining high relationship quality but avoid the negative outcomes of solicitous responses is to promote facilitative and validating responses in partners. Partner facilitative responses—such as encouraging approach-oriented coping and expressions of affection toward the person with pain—support adaptive coping while communicating support and sensitivity to the individual with chronic pain.^{47,48} In addition, partners' validating responses which indicate that partners understand (eg, by saying reflective statements about the pain) and/or are trying to better understand the pain (eg, by asking questions about the pain) can be beneficial for patients.⁴⁹ Expressing validating responses may contribute to better relationship quality and intimacy,⁵⁰ and it has also been found to relate to lower pain intensity.⁵¹

In the current study, we assessed perceptions of individuals with chronic pain about their partners' burden and responses. Therefore, the actual level of burden and partner's report of their own responses to the pain is not clear. Some studies have shown that patients' and partners' perception about a specific variable may not be the same.^{27,52} For example, partners tended to underestimate pain disability and overestimate pain intensity in patients compared with patient reports.⁵² It is possible that when the measured variable has more external representations (ie, it can be observed), individuals who express the behaviors and observers may have more similar estimations.⁵² However, disagreement in patient-partner reports on pain-related variables (eg, pain intensity and pain behaviors) have not been observed in other studies.^{53,54} The current study did not aim to investigate the level of disagreement between patients' and their partners' report, but rather, the factors

that mediated the link between pain expressions of the individuals with chronic pain and perceptions of their partners' responses. Indeed, perceptions of individuals with chronic pain play an essential role in how they interpret their partners' responses.²⁷ It is likely that individuals with chronic pain may not be able to observe and recognize all their partners' responses to pain, or they even may label some responses differently than their partners.⁵⁵ In addition, some studies showed that even when both patients' perceptions of their partners' responses and their partners' report of their responses are related to patients' outcomes, patients' perceptions of their partners' responses play an independent role in predicting patients' outcomes.⁷ Hence, patients' perceptions of their partners' responses and partners' responses both may have significant impact on patients' well-being and understudied variables (eg, partner burden) should be assessed within the patients and their partners.

Study Limitations

Several limitations of this work are noted. First, the cross-sectional nature of the current study prevented us from investigating the causal relationships among the variables in the conceptual model. Second, while previous research provided evidence on the validity of online data collections,^{56,57} it should be mentioned that using an online data collection limited our reach only to individuals who were active online, especially on social media. Third, using self-report measures prevented us from having objective assessments of the actual pain behaviors, partner's burden, and partners' responses. Therefore, it is recommended that future studies include both patients and their partners' responses. In addition, in the current study, we examined the subjective perception of partners' burden and not the actual number of caregiving tasks and responsibilities that were performed by partners (ie, objective burden). Future research may benefit from investigating the link between objective and subjective burden and also from investigating the link between patients' pain behaviors and their partners' objective and subjective burden. Finally, the majority of participants were female which decreases the generalizability of this study. This study has several strengths, including a large sample size of individuals with chronic pain. In addition, the findings provided empirical support for the importance of the interrelationships between perceived partner burden and relationship quality in perceptions of partner responses to pain.

CONCLUSIONS

Overall, considering the important role of partners' responses in the well-being of patients with chronic pain,⁵⁻⁷ the current study advances the literature by identifying some of the factors (ie, perception of partner burden and marital relationship) that may explain the relationship between patients' pain behaviors and their perception of their partners' responses. Identifying these factors is an important step for informing pain management programs because they suggest key targets of intervention for helping patients to have a better understanding of the factors that are linked to their perceptions of their partners' responses. Findings suggest that pain management programs should educate individuals with chronic pain about the possible relationship between their pain behaviors and their perceptions of their partners' burden and their relationship quality. In addition, patients should be aware that disclosing too many pain behaviors may be associated with perceiving more negative

responses than perceiving solicitous or distracting responses. Finally, the findings of the current study highlight the importance of considering more adaptive ways of communicating pain to partners to avoid perceptions of partner burden and increase the probability of more adaptive responses such as facilitative and validating responses.

