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# Beyond solicitousness: A comprehensive review on informal pain-related social support

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# Abstract

Adults with chronic pain cite social support (SS) as an important resource. Research has mostly focused on general SS or pain-specific solicitousness, resulting in a limited understanding of the role of SS in pain experiences. Drawing on SS theoretical models, this review aimed to understand how pain-related SS has been conceptualized and measured and how its relationship with pain experiences has been investigated. Arksey and O´Malley's scoping review framework guided the study. A database search (2000-2015) was conducted in PsycINFO, CINAHL, MEDLINE, EMBASE using a combination of subject headings/keywords on pain and SS; 3864 citations were screened; 101 full texts were assessed for eligibility; references of 52 papers were hand searched. Fifty-three studies were included. Most studies were either a-theoretical or drew upon the operant conditioning model. There are several self-report measures and observational systems to operationalize pain-related SS. However, the Multidimensional Pain Inventory remains the most often used, accounting for the centrality of the concept of solicitousness in the literature. Most studies focused on individuals with chronic pain (ICPs) self-report of spousal pain-related SS and investigated its main effects on pain outcomes. Only a minority investigated the role of pain SS within the stress and coping process (as a buffer or mediator). Little is known about mediating pathways, contextual modulation of the effectiveness of SS exchanges and there are practically no SS-based intervention studies. Drawing on general SS models, the main gaps in pain-related SS research are discussed and research directions for moving this literature beyond solicitousness are proposed.

Key-words: Chronic Pain, informal social support, solicitousness, scoping review

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## Introduction

Over the last decade, a growing body of research has illustrated that interactions with significant others (e.g., spouses, family members, friends) are paramount to adults' adaptation to chronic pain [12,31,36]. Informal social support (SS) is consistently endorsed by individuals with chronic pain (ICPs) as one of the most valuable of their social interactions with significant others [35,45]. SS is a complex and multidimensional construct, generally, referring to social resources that people perceive to be available or that have been received from others in case of need [13]. SS has been found to have a protective role on individuals' health, which can be accounted for by [13,60,70,74]: 1 - direct influences on health, without the involvement of other mediating mechanisms and irrespective of stress levels (direct effect model); 2 - indirect influences on health through cognitive, affective and behavioral mechanisms (indirect effect model); and 3- buffering the negative impact of a stressor on health outcomes (stress buffering model).

Researchers examining the relationship between SS and pain-related outcomes have mostly investigated its direct effects, sometimes showing positive associations (mainly with psychological functioning) [31,43] but often finding inconsistent results [6,28,36]. Conceptual and methodological factors could account for such inconsistencies. First, a myriad of SS-related constructs (e.g., social integration, received vs. perceived SS, satisfaction with SS) and measures to capture these are used, many times without a clear definition [43]. This is a critical limitation considering that different dimensions of SS may influence health outcomes through different pathways [13,60,70,74]. Second, most of these studies used general measures of SS [6,31,43], which do not tap into specific SS responses to individuals' pain and or well behaviors. Such mismatch in the level of specificity between SS and pain-related outcome measures might partially account for the inconsistent findings.

Indeed, studies that have explored pain-specific SS have found more consistent effects. Drawing upon the operant conditioning model [18], a large majority of these studies have been mainly focusing on one particular pain-specific SS response – solicitousness. Solicitousness involves attentiveness to ICPs' pain behaviors, offering assistance and taking over his/her chores [44] and is often associated with higher pain severity, disability, and lower physical and psychological functioning [31,36,44].

Despite being more consistent, this body of research has its limitations. First, it conveys a narrow view of pain-related SS interactions [44], which contrasts with ICPs' reports on the variety of significant others' helping actions (*e.g.*, encouraging task persistence and autonomy, shielding, helping with problem-solving, being emotionally validating) [35,45]. Second, this literature, by often assuming that solicitousness is inherently reinforcing of pain behaviors [44], has framed SS from a negative perspective instead of investigating its (classical) protective functions, often highlighted by ICPs [35,45].

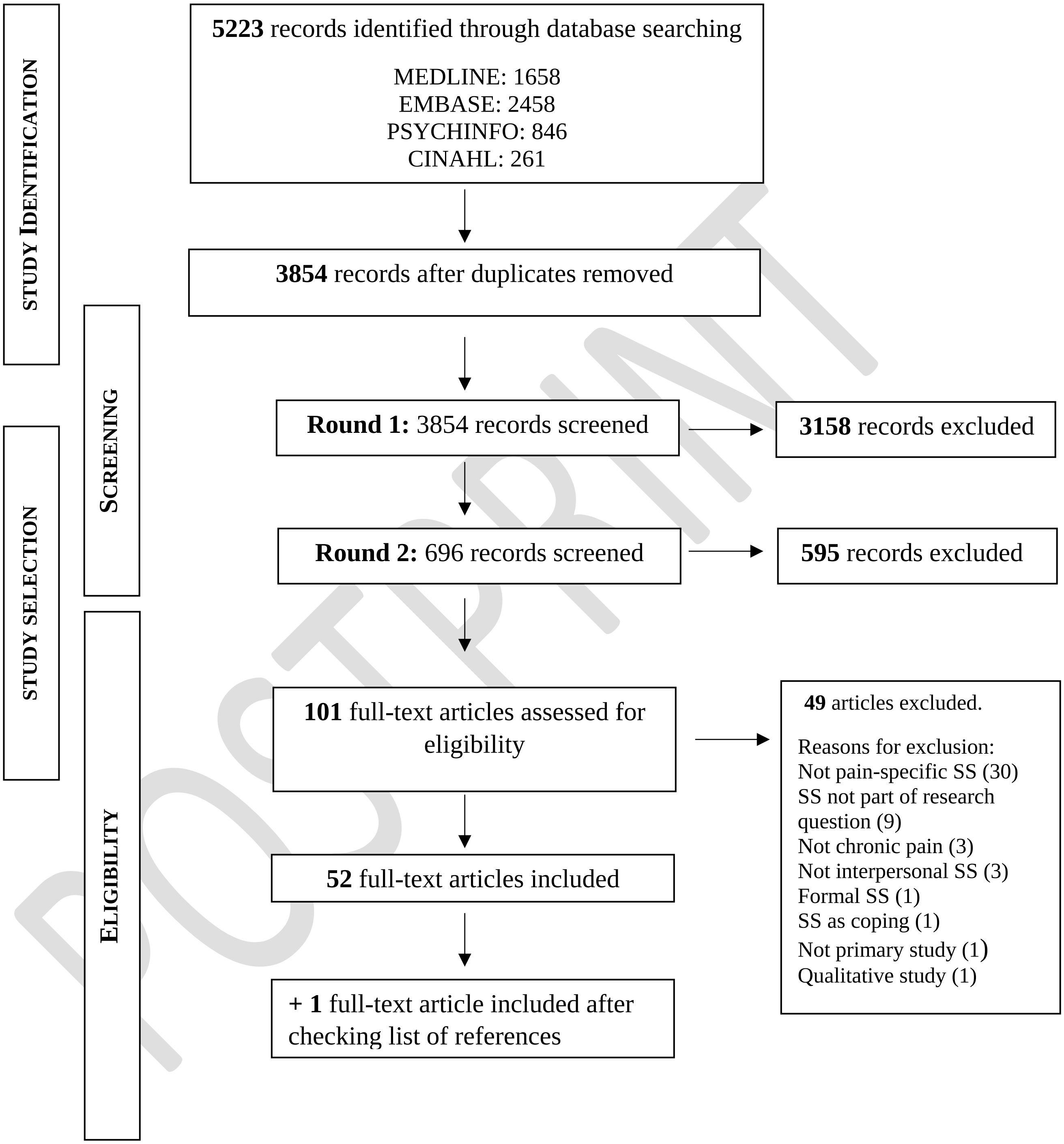
In sum, by focusing on either general SS or pain specific solicitousness, research on the role of SS in the lives of ICPs lacks specificity as well as conceptual breadth and depth. It is our contention that one way to move this literature forward is to draw on general SS theoretical models and concepts [13,60,70,74] to critically analyze research on informal pain-specific SS (i.e., from spouses, family members, friends or acquaintances). To the best of our knowledge, none of the existing literature reviews on informal pain-related SS attempted such integrative analysis [31,36,43,44]. Therefore, by drawing on general SS theoretical models and concepts, the purpose of this study was to undertake a comprehensive review of studies published between

2000 and 2015 to identify main trends and gaps in (1) how pain-related informal SS has been conceptualized and measured and (2) how its relationship with adults' chronic pain experiences has been analyzed. Ultimately, the answers to such questions will provide insights into new conceptual and methodological directions for future research on pain-related SS.

