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Subjective Cognitive Functioning Relates to Parenting in Mothers with Chronic Pain

by

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Abstract

Introduction: Individuals with chronic pain commonly report problems with daily cognitive functioning (e.g. problems with mental clarity, attention, inhibitory control, etc.). This feeling of decreased subjective cognitive functioning (SCF) can be distressing due to its impact on daily life and relationships. Parental cognitive functioning plays an important role in all aspects of parenting and could have a substantial impact on children. Children of parents with chronic pain are at an increased risk for the development of chronic pain and related functional impairment and it is possible that higher levels of parental cognitive dysfunction could increase this risk. Specifically, mothers with lower SCF may have difficulty completing day-to-day caregiving activities (e.g., grocery shopping, helping children with homework) as well as responding flexibly to children's behaviors. The present study focused on examining the impact of SCF on parenting in mothers with chronic pain. We hypothesized that mothers with generalized pain would report lower SCF than mothers with localized pain. Additionally, we hypothesized that decreased levels of SCF in mothers with chronic pain would predict greater catastrophizing about their child's pain, inconsistent discipline, and more guilt/worry regarding how their pain affects their role within their family above and beyond the impact of pain intensity.

Methods: Mothers with chronic pain (n=138) participated in an optional follow-up survey task between years 1 and 2 of a larger, longitudinal study involving mothers with chronic pain and their 8-12-year-old biological child. During this optional survey, mothers completed the Multidimensional Inventory of Subjective Cognitive Impairment and Brief Pain Inventory. During year 1, mothers completed the Brief Pain Inventory pain severity subscale, Pain Catastrophizing Scale-Parent Version, CARE Scale assessing worry about the impact of pain on caregiving roles, and Alabama Parenting Questionnaire inconsistent discipline subscale. Four multiple regression analyses were conducted to assess the contribution of subjective cognitive functioning to parenting behaviors.

Results: Controlling for maternal pain severity, higher SCF was a significant predictor of decreased parent catastrophizing about child's pain ($\beta=.18$, $p=.047$) and lower guilt about the impact of pain on caregiving roles ($\beta=.23$, $p=.009$). SCF was not significantly associated with inconsistent discipline or parental self-care prioritization. Additionally, mothers with generalized pain reported significantly lower levels of SCF compared to mothers with localized pain.

Conclusions: Decreased SCF related to higher levels of parenting behaviors typically associated with increased risk for poor adjustment to pain in children. Higher levels of maternal cognitive dysfunction may confer additional risk to offspring through parenting behaviors. Further research is needed to evaluate the impact of maternal cognitive function on children's functioning and whether these effects are mediated by parenting behaviors.

Keywords: Subjective cognitive function, chronic pain, parenting behaviors, generalized pain

Subjective Cognitive Functioning Relates to Parenting in Mothers with Chronic Pain

Introduction

Chronic pain, defined by the International Association for the Study of Pain as “pain that persists or recurs for more than three months” (2016), is a problem that affects roughly 25 to 100 million adults in the United States (Institute of Medicine, 2011; National Center for Complementary and Integrative Health, 2016). The presence of chronic pain often results in an increase in psychological disorders (Tunks, Crook, & Weir, 2008), decreased social and physical functioning (Ekici et al., 2010; Wilson & Fales, 2015), and potential cognitive difficulties (Berryman et al., 2014; B. Dick, Eccleston, & Crombez, 2002; Ferreira Kdos, Oliver, Thomaz, Teixeira, & Foss, 2016).

Chronic pain is an extremely complex problem and treating it is equally complex. Currently, the most widely accepted approach to the research and treatment of chronic pain is the biopsychosocial model of chronic pain. Researchers and clinicians employ biological, psychological, and social methods to evaluate and treat chronic pain, leading to a more holistic and individualized approach to treatment (Adams & Turk, 2018; Gatchel, Peng, Peters, Fuchs, & Turk, 2007). Biological factors implicated in chronic pain typically include nociception (signaling of the nerves that there is potentially harmful damage to tissue on the body, generally resulting in the feeling of pain), sensitization of the central nervous system to pain stimuli, and genetic influences. Psychological factors include negative thought process, psychological disorders (e.g. anxiety and depression), and emotions (e.g. anger). Emotional distress often co-occurs with various chronic pain conditions and with those experiencing acute pain. Through these negative emotions and thought processes, those experiencing pain may engage in more

passive or maladaptive coping strategies, such as withdrawing or avoiding activities which have been associated with poorer outcomes. Additionally, emotional state can be a moderator in the experience of pain, influencing one's behaviors and cognition; with more negative experiences leading to the persistence and negative adaption to pain (Lumley et al., 2011). Social factors refer to interpersonal and broader cultural factors that influence pain expression and experience. In the case of children, parents and the broader family environment are thought to be key social contexts that may serve to increase or decrease pain experiences and related disability due to the role that family plays in the development of children. The presence of chronic pain in a parent often adds further stress to the family system and influences children's pain-specific social learning behaviors, cognition, and sensitivity (Stone & Wilson, 2017). Evaluating the complex interactions of biological, psychological, and social processes influencing chronic pain can help inform the development of comprehensive treatments for chronic pain.