REFERENCES

- Craig KD. The social communication model of pain. *Can Psychol*. 2009;50:22–32.
- Hadjistavropoulos T, Craig KD. A theoretical framework for understanding self-report and observational measures of pain: a communications model. *Behav Res Ther*. 2002;40:551–570.
- Leonard MT, Chatkoff DK, Gallaway M. Association between pain catastrophizing, spouse responses to pain, and blood pressure in chronic pain patients: a pathway to potential comorbidity. *Int J Behav Med*. 2013;20:590–598.
- Mohammadi S, Dehghani M, Sanderman R, et al. The role of pain behaviour and family caregiver responses in the link between pain catastrophising and pain intensity: a moderated mediation model. *Psychol Health*. 2017;32:422–438.
- Wilson SJ, Martire LM, Sliwinski MJ. Daily spousal responsiveness predicts longer-term trajectories of patients' physical function. *Psychol Sci*. 2017;28:786–797.
- Cano A, Gillis M, Heinz W, et al. Marital functioning, chronic pain, and psychological distress. *Pain*. 2004;107:99–106.
- Rosen NO, Muise A, Bergeron S, et al. Daily associations between partner responses and sexual and relationship satisfaction in couples coping with provoked vestibulodynia. *J Sex Med*. 2015;12:1028–1039.
- Romano JM, Jensen MP, Schmalzing KB, et al. Illness behaviors in patients with unexplained chronic fatigue are associated with significant other responses. *J Behav Med*. 2009;32:558–569.
- Guo C, Deng H, Yang J. Effect of virtual reality distraction on pain among patients with hand injury undergoing dressing change. *J Clin Nurs*. 2015;24:115–120.
- McCarthy AM, Kleiber C, Hanrahan K, et al. Impact of parent-provided distraction on child responses to an IV insertion. *Child Health Care*. 2010;39:125–141.
- Kerns RD, Haythornthwaite J, Southwick S, et al. The role of marital interaction in chronic pain and depressive symptom severity. *J Psychosom Res*. 1990;34:401–408.
- Leonard MT, Chatkoff DK, Maier KJ. Couples' relationship satisfaction and its association with depression and spouse responses within the context of chronic pain adjustment. *Pain Manag Nurs*. 2017. pii: S1524-9042(17)30355-7. Doi:10.1016/j.pmn.2017.10.008. [Epub ahead of print].
- Cano A, Miller LR, Loree A. Spouse beliefs about partner chronic pain. *J Pain*. 2009;10:486–492.
- Cano A, Weisberg JN, Gallagher RM. Marital satisfaction and pain severity mediate the association between negative spouse responses to pain and depressive symptoms in a chronic pain patient sample. *Pain Med*. 2000;1:35–43.
- Leonard MT, Cano A, Johansen AB. Chronic pain in a couples context: a review and integration of theoretical models and empirical evidence. *J Pain*. 2006;7:377–390.
- Newton-John TR, Williams AC. Chronic pain couples: perceived marital interactions and pain behaviours. *Pain*. 2006;123:53–63.
- Grunfeld E, Coyle D, Whelan T, et al. Family caregiver burden: results of a longitudinal study of breast cancer patients and their principal caregivers. *Can Med Assoc J*. 2004;170:1795–1801.
- Deshields TL, Rihanek A, Potter P, et al. Psychosocial aspects of caregiving: perceptions of cancer patients and family caregivers. *Support Care Cancer*. 2012;20:349–356.
- Rha SY, Park Y, Song SK, et al. Caregiving burden and the quality of life of family caregivers of cancer patients: the relationship and correlates. *Eur J Oncol Nurs*. 2015;19:376–382.
- Ferrell BR, Grant M, Borneman T, et al. Family caregiving in cancer pain management. *J Palliat Med*. 1999;2:185–195.
- Zarit SH, Reever KE, Bach-Peterson J. Relatives of the impaired elderly: correlates of feelings of burden. *Gerontologist*. 1980;20:649–655.
- Bedard M, Molloy DW, Squire L, et al. The Zarit Burden Interview: a new short version and screening version. *Gerontologist*. 2001;41:652–657.
- Fitzpatrick K, Vacha-Hasse T. Marital satisfaction and resilience in caregivers of spouses with dementia. *Clin Gerontol*. 2010;33:165–180.
- Homans G. *Social Behavior: Its Elementary Forms*. New York, NY: Harcourt, Brace and World Inc.; 1961.
- Molm L, Cook K. Social Exchange and Exchange Network. In: Cook KS, Fine GA, House JS, eds. *Sociological Perspectives on Social Psychology*. Boston: Allyn & Bacon; 1995:209–235.
- Chadiha LA, Rafferty J, Pickard J. The influence of caregiving stressors, social support, and caregiving appraisal on marital functioning among African American wife caregivers. *J Marital Fam Ther*. 2003;29:479–490.
- Pence L, Cano A, Thorn B, et al. Perceived spouse responses to pain: the level of agreement in couple dyads and the role of catastrophizing, marital satisfaction, and depression. *J Behav Med*. 2006;29:511–522.
- Campbell P, Jordan KP, Dunn KM. The role of relationship quality and perceived partner responses with pain and disability in those with back pain. *Pain Med*. 2012;13:204–214.
- Dunkel-Schetter C, Skokan LA. Determinants of social support provision in personal relationships. *J Soc Pers Relat*. 1990;7:437–450.
- Cano A, Barterian JA, Heller JB. Empathic and nonempathic interaction in chronic pain couples. *Clin J Pain*. 2008;24:678–684.
- Claar RL, Simons LE, Logan DE. Parental response to children's pain: the moderating impact of children's emotional distress on symptoms and disability. *Pain*. 2008;138:172–179.
- Kerns RD, Haythornthwaite J, Rosenberg R, et al. The Pain Behavior Check List (PBCL): factor structure and psychometric properties. *J Behav Med*. 1991;14:155–167.
- Hagell P, Alvariza A, Westergren A, et al. Assessment of burden among family caregivers of people with Parkinson's disease using the Zarit Burden Interview. *J Pain Symptom Manage*. 2017;53:272–278.
- Lai DWL. Effect of financial costs on caregiving burden of family caregivers of older adults. *SAGE Open*. 2012;2:1–14.
- Busby DM, Christensen C, Crane DR, et al. A revision of the Dyadic Adjustment Scale for use with distressed and non-distressed couples: construct hierarchy and multidimensional scales. *J Marital Fam Ther*. 1995;21:289–308.
- Ward PJ, Lundberg NR, Zabriskie RB, et al. Measuring marital satisfaction: a comparison of the revised Dyadic Adjustment Scale and the satisfaction with married life scale. *Marriage Fam Rev*. 2009;45:412–429.
- Kerns RD, Turk DC, Rudy TE. The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain*. 1985;23:345–356.
- Hayes AF. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. New York, NY: Guilford Publications; 2013.
- Brouwer WBF, van Exel NJA, van de Berg B, et al. Burden of caregiving: evidence of objective burden, subjective burden, and quality of life impacts on informal caregivers of patients with rheumatoid arthritis. *Arthritis Rheum*. 2004;51:570–577.
- Andrucio C, Pimenta DM. Caregivers of patients with chronic pain: responses to care. *Int J Nurs Terminol Classif*. 2004;15:5–14.
- Mohammadi S, de Boer MJ, Sanderman R, et al. Caregiving demands and caregivers psychological outcomes: the mediating role of perceived injustice. *Clin Rehabil*. 2017;31:403–413.
- Juarez G, Ferrell BR. Family and caregiver involvement in pain management. *Clin Geriatr Med*. 1996;12:531–547.
- Luttik ML, Jaarsma T, Tijssen JG, et al. The objective burden in partners of heart failure patients; development and initial