## Methods

This comprehensive review was guided by Arksey and O´Malley's framework for conducting scoping studies [2] and PRISMA statement recommendations [42]. The methodology included four major stages: (1) Identification of relevant studies; (2) Study selection for inclusion; (3) Charting the data, and (4) Collating, summarizing and reporting the results. Figure 1 depicts the two first stages.

Figure 1- Flowchart of the study identification and selection process



## Stage I - Identification of relevant studies

A library information specialist (K. F.) conducted a focused systematic database search on PsycINFO, CINAHL, MEDLINE, EMBASE to identify primary studies published between 2000 and August 2015. Following Arksey and O'Malley's recommendation for this stage [2], we started with a wide search strategy to ensure a comprehensive coverage of the relevant field of research. This search captured two main concepts – Pain and SS - using the following subject headings and keyword combinations: (1) acute/chronic pain, pain management/perception/measurement; and (2) social interaction/influence/response/presence /modulation/relationship/assistance, support groups, peer counseling, family/couple/marital/ spousal/friend/significant other support, solicitousness, reassurance. Only empirical studies were included, with no limits to the study design. Although we were aiming at covering research on adults with chronic pain, at this stage we included the search terms acute pain and children to ensure that we did not miss studies that examined: (1) the transition from stages of (sub-)acute to chronic pain and/or (2) individuals in late adolescence/emerging adulthood.

## Stage II- Study selection

As depicted in Figure 1, the study selection was a two-step iterative process, which involved a *screening* and an *eligibility* phase. After duplications were removed (n=1369) all citations were uploaded into *Abstrackr*, a free online citation screening software. The screening phase was conducted in two rounds. First, two independent research assistants screened 3854 citations, using the following inclusion criteria: 1) primary research (qualitative, quantitative, mixed methods); 2) conceptualization of SS from a psychological/functional perspective [13]; 3) measured pain specific SS; 4) measured informal SS (i.e. family, spouse, friends); 5) all ages. In addition to the inclusion criteria a set of criteria for exclusion was developed *a priori*. More specifically, records were excluded if they were:

1. not pain-related;
2. not a primary study;
3. related to cancer or palliative care;
4. not in English, Dutch, French, Spanish or Portuguese
5. not on SS, i.e., focused exclusively on other dimensions of social interactions (e.g., social control or other dimensions of marital functioning);
6. on formal SS, *i.e*., received/provided by institutions and/or organized support services (e.g., hospitals, day care centers, nursing homes) and/or their staff (e.g., health-care professionals, social workers);
7. on SS from a sociological perspective, *i.e*., studies conceptualizing and/or measuring social networks, social integration and/or social participation;
8. only based on general measures of SS, i.e., not pain-specific.

In line with Arksey and O'Malley's methodology [2], this stage of screening allowed us to first have a rough overview of the size of the literature on informal (non-cancer) pain-related SS from a psychological/functional perspective, before narrowing to the more specific literature we were aiming for, namely, on adults and chronic pain. At this stage, the research assistants agreed on excluding 2225 records. A third research assistant, more familiar with the SS literature, reviewed the 1240 records of disagreement using the same exclusion criteria, which resulted in the exclusion of another 933 records. Thus, by the end of round one, a total of 3158 records were excluded with 696 citations coded as *include* based on title and abstract (n=508) or as *unsure* (n=188) due to insufficient information at the title and/or abstract level to determine eligibility. Most of the citations coded as *unsure* were due to absent abstracts.

To ensure that retrieved articles would fit within our scoping review purpose, the team tightened the inclusion and exclusion criteria in a second round of screening. Within their scoping review methodology, Arksey & O'Malley [2] have identified the need to revise inclusion/exclusion criteria *post hoc.* Therefore, in addition to the previous inclusion and exclusion criteria, remaining citations were further screened and excluded if they were:

1. dissertation abstracts;
2. not on chronic pain
3. on children and adolescents chronic pain
4. qualitative studies
5. instrument development psychometric studies, as it would be beyond the scope of our paper to do a critical in-depth analysis of the psychometric qualities of the instruments and their respective preliminary versions.
6. not on interpersonal SS, i.e., perceived/received from other individuals (e.g., spouse, significant other, friend) and focusing on interpersonal processes but instead studied SS from groups and respective group processes (e.g., pain-related peer support groups or family dynamics).
7. the term SS was used to refer to a coping strategy (e.g., seeking or requesting for SS), instead of referring to the SS construct, which is conceptualized as a social coping resource that can assist individuals' actions to deal with chronic pain [60,70].

8. focused on workplace SS, because most often encompasses formal SS from supervisors and co-workers (see Campbell et al. [7] for a systematic review on workplace SS and pain).
9. SS was not part of the main research question (e.g., it was a controlled variable).

The first author (SB) and a research assistant independently conducted this second round of screening of the 696 citations after training on the revised criteria. These two reviewers agreed on excluding 531 citations and coded 96 as unsure. However, unlike the previous group of citations coded as unsure, abstracts were available for most. A second pair of reviewers (PF and JR) rescreened these 96 citations to determine inclusion or exclusion and unanimously coded 64 as excluded using the secondary screening criteria. Therefore, in sum, 595 (out of 696 from round 1) were excluded.

After the first two iterative rounds of screening at the title and abstract level 101 full-text articles were assessed for *eligibility* by two of three independent reviewers (S.B., P.F., J.R.). Consensus by a third reviewer (either S. B. or P.F) was used for any remaining disagreements after the full text review. A total of 49 articles were excluded at this stage; approximately 61% due to data collections using general (vs. pain specific) measures of SS (Figure 1). The research team agreed upon the inclusion of 52 articles in the scoping review. Finally, a manual search of the 52 included papers' reference lists was undertaken to locate additional relevant articles resulting in the inclusion of one more full-text article. Therefore, in sum, a total of 53 full-text articles were included in our review.

## Stage III- Data charting

The team developed a data charting form (available upon request), identifying the main variables to be extracted. The data extracted included: (1) last names of all authors, year of publication and countries of authors' affiliations; (2) theoretical background and main aims of the study; (3) pain-related SS concepts and their role in the research problem (e.g., correlate, predictor, outcome, mediator, moderator); (4) study design (e.g., experimental/ cross sectional/ longitudinal, retrospective or prospective/ dyadic) and methods (e.g., self-report measures/ daily diaries/ observational methods/ secondary analysis); (5) participants' socio-demographic and pain-related characteristics; (6) SS measures (e.g., name and respective scales, when applicable); (7) source of SS (e.g., spouse, significant other); (8) main findings on associations between pain-related SS and pain-related outcomes. It should be noted that, given the conceptual confusion that often characterizes SS literature (e.g., the terms being used to mean different SS-related dimensions) [13,43], the following classification of pain-related SS concepts was used to homogenize the data extraction procedure:

1. Observed SS – observed supportive behaviors towards people in pain
2. Self-reported SS:
    2.1. Provided SS – caregivers' self-reports of their own SS actions towards ICPs.
    2.2. Received SS – ICPs' self-reports of SS they have received in the past.
    2.3. Perceived SS – ICPs' self-reported perceptions of the SS that will be available to them if needed in the future.
    2.4. SS preferences – ICPs' self-reported preferences for different types of pain-related socials support.
    2.5. SS (dis)satisfaction – ICPs' self-reported (dis)satisfaction with the SS they have received or that will be available if needed.

For every article, initial data charting was conducted by one researcher and then checked by a second team member. Regular team meetings were conducted to discuss any discrepancies and resolve them by consensus. See Table S1, Supplemental Digital Content 1 (SDC1), which includes the data extracted for every included paper.

### Stage IV-Collating and summarizing the findings

Studies were summarized based on: (1) general characteristics: authors' countries, study design and methods, and participants' primary pain sites (Table 1); (2) pain-related SS conceptualizations: theoretical backgrounds and SS concepts (Table 2); and (3) pain-related SS operationalization strategies: measures/scales and coding systems (Table 3). Overall, these analyses informed our first two main research questions, namely, how has pain-related SS been conceptualized and measured?