In recent years, studies have begun to focus on external factors relating to chronic pain and its impact, factors such as the impact of chronic pain on parenting and the impact of parental chronic pain on children. Current research has shown that chronic pain has an intergenerational effect, meaning that children of parents with chronic pain are at greater risk for poorer mental and physical health outcomes, including the development of chronic pain. A recently developed model regarding the intergenerational transmission of chronic pain identified five potential mechanisms for this relation; genetics, alterations in early neurobiological development, pain-specific social learning, general parenting and family health, and exposure to stressful environment. Parenting behaviors include both parental responses to children's pain such as the extent to which they catastrophize about children's pain or respond in a protective manner as well as more general parenting behaviors such as the extent to which a parent provides

consistency and warmth for their child. Both pain-specific and more general parenting behaviors could influence children's risk for the development of chronic pain or emotional distress.

Chronic pain, adds an increased amount of difficulty to parenting compared to those who do not have chronic pain. In a qualitative interview conducted by Wilson and Fales (2015) commonly reported difficulties include reduced parental involvement, increased impatience, parental guilt and self-disappointment and reduced child physical activity. This increase in difficulty may be one of the primary reasons that the offspring of those with chronic pain are at an increased risk for adverse mental and physical health outcomes (Higgins et al., 2015; Stone & Wilson, 2016; Wilson, Moss, Palermo, & Fales, 2014).

However, not all parents with chronic pain engage in parenting behaviors which may increase children's risk for the development of poorer outcomes. A number of parents with chronic pain engage in effective parenting behaviors which may be a protective factor for their children. Thus, evaluating factors which may influence parenting behaviors in parents with chronic pain could elucidate targets for interventions. Subjective cognitive functioning (SCF) is one factor that has been associated with both chronic pain and parenting difficulties. SCF refers to one's perceived ability to complete cognitive tasks, mental clarity, memory, attention, concentration, language, inhibitory control, and tendencies to stray towards negative thought processes. Lower levels of SCF are known to be an extremely common symptom of fibromyalgia, affecting approximately 75% of individuals with the condition (Bell et al., 2018; Kratz, Schilling, Goesling, & Williams, 2015). What has become increasingly evident is the recognition that this symptom does not just affect people with fibromyalgia, it is also common in those with other chronic pain conditions. While the reasons for this are largely unknown, increased pain severity may lead to worse cognitive functioning (Coppieters et al., 2015; B. Dick

et al., 2002; Ekici et al., 2010; Ojeda et al., 2018). Low SCF is a very distressing symptom of chronic pain due to the problems it can cause in regards to work, relationships, and other daily life related activities.

In regards to parenting with chronic pain, this perceived decrease in cognitive functioning may result in a whole host of other struggles with parenting approaches. Difficulties with memory, concentration, and mental clarity could lead to inconsistent discipline. That is, threatening to punish a child but not following through, getting talked out of punishment, or lifting a punishment early (Evans, Shipton, & Keenan, 2006). Discipline is an essential parenting behavior, as when discipline is inconsistent it has been shown to lead to increased aggressive behaviors, delinquent behaviors, and increasingly coercive interactions between parent and child (Barry, Dunlap, Lochman, & Wells, 2009). With chronic pain, discipline may become more inconsistent due to parents' focus on pain and the influence that pain plays on physical and mental processes, leading to less focus on discipline and poorer concentration. Pain also contributes to poorer concentration and difficulties planning or organizing tasks, as well as physical impairments that cause difficulties in regards to getting their child to school and a potential reduction in parental involvement (Wilson & Fales, 2015). Numerous studies have found that those with chronic pain have a tendency to focus on negative thoughts, which often lead to catastrophizing when something goes wrong or their child experiences pain. Catastrophizing refers to their thoughts and feelings when their child experiences pain. Signs of high catastrophizing materialize as thoughts of "When my child is in pain, there is nothing I can do to stop the pain" and "When my child is in pain I can't keep it out of my mind" (Akbari, Dehghani, Khatibi, & Vervoort, 2016; Caes, Vervoort, Eccleston, & Goubert, 2012; Liesbet Goubert, Eccleston, Vervoort, Jordan, & Crombez, 2006; L. Goubert, Vervoort, Sullivan,