- validation of the Dutch Objective Burden Inventory. *Eur J Cardiovasc Nurs.* 2008;7:3–9. pii.
44. Fitzpatrick K, Vacha-Haase T. Marital satisfaction and resilience in caregivers of spouses with dementia. *Clin Gerontol.* 2010;33:165–180.
 45. Hurter S, Paloyelis Y, Williams AC, et al. Partners' empathy increases pain ratings: effects of perceived empathy and attachment style on pain report and display. *J Pain.* 2014;15:934–944.
 46. Fordyce WE. A behavioural perspective on chronic pain. *Br J Clin Psychol.* 1982;21:313–320.
 47. Rosen NO, Bergeron S, Leclerc B, et al. Woman and partner-perceived partner responses predict pain and sexual satisfaction in provoked vestibulodynia (PVD) couples. *J Sex Med.* 2010;7:3715–3724.
 48. Schwartz L, Jensen MP, Romano JM. The development and psychometric evaluation of an instrument to assess spouse responses to pain and well behavior in patients with chronic pain: the Spouse Response Inventory. *J Pain.* 2005;6:243–252.
 49. Issner JB, Cano A, Leonard MT, et al. How do I empathize with you? Let me count the ways: relations between facets of pain-related empathy. *J Pain.* 2012;13:167–175.
 50. Mitchell AE, Castellani AM, Herrington RL, et al. Predictors of intimacy in couples' discussions of relationship injuries: an observational study. *J Fam Psychol.* 2008;22:21–29.
 51. Edmond SN, Keefe FJ. Validating pain communication: current state of the science. *Pain.* 2016;156:215–219.
 52. Cano A, Johansen AB, Geisser M. Spousal congruence on disability, pain, and spouse responses to pain. *Pain.* 2004;109:258–265.
 53. Cano A, Johansen AB, Franz A. Multilevel analysis of couple congruence on pain, interference, and disability. *Pain.* 2005;118:369–379.
 54. Mohammadi S, Dehghani M, Khatibi A, et al. Caregivers' attentional bias to pain: does it affect caregiver accuracy in detecting patient pain behaviors? *Pain.* 2015;156:123–130.
 55. Bolger N, Amarel D. Effects of social support visibility on adjustment to stress: experimental evidence. *J Pers Soc Psychol.* 2007;92:458–475.
 56. Ramo DE, Hall SM, Prochaska JJ. Reliability and validity of self-reported smoking in an anonymous online survey with young adults. *Health Psychol.* 2011;30:693–701.
 57. Cantrell MA, Lupinacci P. Methodological issues in online data collection. *J Adv Nurs.* 2007;60:544–549.