Next, to identify how the relationship between pain-related SS and chronic pain experiences has been investigated, we conducted a descriptive numerical summary (e.g. percentages) of the role of SS in the included studies (Table 2), followed by a narrative synthesis of the main research trends. In the following sections, when referring to one of the 53 studies in the review, we list the corresponding number in Table S1 (Supplemental Digital Content 1) instead of the number in the reference list for reader ease in locating details about the study.

## Results

1. Overview of study characteristics

The majority of the research (85%) was predominately conducted in the United States of America and Canada, followed by research in Western European Countries (see Table 1). Most studies used cross-sectional designs (71.70%), solely captured the perspectives of ICPs (66.04%) and solely employed standardized self-report measures (67.92%). Many studies (43.39%) did not provide a specific chronic pain diagnosis; this was followed by studies with individuals with some form of arthritis (18.86%; ID#13,18,20,24,25,26,43,53). Finally, most studies included male and female ICPs (77.36%), who experienced chronic pain in various sites in the body and/or more than one body site (39.62%).

Table 1- Study characteristics: country, design, methods and primary pain sites

| Study characteristics | n (%) | Corresponding ID Table S1 (SDC1) |
|---|---|---|
| **1.Country** | | |
| United States of America | 34 (64.15%) | 1-3, 5-9, 11-12, 14, 18-19, 21-26, 29-35, 42-43, 45-46, 48, 51-53 |
| Canada | 11 (20.75%) | 10, 16-17, 20, 28, 36-40, 50 |
| United Kingdom | 2 (3.77%) | 4, 27 |
| The Netherlands | 2 (3.77%) | 44, 49 |
| France | 1 (1.89%) | 13 |
| Sweden | 1 (1.89%) | 41 |
| International | 2 (3.77%) | 15, 47 |
| **2.Design** | | |
| Cross-sectional, individual | 25 (47.17%) | 2-5, 9, 11-16, 23, 27, 29, 31-33, 37, 41-42, 47-48, 50-52 |
| Cross-sectional, dyadic | 13 (24.53%) | 6-8, 10, 21, 24, 30, 34-36, 40, 43, 46 |
| Prospective, individual | 10 (18.87%) | 1, 17-20, 22, 28, 44- 45, 49 |
| Prospective, dyadic | 4 (7.55%) | 26, 38-39, 53 |
| Other | 1 (1.89%) | 25 |

| **3.Methods** | | |
|---|---|---|
| Self-report, questionnaires | 36 (67.92%) | 2-5, 10-16, 18-19, 21-25, 27, 28-33, 36-37, 40-42, 46, 48-52 |
| Self-report, daily diary | 7 (13.21%) | 17, 20, 26, 38-39, 44, 53 |
| Self-report and observational | 6 (11.32%) | 1,6-8, 34-35 |
| Self-report and interviews | 2 (3.77%) | 9, 45 |
| Observational | 2 (3.77%) | 43, 47 |
| **4.Primary pain sites** | | |
| Multiple pain sites | 21 (39.62%) | 2-3, 5-6, 9, 11-12, 21, 23-25, 27-30, 32-34, 41, 45, 51 |
| Low-back | 6 (11.32%) | 1, 4, 7-8, 17, 50 |
| Joints (single and multiple) | 6 (11.32%) | 13, 18, 20, 26, 43, 53 |
| Vulva | 6 (11.32%) | 10, 36-40 |
| Limbs | 2 (3.77%) | 19, 22 |
| Head | 2 (3.77%) | 31, 42 |
| Pelvis | 2 (3.77%) | 16, 48 |
| Neck | 1 (1.89%) | 44 |
| Bladder | 1 (1.89%) | 15 |
| Unspecified | 1 (1.88%) | 14 |

Note: International = involving authors from more than one country (Canada, U.S.A, Germany, Austria).

## 2. Pain-related SS conceptualization

Almost 40% of the studies were either a-theoretical or only referred to the biopsychosocial model of pain (Table 2). One third of the studies drew upon the operant behavioral model, which conceptualized SS actions as reinforcing pain behaviors. The remaining studies were almost equally distributed between the cognitive-behavioral and interpersonal/integrative perspectives. Cognitive-behavioral studies mainly focused on how pain-related appraisals and beliefs (e.g., catastrophizing) were associated with SS. Most of these studies drew upon the communal coping model (ID#2,3,5,6,7,14,40), although other theories like the fear-avoidance model, the transactional model of stress and coping or the attachment diathesis model were also mentioned. Approximately, 25% of the studies were explicitly based on interpersonal perspectives, of which only 4 (7.5%) specifically mentioned SS models (ID#6,23,24,45). Other interpersonal theories mentioned by more than one study were the social communication model of pain (ID#10,43,53), the transactional model of health (ID#15,16) and empathy-related models (ID#7,8,21).

In regards to SS constructs, solicitousness was evaluated in over 90% of the studies, mostly as received SS. Only four studies (ID#20,26,42,45) did not include a measure of solicitousness. Most but not all of the studies also included another pain-related SS construct. Almost half of the studies assessed distraction. Besides solicitousness and distraction, a diversity of less frequently used constructs were found, which can be organized in three clusters assessing: (1) SS aiming at positively reinforcing well-behaviors (facilitating well-behaviors; ID#31,33,35,37,38,39,43) or promoting functional autonomy (autonomy support; ID#26); (2) emotional functions of pain-related SS, namely, validation and acceptance by others (ID#6,7,8,42), and empathic responses and understanding (ID#45,53); and (3) SS preferences and (dis)satisfaction (ID#20,24,28). Finally, three studies assessed individuals' maladaptive beliefs that others must respond solicitously to their pain behaviors (perceived entitlement to pain-related SS) (ID#6,7,32).

Table 2- Social support (SS) conceptualization: theoretical background, concepts and role in research

| **SS conceptualization** | **n (%)** | **Corresponding ID Table S1 (SDC1)** |
|---|---|---|
| **1.Theoretical background** | | |
| 1.1.Operant behavioral model | 16 (30.19%) | 1-2, 9, 19, 22, 31, 33-39, 44, 46-47 |
| 1.2. Not specified | 14 (26.42%) | 11, 17-18, 20, 25, 27-30, 41-42, 49, 51-52 |
| 1.3.Interpersonal/integrative models | 13 (24.53%) | 6-8,10,15-16, 21,23-24,26,43,45,53 |
| 1.4.Cognitive-behavioral models | 12 (22.64%) | 1-3, 5-7, 12-14, 23, 31, 40 |
| 1.5. Biopsychosocial model | 6 (11.32%) | 4, 19, 22, 32, 48, 50 |
| 1.6.Other | 2 (3.77%) | 1,26 |
| **2.Social Support concepts** | | |
| 2.1.Received social support | | |
| ....solicitousness | 44 (83.01%) | 1-9, 11-12, 14-19, 22-25, 27, 29-41, 44, 46-53 |
| ….distraction | 23 (43.39%) | 1-2, 5-6, 8, 15-18, 23-25, 27, 29-30, 34-35, 41, 46-47, 50-52 |
| ….general social support | 7 (13.20%) | 3, 23, 25, 27, 33, 51-52 |
| ….facilitating well-behaviors | 5 (9.43%) | 31, 33, 37-39 |
| ….other | 4 (7.54%) | 26, 42, 45, 53 |
| 2.2.Provided social support | | |
| ….solicitousness | 11 (20.75%) | 7-8, 10, 13, 21, 30, 34, 36, 38, 39-40 |
| ….distraction | 4 (7.54%) | 8, 13, 30, 34 |
| ….facilitating well-behaviors | 2 (3.77%) | 38-39 |
| ….general social support | 1 (1.88%) | 13 |
| 2.3.Observed social support | | |
| …..solicitousness | 3 (5.66%) | 34, 35, 43 |
| …..validation responses | 3 (5.66%) | 6, 7, 8 |
| …..facilitating well behaviors | 2 (3.77%) | 35, 43 |
| 2.4.Perceived entitlement to pain-related social support | 3 (5.66%) | 6-7, 32 |
| 2.5.Social support [dis]satisfaction | 2 (3.77%) | 20, 24 |
| 2.6.Social support preferences | 1 (1.88%) | 28 |
| **3.Social Support role** | | |
| 3.1 predictor | 32 (60.38%) | 1, 6-7, 9, 11-12, 17-23, 26-28, 31-40, 43-44, 46-49 |
| 3.2 correlate | 10 (18.87 %) | 2, 8, 29-31, 33, 41-42, 51-52 |
| 3.3 outcome | 11 (20.75%) | 5-7, 13, 24-25, 28, 30, 43, 45, 53 |
| 3.4 moderator | 6 (11.32%) | 3, 6, 14-16, 23 |
| 3.5 mediator | 5 (9.43%) | 3-4, 10, 12, 50 |