Verhoeven, & Crombez, 2008). High levels of parental catastrophizing have been associated with increased pain frequency, intensity, and pain-related disability in children of parents with chronic pain. Higher levels of parental catastrophizing have also been associated with children catastrophizing more about their own pain (Caes et al., 2012; Wilson et al., 2014). Lastly, any of the difficulties completing activities listed above could lead to guilt about the individual's parenting (Kowal, Wilson, McWilliams, Peloquin, & Duong, 2012). Cognitive functioning has a great impact on any sort of functioning, both in daily life and more complex activities. Parenting a child of any age requires an enormous amount of cognitive functioning to the extent that even parents who are considered healthy can struggle to raise their child in the way that they believe is best. In this way, higher cognitive functioning may be a protective factor to help moderate the effect of chronic pain on the family dynamic.

Our present study focused on examining the impact of SCF on parenting in mothers with chronic pain; both generalized and localized, as well as SCF predicts parenting behaviors above and beyond pain intensity. Two specific aims were identified: (1) to describe the effects of subjective cognitive functioning in mothers with chronic pain and the differences in mothers with and without generalized pain, and (2) to examine the role that subjective cognitive function plays on parenting in mothers with chronic pain, above and beyond mothers' own pain severity. Based on extensive literature review to support the aims we hypothesized that: (a) Mothers with generalized pain are more likely to have lower levels of subjective cognitive functioning compared to mothers with localized pain. (b) Mothers who report lower levels of subjective cognitive functioning are more likely to report higher levels of guilt regarding how their pain affects their role within their family. (c) Mothers who have lower levels of subjective cognitive functioning are more likely to catastrophize about their child's pain. (d) Mothers who have lower

levels of subjective cognitive functioning are more likely to be inconsistent in disciplining their child.

Methods

The present study was conducted through an ongoing, longitudinal (3 years), online, multi-site study. This overarching study is designed to evaluate the impact of maternal chronic pain on the emotional and physical functioning of children as they transition to adolescence. The study utilized participant data collected in Year 1 of the larger study as well as an optional time point between Year 1 and Year 2.

Participants

Mothers and one of their 8-12 year old children were recruited to participate in the present study through social media (Facebook and Twitter advertisements), research databases (e.g. ResearchMatch), and three academic medical center pain clinics in the Western United States (Oregon Health and Science University, Stanford University, University of Washington). The institutional review board at each academic medical center where participant recruitment occurred approved the study protocol as well as the university providing oversight for this thesis (Portland State University). At the time of present analyses, 484 mother and child dyads had been enrolled. 396 dyads had completed Year 1 questionnaires and 138 mothers (23% of mothers enrolled) had completed an Optional Follow-up Task, following Year 1 participation. This follow-up task contains the Multidimensional Inventory of Subjective Cognitive Impairment, the main measure of use in the present study. Due to this, only data from mothers who completed the Optional Follow-up Task will be used in subsequent analyses.

Eligibility criteria for mothers included diagnosis with a non-life threatening (e.g. cancer or diabetes) chronic pain disorder, experience pain at least weekly for a minimum of six months,

and have a biological child between eight and twelve years of age. In addition, mothers had to have sought specialty medical care or treatment (e.g. primary care, massage therapy, acupuncture, etc.) at least once in the last six months for their chronic pain. Exclusionary criteria included with a diagnosis of a life-threatening medical condition (such as cancer or diabetes), a diagnosis of rheumatoid arthritis with prescribed DMARDs or biologics, and hospitalization for psychiatric problems within the last six months.

Procedure

Through the recruitment methods listed above, mothers completed an initial contact form to express interest in study participation. A member of the study team later reached out via email to set up a time for the eligibility screening phone call. Once this was set up, a member of the study team would conduct the eligibility screening at the time designated and review consent and assent forms if the participant was eligible and wished to participate in the study.

Upon completion of a second call regarding family history, each member of the dyad would be sent links to an online survey, comprised of a battery of measures. The surveys asked questions regarding pain, parenting, beliefs/responses to pain, and the impact of pain on functioning. These surveys were administered once per year, each year of study, for each participant and were completed through REDCap; a secure, online data collection tool created by Harris et al. (2009). Participants were compensated upon completion of each year of study.