3. Pain-related SS operationalization strategies

Most studies used some form of self-report instruments to assess pain-related SS (Table 3). By far, the most commonly used self-report measure was the West-Haven Multidimensional Pain Inventory (WHYMPI), especially the ICP version, although the version administered to the significant other was also used by almost 25% of the studies. These two versions of this one instrument were most often used to assess received/provided solicitousness and distraction, with a few studies also using the 3-item scale assessing general pain-related SS. The Spouse Response Inventory (SRI), composed by two sub-scales "Solicitous responses to pain behaviors" and "Facilitative responses to well-behaviors" was the second most frequently used measure, mostly its ICP version. The third most used scale was the solicitousness sub-scale of the Survey of Pain Attitudes (SOPA), which was used in three studies. This subscale assessed individuals' maladaptive belief that others must respond solicitously to their pain behaviors. The other two scales, which were only used in one study each, were: (1) the Pain Response Preference Questionnaire (PRPQ), assessing individuals' preferences for solicitude and activity direction; and (2) the Headache SS Scale (HSSS), adapted from the Berlin SS Scales to the specific needs of headache sufferers, measuring two types of received SS, namely, "active involvement" and "acceptance" by others. Finally, 6 out of the 53 studies used specifically tailored scales/items, assessing a variety of SS dimensions (e.g., satisfaction with spousal emotional and instrumental assistance, activity-related autonomy support, reinforcement of well-behaviors, spousal empathic responses) to capture daily diary or electronic momentary assessment data (ID#20,24,26,44,45,53).

In addition to self-report measures, 7 studies (13.21%) included an observation data collection component. Based on operant (ID#34,35) and social communication models (ID#43), the Living in Family Environments (LIFE) coding system was used in three studies to code frequencies, rates and sequences of spouse solicitous and facilitative behaviors in response to ICP verbal and non-verbal pain behaviors while performing routine household activities. Also drawing on an operant perspective, Thieme et al. (ID#47), used the WHYMPI to base ratings of spouse solicitous and distracting behaviors in response to ICP pain behaviors during a window washing task. Finally, drawing upon an emotional regulation perspective on marital interaction, the Validation and Invalidation coding system was used in three studies (ID#6,7,8) to assess spousal validation responses to ICPs emotional expressions during a 10-min interaction task about the pain problem.

It should be noted that, regardless of the type of methodology, an overwhelming majority of studies have investigated SS from spouses or significant others (e.g., partners). Only four studies (ID#14,20,32,42) have considered other informal sources of support such as other family members, friends or neighbors.

Table 3- Pain-related social support operationalization strategies

| Operationalization Strategy | n (%) | Corresponding ID Table S1 (SDC1) |
|---|---|---|
| **1.Self-report scales/measures** | | |
| 1.1.West-Haven Yale Multidimensional Pain Inventory (WHYMPI) | | |
| ICP version | 41 (77.36) | 1-9,11,14-19,22-25,27,29-30,32-41,46-53 |
| source of SS version | 13 (24.53) | 7,8,10,13,21,30,34,35,36,38,39,40,46 |
| 1.2.Spouse Response Inventory (SRI) | | |
| ICP version | 6 (11.32) | 12,31,33,37-39 |
| Source of SS version | 2 (3.77) | 38-39 |
| 1.3.Survey of Pain Attitudes (SOPA) | 3 (5.66) | 6-7, 32 |
| 1.4.Pain Response Preference Questionnaire (PRPQ) | 1 (1.89) | 28 |
| 1.5.Headache Social Support Scale (HSSS) | 1 (1.89) | 42 |
| 1.6.Other self-report measures | 6 (11.32) | 20,24,26, 44-45, 53 |
| **2.Observational Coding Systems** | | |
| 2.1.Validation and Invalidation | 3 (5.66) | 6-8 |
| 2.2.Living in Family Environments (LIFE) | 3 (5.66) | 34-35, 43 |
| 2.3.Other coding systems | 1 (1.89) | 47 |

## 4. The role of pain-related SS on chronic pain experiences

Almost 80% of the studies considered pain-related SS as a predictor or a correlate of pain outcomes (see Table 2) and most authors have investigated the main effect of pain-related SS on pain experiences. One fifth of the studies looked into predictors of received and/or provided pain-related SS, hence, conceptualizing it as an outcome. Only a few studies have considered pain-related SS as a moderator or a mediator of psychosocial processes accounting for pain experiences.

## 4.1. SS as predictor/correlate

A majority of studies investigated the direct association between SS and several dimensions of pain experiences. Most dimensions pertained to the experience of the ICP, e.g., pain severity and disability (ID#2,11,12,17,20,21,22,23,28,31,32,33,35,36,37,44,46,48), distress (ID#2,11,12,17,18,19,22,23,31,32,33,46,49), physical functioning (ID#1,2,11,26,33,35), pain behavior and communication (ID#7,12,31,33,34,43,47), cognitive appraisals (ID#2,3,27,40), pain coping strategies (ID#18,20,37,42) or opioid use (ID#9,11). Only six studies (ID#33,36,37,39,40,41) investigated the association between pain related SS and relationship outcomes, namely, satisfaction with relationship or family life, sexual function and satisfaction, and dyadic adjustment. Also, most of these studies either did not specify their theoretical background (n=13) or drew upon the operant perspective (n=17). Only seven studies drew upon interpersonal theoretical backgrounds, of which only two were based on SS models (#ID6,23). Most of the studies were cross-sectional and therefore, although 32 studies described SS constructs as predictors of pain outcomes (based on statistical approaches), the study designs only allowed for an understanding of associations between the constructs (see Table S1, SDC1). Thirteen studies were prospective and used self-report measures (namely diaries) to capture data over time (ID#1,17,18,19,20,22,26,28,38,39,44,45,49) to predict the effect of SS on pain related outcomes. However, only six of them conducted lag time effects (ID#18,19,20,22,26,49), finding differing results. For example, higher solicitousness at 1 month predicted pain interference and depression at 5 months (ID# 22) as well as at 9 and 12 months (ID#19) but more solicitousness also predicted decreases in disease state at 9 months (ID#18). Based on these studies, the temporal effects (specifically predictive role) of SS on pain related outcomes remains unclear.

### 4.2. SS as an outcome

Twelve studies (22.64%) conceptualized pain-related SS as an outcome (ID#3,5,6,7,13,24,25,28,30,43,45,53), and investigated several types of predictors of pain-related SS. Although three studies did not specify their theoretical background (ID#25,28,30), most were based on cognitive-behavioral (e.g., communal coping and burnout models; ID#3,5,6,7,13) or integrative/interpersonal models (e.g., empathy models, social communication model of pain; ID#7,24,43,45,53). Within the latter, only two studies were based on SS-related models (ID#24,45).

Most of these studies focused on predictors of received SS (ID#3,5,6,24,25,30,53), mainly solicitousness and distraction. Only a few studies focused on predictors of provided SS (ID#13,30), observed SS responses (e.g., validation, solicitous and facilitative responses; ID#7,43) or SS satisfaction/preferences (ID#24,28).

As for the predictors, studies drawing upon cognitive-behavioral models (e.g., communal coping and burnout models), mainly focused on appraisals and feelings, namely, catastrophizing (ID#3,5,6), perceived entitlement to support (ID#6) and providers’ distress (ID#7,13). Whereas studies drawing upon more interpersonal perspectives also included predictors associated with pain communication, namely ICPs emotional disclosure (ID#7) or non-verbal pain expressions (ID#53). Finally, studies drawing on SS models have investigated ICPs pain (ID#45) or the ICP/spouse concordance on pain ratings (ID#24) as predictors of pain-related SS.

However, like the body of empirical evidences on predictors/correlates of SS, a large majority of these findings come from cross-sectional studies, preempting any conclusions on the temporal relationships. Two of the four studies (ID#25,28) that used a prospective design examined the effects of a group-based intervention on SS preferences (ID#28) or of couple-oriented versus patient-oriented interventions on received SS (ID#25). Only the couple-oriented intervention showed some significant effects, improving spousal received SS at 6 months (ID#25). The other two prospective studies examined the effect of pain expressions on provided and received SS in adults with osteoarthritic pain (ID#45,53) finding, for example, that verbal and non-verbal pain expression, as perceived by one's spouse, independently predicted same day spousal solicitous and empathic responses (ID#53).

In summary, most predictors to garnering some form of SS have focused on the ICP behaviors (verbal and non-verbal), appraisals and/or feelings. Apart from support providers' distress no other support provider factors have been investigated as predictors of provided or received SS.

### 4.3. SS as moderator

Only 6 cross-sectional studies considered pain-related SS as a moderator. All these studies clearly reported their theoretical backgrounds, namely, the communal coping model of pain (ID#3,6,14), Turk and Kern's transactional model of health (ID#15,16) and the transactional model of stress and the SS stress buffering hypothesis (ID#23). The set of studies drawing on the communal coping model first sought to investigate the extent to which different dimensions of pain-related SS (e.g., general received SS, source of support, perceived entitlement to solicitous support) moderated the association between catastrophizing and perceived spousal responses to pain (e.g., solicitous, punishing; ID#3, 6). For example, Buenaver et al. (ID#3) showed there was a positive association between patient catastrophizing and perceived spousal punishing responses but only among patients with low scores on general pain related spousal support.

Second, the extent to which pain-related SS moderated the association between catastrophizing and pain outcomes was also investigated (ID#3,14). For example, Giardino et al. (ID#14) found a positive association between catastrophizing and affective pain among individuals with spinal cord injuries but only at high levels of received solicitousness. In other words, received solicitousness seemed to amplify the detrimental effects of catastrophizing on pain.

As for the set of studies drawing upon the transactional models, their main aim was to investigate the extent to which pain-related SS buffered the detrimental effects of stressors on pain-related outcomes (ID#15,16,23). Some of the findings supported the stress buffering hypothesis. For example, a general score on pain-related SS buffered the association between self-appraised problem solving and depression among patients attending a pain management centre (ID#23). Also, received spousal distraction support buffered the impact of pain on mental health quality of life of women with interstitial cystitis/painful bladder syndrome (ID#15) and on pain related disability of men with prostatitis/chronic pelvic pain syndrome (ID#16). However, in line with Giardino et al's findings (ID#14), Gintig et al (ID#16) also found that received solicitousness enhanced the detrimental association between pain and disability.

### 4.4. SS as mediator

Only five cross-sectional studies (9.43%) conceptualized pain-related SS as a mediating process. None of these studies drew upon SS theoretical models. Three studies were based on specific process theories accounting for pain-related outcomes, namely, the communal coping model (ID#3), the social communication model of pain (ID#10) and the attachment-diathesis model of chronic pain (ID#12). Two other studies only mentioned the biopsychosocial model as their theoretical background (ID#4,50).

The first set of studies, investigated the extent to which received (ID#3,12) or provided solicitousness (ID#10) accounted for the associations between patient (ID#3)/partner (ID#10) catastrophizing or patient attachment style (ID#12) and pain related outcomes (e.g. pain behaviors, severity, disability, depression). Studies 3 and 12 from Table S1 (SCD1) did not confirm their mediating hypothesis, as received solicitousness was not significantly associated with the predictors, namely, patient catastrophizing (ID#3) and attachment style (ID#12). However, a study conducted with heterosexual women with vestibulodynia and their partners (ID#10) showed that, controlling for relationship satisfaction, the negative association between partner catastrophizing and women' pain severity/depression were partially mediated by provided solicitousness (ID#10).

Loosely drawing upon the biopsychosocial model, the second set of studies, investigated the extent to which received solicitous (ID#4,50) and distraction responses (ID#50) accounted for the association between several dimensions of relationship quality and pain severity/disability. However, the findings did not support a mediator role for SS in the association between relationship quality and pain outcomes.

## Discussion

The purpose of this scoping review was to provide an overview of how pain-related SS has been conceptualized and measured and how its relationship with chronic pain experiences has been investigated. Drawing upon SS theoretical models, we will highlight the major gaps in the current literature and then point toward new avenues for future research on pain-related SS.

### Gaps in pain-related SS conceptualization and measurement

Just a little beyond solicitousness and the WHYMPI

Almost 40% of the studies were a-theoretical or only mentioned the meta-theoretical biopsychosocial model. Without clear theoretical concepts and propositions knowledge on pain-related SS and its relationship with pain experiences will be curtailed as new research ideas are unlikely to be generated. Among those studies that specified a micro-range theory, the operant model of pain [18] was the most cited, followed by cognitive-behavioral models, mostly, the communal coping model of pain catastrophizing [67]. Only 7.5% of the studies drew upon SS theoretical models. Thus, pain-related SS has been predominantly conceptualized either as reinforcement of pain behaviors or as correlate of maladaptive appraisals and beliefs (e.g., catastrophizing), as opposed to a valuable coping resource [13,60,72].

Moreover, despite previous calls for moving beyond solicitousness [12,36,44], this construct still takes precedence, being measured in almost 90% of the studies. This could be, in part, the result of a methodological bias towards the use of the WHYMPI, which was by far the most used self-report measure, either in its ICP [34] or spouse version [17,32]. Not surprising, the second most frequently measured SS construct (also by the WHYMPI) was distraction despite that its role in pain experiences has received much less conceptualization; e.g., only two studies presented specific hypotheses regarding its role in pain experiences (ID#24,25). This suggests that much of the research has been driven by data capture methods rather than conceptualization, which has kept it from moving beyond solicitousness (and distraction).

Moving beyond solicitousness is critical for two reasons. First, there is often a wrongful assumption that solicitousness is inherently positively reinforcing [44]. This is at odds with findings showing that for some ICPs solicitousness is perceived as unhelpful [45] and potentially undermining their sense of autonomy and self-esteem. Determining recipients' perspectives on pain-related SS interactions (e.g., needs, preferences, satisfaction) would help clarify the role of solicitousness in their pain experience [36,44]. However, only three studies captured data on ICPs satisfaction or dissatisfaction with pain-related SS and/or their preferences for support (ID#20,24,28).

Second, the dominant focus on solicitousness reflects a narrow view of the rich, complex and multidimensional SS construct [60,72,73]. Solicitousness (as measured by the WHYMPI) mainly taps into tangible or instrumental functions of pain-related SS, disregarding other classical functions, such as informational and emotional support [70,74]. Also, it neglects specific and important functions of pain-related SS, often mentioned by ICPs in qualitative studies, namely encouraging task persistence and autonomy, shielding, helping with problem solving, and validating emotions [35,45]. Fortunately, our findings have shown that other types of pain-related SS have begun to emerge. There has been an increased focus on SS of well-behaviors and functional autonomy (#ID26,31,33,35,37,38,39,43), partly due to the emergence in the literature of the SRI [59]. Also, a few studies have conceptualized and measured pain-related emotional support (e.g., validation, empathy, acceptance by others; ID#6,7,8), either using the Validation and Invalidation coding system (ID#6,7,8) or the adaptation of other self-report measures of general SS to the pain context (e.g., Headache Support Scale ID#42, 45, 53). These studies, although still in the minority, point to new directions for future research that will be discussed below.

### A dominant focus on received pain-related SS

Our findings showed a dominant focus on ICPs self-reported received (in the past) pain-related SS. As a result there is limited understanding of the role played by ICP perceptions of pain-related support availability in case of need (i.e., perceived SS). This is troubling as perceived SS is one of the most well documented psychosocial factor positively influencing health-related outcomes [70,72,74]. Furthermore, the distinction between received and perceived SS is crucial given that these are two distinct processes with different antecedents and pathways to health-related outcomes [72,73]. Some evidence suggests that perceived SS may have part of its roots in early childhood experiences (e.g., attachment) and is a more stable personality-related dimension consistently linked to positive effects on health [72,73]. While findings on the relationship between received SS and health-related outcomes are often mixed and inconsistent, suggesting that this construct mainly focuses on social exchanges that are highly contextual [72,73]. Considering the behavioral roots of research on interpersonal factors in pain, the focus on received SS is not surprising. However, the conceptual distinction between the terms has not been clearly grasped as many authors often used the term perceived SS while referring to received SS.

## A one-sided view of pain-related SS interactions

A corollary of the dominant focus on received SS is the centrality given to ICP perceptions of SS exchanges, as compared to the perceptions of the support providers. Only 20% of the studies have examined providers' self-report of given SS and only eight of those used dyadic designs allowing for an understanding of the perspectives of recipient and provider (ID#7,8,30,34,36,38,39,40). Examining interpersonal SS exchanges exclusively from the perspective of only one of the parties involved reduces the rich and complex process that occurs within dyads. To improve our understanding of the factors associated with effective SS exchanges it is critical that research examine the relationship between provided and received SS, namely such factors as timing, reciprocity, visibility, or the match to recipients' needs [49,72]. These dimensions have been largely underinvestigated in the pain context.

Spouse as main source of support

A large majority of the studies in this review focused on spousal or partner SS. Currently, we have little knowledge on the role of other sources of informal SS (e.g., family members, friends, neighbors), which may be important, particularly for individuals with chronic pain who are not involved in romantic relationships.

## Gaps in researching the links between pain-related SS and pain outcomes

### Underexplored mediating pathways and temporal relationships

Our findings showed that 75% of the studies have investigated the direct relationship between pain-related SS and pain outcomes. Major models on SS postulate psychosocial mechanisms (e.g., appraisals, emotions, coping) accounting for the relationship between SS and health and, albeit struggling for clear empirical findings, researchers in the area have moved to investigating such mediating pathways [13,70,74]. Our findings showed that some studies have examined the association between pain-related SS and cognitive appraisals (life-control, pain catastrophizing, acceptance, self-efficacy; ID#2,3,27,40), pain coping (e.g., active coping, avoidance, disengagement, cognitive reframing, problem solving, emotional expression, ID#18,20,37,42) and distress (mood, depression, anxiety, ID#2,11,12,17,18,19,22,23,31,32,33,46,49). However, only once (ID#40) were these factors investigated as mediating mechanisms; pain catastrophizing (but not self-efficacy) partially mediated the association between received solicitousness and pain severity among women with provoked vestibulodynia. As such, pathways accounting for the relationship between pain-related SS and pain outcomes are clearly warrant further investigation. Moreover, any conclusions on the temporal relationships between the constructs are hindered by the fact that more than 80% of the findings were cross-sectional, despite all the calls for prospective studies [36,44]. This is particularly problematic as most studies have been focusing on received/provided SS, which are more often affected by reverse causality issues (e.g., more pain disability may lead to more received/provided SS) [70,72].

## SS exchanges studied in a social vacuum

SS theoretical models conceptualize received SS as a construct focused on SS exchanges that are highly dependent on the context where they take place. SS researchers have identified categories of variables that may influence the effectiveness of SS exchanges [49,72,73], namely: (1) Task-related factors (e.g., the extent to which the type of support matches the stressor demands); (2) Recipient-related factors (e.g., the extent to which SS matches recipient's needs, preferences and goals); (3) Provider-related factors (e.g., who is the support provider, what are his/her goals, motivations and skills for providing support); and (4) relationship factors, namely, the quality of the relationship, which can greatly influence the meanings of SS exchanges [72,73].

Our findings showed that the conditions under which received/provided pain-related SS are effective are not often investigated. Out of the 32 studies that considered pain-related SS as a predictor/correlate of pain outcomes, only 8 explicitly investigated moderators of such relationships (ID#11,12,26,28,33,34,35,44). Most of these studies investigated moderators pertaining to recipients' characteristics (sex, attachment style, depression and support preferences; ID#11,12,26,28,34), a couple of studies considered relationship characteristics as a moderator (e.g., marital satisfaction; ID#33,34) and only one study took into account moderators pertaining to the provider (type of source of support; ID#35). Pain-related characteristics (e.g., diagnosis, site, severity, duration) were rarely considered as potential moderators of the effectiveness of SS exchanges (ID#34,44). Finally, although cultural processes may influence SS exchanges [68], these have been ignored. Since most research has been conducted in North America and western countries any attempts of generalization of the findings to other cultures is hampered. In sum, pain-related SS exchanges have been mostly studied in a social vacuum with little regard to the proximal or distal circumstances where they take place.

## A need for attention to the role of pain-related SS within the stress and coping process

Both perceived and received support have been shown to buffer the detrimental effects of stress on health outcomes [13] and SS researchers have been calling for research that uncovers the mediating mechanisms of such buffering effects [70]. Received SS may also be one of several mediating mechanisms within the stress and coping process [13,60]. For example, it can account for the effects of agency beliefs, like self-efficacy, on health-related outcomes (the cultivating hypothesis) or the effects of provided SS on individuals' coping strategies.

The buffering and mediating roles of pain-related SS have received very little attention. A few studies have conceptualized pain-related SS as a mediating mechanism but most did not find evidence to support this role (ID#3,12,4,50). Only three studies (ID#15,16,23) have attempted to investigate the stress buffering hypothesis in a pain context, and none went further in trying to account for its mediating pathways. Interestingly, and at odds with most evidence on SS literature, some findings suggested that certain types of SS, namely solicitousness, may amplify the effects of the stressors (ID#14,16). This may point out the interesting possibility that, depending on the circumstances (or types of support), pain-related SS may either buffer or amplify the detrimental effect of stress on pain experiences. This is yet to be explored and warrants investigation.

### A call for systematic research on determinants of pain-related SS

Considerable attention has been paid to the investigation of the determinants of pain-related SS (22.6% of the studies). To develop effective SS interventions it will be critical to identify the subjective or objective factors that may determine pain-related received or provided SS [13]. The fact that most of the included studies were cross-sectional hinders this endeavor. Moreover, most studies focused on determinants pertaining to the ICP (appraisals, pain behaviors) and/or determinants of received SS. Therefore, little is known about the role of provider or relationship/dyadic characteristics on pain-related SS processes and on the determinants of provided pain-related SS. Also, our findings showed that there were only two studies testing group-based or couple-oriented interventions on pain-related SS (ID#25,28), with limited findings. Designing and testing the effectiveness of pain-related SS interventions warrants greater attention.

## Limitations and future directions for research

There are some limitations to this study that must be noted. First, related to the methods of scoping reviews, we are not able to make clinical recommendations, as there is no attempt to determine effect sizes or quality assessment of studies; some of the studies indeed had quality issues that need to be considered when interpreting their findings. Furthermore, given that scoping review methodology does not call for the quality assessment of each study's quality it is beyond the scope of our study to address whether or not methodological historical trends may have resulted in more sophisticated study design and more robust and nuanced outcomes over time, all of which would improve our understanding of pain related social support. Second, we excluded qualitative studies although they might have provided insights into components of pain-related SS that have been under-conceptualized/measured. Third, given the focus of this review we did not examine research on the role of social integration and participation in pain experiences or with pediatric population experiencing pain. Therefore, research trends and gaps reported in the previous section may not be generalized to these specific bodies of research.

Despite these limitations, the identified gaps offer insights into directions for future research. The conceptualization and measurement of pain-related SS should be expanded to encompass the complexity and multidimensionality of these particular social exchanges. Besides solicitousness, other specific functions of pain-related SS have emerged in the literature, namely, SS of well-behaviors and functional autonomy and pain-related emotional support. These concepts begin to unravel the potential of pain-related SS as an important social resource for ICPs. A more systematic use of existing measures other than, or in addition to, the WHYMPI (e.g., SRI) and the development of new self-report measures (e.g., to assess validation and empathic responses) is needed to move research beyond solicitousness. Also, although studies that focused on development or refinement of pain related social support measures (psychometric evaluation studies) were not part of this scoping review, a systematic in-depth evaluation of the various instruments available is warranted. Second, besides investigating received SS, researchers should also consider examining the role of perceived availability of pain-related SS and of SS preferences and satisfaction, as they may be relevant dimensions to include in cognitive-behavioral interventions. In this regard, it is worth mentioning a short and unidimensional scale of pain-related social support satisfaction developed by van der Lugt et al [75]. Although, between 2000 and 2015, this measure had not been referred by other studies besides its original psychometric development study, it is a parsimonious measure offering the possibility of further research on ICPs SS satisfaction. Fourth, more dyadic studies are needed that examine the relationship between provided and received SS, namely, dimensions such as reciprocity, timing, visibility and responsiveness [49]. Finally, the role of other informal sources of support (e.g., family members, friends, neighbors) must also be investigated.

More research based on SS theoretical models is needed to inform new directions for research of the relationship between pain-related SS and pain outcomes, namely, the investigation of: (1) its mediation pathways (cognitive, affective, behavioral and physiological) and (2) the role of pain-related SS within the stress and coping process. We reiterate the call for prospective studies to clarify temporal relationships. We also extend the call to mixed-method and qualitative studies to allow a more detailed and in-depth analysis of contextually situated pain-related SS processes. Indeed, more attention should be paid to the (social) contexts of SS processes. Characteristics of pain, ICPs, providers, their relationship and family or of broader social contexts (e.g., culture) could be systematically analyzed as conditions influencing the relationship between received/provided pain-related SS and pain-outcomes. Finally, a more systematic investigation of the determinants of pain-related SS is needed to inform the development of SS interventions. Theoretically driven studies determining the content, format, delivery mode of interpersonal SS interventions are needed to harness the potential of this relatively untapped source of treatment to improve outcomes for those with chronic pain.

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## References

[1] Alschuler KN, Hoodin F, Murphy SL, Rice J, Geisser ME. Factors contributing to physical activity in a chronic low back pain clinical sample: a comprehensive analysis using continuous ambulatory monitoring. Pain 2011;152(11):2521–7.

[2] Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol 2005;8(1):19–32.

[3] Boothby JL, Thorn BE, Overduin LY, Ward LC. Catastrophizing and perceived partner responses to pain. Pain 2004;109:500–6.

[4] Buenaver LF, Edwards RR, Haythornthwaite JA. Pain-related catastrophizing and perceived social responses: inter-relationships in the context of chronic pain. Pain 2007;127(3):234–42.

[5] 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;13:204–14.

[6] Campbell P, Wynne-Jones G, Dunn K. The influence of informal social support on risk and prognosis in spinal pain: A systematic review. Eur J Pain 2011;15:444e1-444e14.

[7] Campbell P, Wynne-Jones G, Muller S, Dunn KM. The influence of employment social support for risk and prognosis in nonspecific back pain: A systematic review and critical synthesis. Int Arch Occupat Environ Health 2013;86(2):119-137.

[8] Cano A. Pain catastrophizing and social support in married individuals with chronic pain: the moderating role of pain duration. Pain 2004;110(3):656–64.

[9] Cano A, Barterian JA, Heller JB. Empathic and nonempathic interaction in chronic pain couples. Clin J Pain 2008;24(8):678–84.

[10] Cano A, Leong L, Heller JB, Lutz JR. Perceived entitlement to pain-related support and pain catastrophizing: associations with perceived and observed support. Pain 2009;147(1-3):249–54.

[11] Cano A, Leong L, Williams AM, May DK, Lutz JR. Correlates and consequences of the disclosure of pain-related distress to one's spouse. Pain 2012;153(12):2441–7.

[12] Cano A, Williams ACC. Social interaction in pain: Reinforcing pain behaviors or building intimacy? Pain 2010;149:9-11.

[13] Cohen S, Gottlieb BH, Underwood LG, editors. Social support measurement and intervention: A guide for health and social scientists. New York: Oxford University Press, 2000.

[14] Cunningham JL, Hayes SE, Townsend CO, Laures HJ, Hooten WM. Associations between spousal or significant other solicitous responses and opioid dose in patients with chronic pain. Pain Med 2012;13:1034–9.

[15] Davis SN, Bergeron S, Sadikaj G, Corsini-munt S, Steben M. Partner behavioral responses to pain mediate the relationship between partner pain cognitions and pain outcomes in women with provoked vestibulodynia. J Pain 2015;16(6):549–57.

[16] Fillingim RB, Doleys DM, Edwards RR, Lowery D. Spousal responses are differentially associated with clinical variables in women and men with chronic pain. Clin J Pain 2003;19(4):217–24.

[17] Flor H, Kerns RD, Turk D. The role of spouse reinforcement, perceived pain, and activity levels of chronic pain patients. J Psychosomatic Res 1987;31(2):251-259.

[18] Fordyce WE. Behavioral methods for chronic pain and illness. St Louis: C.V. Mosby, 1976.

[19] Forsythe LP, Romano JM, Jensen MP, Thorn BE. Attachment style is associated with perceived spouse responses and pain-related outcomes. Rehabil Psychol 2012;57(4):290–300.

[20] Fromage B, Goutany E. Old caregiver’s burn out. Rev Eur Psychol Appl 2007;57:145–50.

[21] Giardino ND, Jensen MP, Turner JA, Ehde DM, Cardenas DD. Social environment moderates the association between catastrophizing and pain among persons with a spinal cord injury. Pain 2003;106:19–25.

[22] Ginting JV, Tripp DA, Nickel CJ. Self-reported spousal support modifies the negative impact of pain on disability in men with chronic prostatitis/chronic pelvic pain syndrome. Urology 2011;78(5):1136–41.

[23] Ginting JV, Tripp DA, Nickel JC, Fitzgerald MP, Mayer R. Spousal support decreases the negative impact of pain on mental quality of life in women with interstitial cystitis/painful bladder syndrome. BJU Int 2010;108:713–7.

[24] Grant LD, Long BC, Willms JD. Women’s adaptation to chronic back pain: daily appraisals and coping strategies, personal characteristics and perceived spousal responses. J Health Psychol 2002;7(5):545–63.

[25] Griffin KW, Friend R, Kaell AT, Bennett RS. Distress and disease status among patients with rheumatoid arthritis: roles of coping styles and perceived responses from support providers. Ann Behav Med 2001;23(2):133–8.

[26] Hanley MA, Jensen MP, Ehde DM, Hoffman AJ, Patterson DR, Robinson LR. Psychosocial predictors of long-term adjustment to lower-limb amputation and phantom limb pain. Disabil Rehabil 2004;26(14/15):882–93.

[27] Holtzman S, Newth S, Delongis A. The role of social support in coping with daily pain among patients with rheumatoid arthritis. J Health Psychol 2004;9(5):677–95.

[28] Hoogendoorn WE,van Poppel MN,Bongers PM Koes BW, Bouter LM. Systematic review of psychosocial factors at work and private life as risk factors for back pain. Spine 2000;25(16):2114-25.

[29] Issner JB, Cano A, Leonard MT, Williams AM. How do I empathize with you? Let me count the ways: relations between facets of pain-related empathy. J Pain 2012;13(2):167–75.

[30] Jensen MP, Ehde DM, Hoffman AJ, Patterson DR, Czerniecki JM, Robinson LR. Cognitions, coping and social environment predict adjustment to phantom limb pain. Pain 2002;95:133–42.

[31] Jensen MP, Moore MR, Bockow TB, Ehde DM, Engel JM. Psychosocial factors and adjustment to chronic pain in persons with physical disabilities: A systematic review. Arch Phys Med Rehabil 2011;92:146-160.

[32] Kerns RD, Rosenberg R. Pain-relevant responses from significant others: Development of a significant-other version of the WHYYPI scales. Pain 1995; 61:245–249.

[33] Kerns RD, Rosenberg R, Otis JD. Self-appraised problem solving and pain-relevant social support as predictors of the experience of chronic pain. Ann Behav Med 2002;24(2):100–5.

[34] Kerns RD, Turk DC, Rudy TE. The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). Pain 1985;23(4):345-56.

[35] Kostova Z, Caiatta-Zufferey M, Schulz PJ. The impact of social support on the acceptance process among RA patients: A qualitative study. Psychol Health 2014; 29:1283-1302.

[36] Leonard MT, Cano A, Johanssen AB. Chronic pain in a couples' context: A review and integration of theoretical models and empirical evidence. J Pain 2006; 7:377-390.

[37] Martire LM, Keefe FJ, Schulz R, Ready R, Beach SR, Rudy TE, et al. Older spouses' perceptions of partners' chronic arthritis pain: implications for spousal responses, support provision, and caregiving experiences. Psychol Aging 2006;21(2):222–30.

[38] Martire LM, Schulz R, Keefe FJ, Rudy TE, Starz TW. Couple-oriented education and support intervention for osteoarthritis: effects on spouses' support and responses to patient pain. Fam Syst Health 2008;26(2):185–95.

[39] Martire LM, Stephens M, Mogle J, Schulz R, Brach J, Keefe FJ. Daily spousal influence on physical activity in knee osteoarthritis. Ann Behav Med 2013;45(2):213–23.

[40] McCracken LM. Social context and acceptance of chronic pain: the role of solicitous and punishing responses. Pain 2005;113:155–9.

[41] McWilliams LA, Higgins KS, Dick BD, Verrier MJ. A longitudinal investigation of pain-related social support preferences in a chronic pain treatment sample. Clin J Pain 2014;30(8):672–8.

[42] Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. BMJ 2009;339:2535.

[43] Müller R, Peter C, Cieza A, Geyth S. The role of social support and social skills in people with spinal cord injury: A systematic review of the literature. Spinal Cord 2012;50:94-106.

[44] Newton-John TR. Solicitousness and chronic pain: A critical review. Pain Rev 2002; 9:7-27.

[45] Newton-John TR, Williams AC. Chronic pain couples: perceived marital interactions and pain behaviours. Pain 2006;123(1-2):53-63.

[46] Papas RK, Robinson ME, Riley III JL. Perceived spouse responsiveness to chronic pain: three empirical subgroups. J Pain 2001;2(5):262–9.

[47] Pence LB, Cano A, Thorn B, Ward LC. Perceived spouse responses to pain: the level of agreement in couple dyads and the role catastrophizing, marital satisfaction, and depression. J Behav Med 2006;29(6):511–22.

[48] Pence LB, Thorn BE, Jensen MP, Romano JM. Examination of perceived spouse responses to patient well and pain behavior in patients with headache. Clin J Pain 2008;24(8):654–61.

[49] Rafaeli E, Gleason, M. (2009). Skilled support within intimate relationships. J Family Theory Rev 2009;1:20-37.

[50] Raichle KA, Hanley MA, Jensen MP, Cardenas DD. Cognitions, coping and social environment predict adjustment to pain in spinal cord injury. J Pain 2007;8(9):718–29.

[51] Raichle KA, Romano JM, Jensen MP. Partner responses to patient pain and well behaviors and their relationship to patient pain behavior, functioning, and depression. Pain 2011;152(1):82–8.

[52] Romano JM, Jensen MP, Turner JA, Good AB, Hops H. Chronic pain patient-partner interactions: further support for a behavioral model of chronic pain. Behav Ther 2000;31:415–40.

[53] Romano JM, Jensen MP, Schmaling KB, Hops H, Buchwald DS. Illness behaviors in patients with unexplained chronic fatigue are associated with significant other responses. J Behav Med 2009;32:558–69.

[54] Rosen NO, Bergeron S, Lambert B, Steben M. Provoked vestibulodynia: mediators of the associations between partner responses, pain, and sexual satisfaction. Arch Sex Behav 2013;42:129–41.

[55] Rosen NO, Bergeron S, Leclerc B, Lambert B, Steben M. Woman and partner-perceived partner responses predict pain and sexual satisfaction in provoked vestibulodyna (PVD) couples. J Sex Med 2010;7:3715–24.

[56] Rosen NO, Bergeron S, Glowacka M, Delisle I, Baxter M Lou. Harmful or helpful: perceived solicitous and facilitative partner responses are differentially associated with pain and sexual satisfaction in women with provoked vestibulodynia. J Sex Med 2012;9:2351–60.

[57] Rosen NO, Bergeron S, Sadikaj G, Glowacka M, Delisle I, Baxter M-L. Impact of male partner responses on sexual function in women with vulvodynia and their partners: a dyadic daily experience study. Heal Psychol 2014;33(8):823–31.

[58] Rosen NO, Muise A, Bergeron S, Delisle I, Baxter M Lou. Daily associations between partner responses and sexual and relationship satisfaction in couples coping with provoked vestibulodynia. J Sex Med 2015;12:1028–39.

[59] 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(4):243-52.

[60] Schwarzer R, Knoll N. Functional roles of social support within the stress and coping process: A theoretical and empirical overview. Int J Psychol 2007;42(4):243–52.

[61] Silvemark AJ, Källmén H, Portala K, Molander C. Life satisfaction in patients with long-term non-malignant pain – relating LiSat-11 to the Multidimensional Pain Inventory to the Multidimensional Pain Inventory (MPI). Health Qual Life Outcomes 2008;6(70).

[62] Skomo ML, Desselle SP, Berdine HJ. Factors influencing migraineur-consulting behavior in a university population. Headache 2006;46:742–9.

[63] Smith SJ, Keefe FJ, Caldwell DS, Romano J, Baucom D. Gender differences in patient – spouse interactions: a sequential analysis of behavioral interactions in patients having osteoarthritic knee pain. Pain 2004;112:183–7.

[64] Sorbi MJ, Peters ML, Kruise DA, Maas CJ, Kerssens JJ, Verhaak PF, Bensing JM. Electronic momentary assessment in chronic pain I: psychological pain responses as predictors of pain intensity. Clin J Pain 2006;22(1):55–66

[65] Stephens M, Martire LM, Cremeans-Smith JK, Druley JA, Wojno WC. Older women with osteoarthritis and their caregiving husbands: effects of pain and pain expression on husbands' well-being and support. Rehabil Psychol. 2006;51(1):3–12.

[66] Stroud MW, Turner JA, Jensen MP, Cardenas DD. Partner responses to pain behaviors are associated with depression and activity interference among persons with chronic pain and spinal cord injury. J Pain 2006;7(2):91–9.

[67] Sullivan MJL, Thorn B, Haythornthwaite JA, Keefe F, Martin M, Bradley LA, Lefebvre JC. Theoretical perspectives on the relation between catastrophizing and pain. Clin J Pain 2001;17:52– 64.

[68] Taylor SE, Sherman DK, Kim HS, Jarcho J, Takagi K, Dunagan MS. Culture and social support: Who seeks it and why? J Pers Soc Psychol 2004;87:354-62.

[69] Thieme K, Spies C, Sinha P, Turk DC, Flor H. Predictors of pain behaviors in fibromyalgia syndrome. Arthritis Care Res 2005;53(3):343–50.

[70] Thoits, P. Mechanisms linking social ties and support to physical and mental health. J Health Soc Behav 2011;52(2):145-61.

[71] Tripp DA, Nickel JC, Wang Y, Litwin MS, McNaughton-Collins M, Landis JR, Alexander RB, Schaeffer AJ, O'Leary MP, Pontari MA, Fowler JE, Nyberg LM, Kusek JW, National Institutes of Health-Chronic Prostatitis Collaborative Research Network (NIH-CPCRN) Study Group. Catastrophizing and pain-contingent rest predict patient adjustment in men with chronic prostatitis/chronic pelvic pain syndrome. J Pain 2006;7(10):697–708.

[72] Uchino BN. Understanding the links between social support and physical health. A life-span perspective with emphasis on the separability of perceived and received social support. Persp Psychol Sci 2009;4(3):236-54.

[73] Uchino BN, Carlisle M, Birmingham W, Vaughn AA. Social Support and the reactivity hypothesis: Conceptual issues in examining the efficacy of received support during acute psychological stress Biol Psychol 2011;86(2): 137–42.

[74] Uchino BN, Bowen K, Carlisle M, Birmingham W. Psychological pathways linking social support to health outcomes: A visit with the "ghosts" of research past, present, and future. Soc Sci Med. 2012;74(7): 949–57.

[75] Van der Lugt CMC, Rollman A, Naeije M, Lobbezoo F, Visscher CM. Social support in chronic pain: development and preliminary assessment of a new instrument. J Oral Rehab 2012;39:270-276.

[76] van Koulil S, van Lankveld W, Kraaimaat FW, van Riel PL, Evers AW. Risk factors for longer term psychological distress in well-functioning fibromyalgia patients: a prospective study into prognostic factors. Patient Educ Couns 2010;80(1):126–9.

[77] Waxman SE, Tripp DA, Flamenbaum R. The mediating role of depression and negative partner responses in chronic low back pain and relationship satisfaction. J Pain 2008;9(5):434–42.

[78] Widerström-Noga EG, Duncan R, Turk DC. Psychosocial profiles of people with pain associated with spinal cord injury: identification and comparison with other chronic pain syndromes. Clin J Pain 2004;20(4):261–71.

[79] Widerström-Noga EG, Felix ER, Cruz-Almeida Y, Turk DC. psychosocial subgroups in persons with spinal cord injuries and chronic pain. Arch Phys Med Rehabil 2007;88:1628–35.

[80] Wilson SJ, Martire LM, Keefe FJ, Mogle JA, Stephens MAP, Schulz R. Daily verbal and nonverbal expression of osteoarthritis pain and spouse responses. Pain 2013;154(10):2045–53.

## Figure Legends

Figure 1- Flowchart of the study identification and selection process

Supplemental Digital Content 1. Table S1 that summarizes data from 53 studies on informal pain-related social support published between 2000 and 2015. pdf