After completion of Year 1, a subset of the first 150 participants that completed Year 1 was contacted with an opportunity to complete an optional follow-up task. Upon completion of this task, the subset of participants were entered into a random drawing to with a chance to receive compensation through the drawing.

Measures

Demographic Characteristics. Participant demographic information was collected during the Year 1 survey. Characteristics collected include: maternal and child age, race and ethnicity, marital status, employment status, highest level of schooling completed, and annual household income. The number of years since pain onset and whether or not the mother experienced chronic pain prior to having children was also collected.

Multidimensional Inventory of Subjective Cognitive Impairment (MISCI). The MISCI was originally designed as a brief self-report to measure subjective cognitive impairment in people with Fibromyalgia. It was designed due to the lack of self-report measures that measure multiple facets of cognitive functioning. The MISCI has been validated using both the Multiple Ability Self-Report Questionnaire (MASQ), which was developed for use in medical populations, and the Quality of Life in Neurological Disorders (Neuro-QOL) which was designed to be a generic measure for cognitive functioning across neurological. In validation studies, the MISCI has been associated with the MASQ scales of language, visual/perception, verbal memory, visual memory, and attention. It was also associated with the Fibromyalgia Impact Questionnaire-Revised (FIQ-R) scales of physical function, overall impact, symptoms, and memory conditions (Kratz et al., 2015). The inventory contains 10 items, answered using a 5-point scale (1-“Not at All” to 5-“Very Much”) regarding perceived cognition over the past seven days. Six items are positively worded to measure cognitive abilities and the other four are negatively worded to measure cognitive difficulties. To score, each item’s raw score is added, to achieve a maximum score of 50, indicating greater perceived cognitive function (Kratz et al., 2015). The measure’s internal consistency for the present study was strong at 0.89.

Widespread Pain Index (WPI). The WPI utilizes a visual map of the human body (male or female) and participants mark the areas where they have had pain over the last week in order

to determine the extent to which an individual's pain is widespread. The map is divided into five regions (left upper, right upper, left lower, right lower, and axial) with scores ranging from 0-19. A score of 7 or greater qualifies the participant as having widespread pain (though not necessarily fibromyalgia) (Wolfe et al., 2016).

CARE Scale. This scale was designed to measure interpersonal factors that may influence pain experiences in those who have chronic pain. Such items include relationship guilt and worry, as well as difficulty prioritizing self-care in chronic pain. This scale contains 10 items and is rated on a 5-point scale (0-“Not at all” to 4-“To an extreme degree”). Each item assesses either Factor 1: “Externalized self-care,” or Factor 2: “Guilt/Worry (about the impact of pain on relationships” with a greater score indicating difficulty prioritizing own self-care and increased guilt/worry (Ziadni, You, Wilson, & Darnall, 2018). This sample showed strong internal consistency with Cronbach's alphas ranging from 0.84-0.89 between factors.

Alabama Parenting Questionnaire (APQ). Adapted from the original APQ for use as a short-form, this measure was designed to assess parental involvement. This version utilizes a three-factor model to measure positive parenting, inconsistent discipline, and poor supervision. The version for this project also includes one item on positive involvement. Only the inconsistent discipline subscale was used for analysis. Items are rated on a 5-point scale (1-“Never” to 5-“Always”), with a greater total subscale score indicating more inconsistent discipline (Gross, Fleming, Mason, & Haggerty, 2017; Shelton, Frick, & Wootton, 1996). The inconsistent discipline subscale showed an acceptable internal consistency score of 0.70.

Pain Catastrophizing Scale, Parent Version (PCS-P). This scale was designed to assess catastrophic thinking in parents regarding their child's pain. It contains 13 items measured using a 5-point scale (0-“Not at all” to 4-“Extremely”). Scores range from 0-52 and have

rumination, magnification, and helplessness subscales, where a higher score indicates greater catastrophizing (Liesbet Goubert et al., 2006). This sample showed strong internal consistency with Cronbach's alphas ranging from 0.84-0.87 between scales.

Brief Pain Inventory (BPI). Originally developed for use in Cancer populations, the Brief Pain Inventory (BPI)(Cleeland & Ryan, 1994) is a short, self-report inventory that measures pain severity and interference (the impact of pain on daily activities and mood). This short-form contains 15 total items consisting of 11 10-point scale ratings (e.g. '0' No pain to '10' Pain as bad as you can imagine) to assess pain severity and interference, a binary, Yes/No question asking about pain other than minor aches occurring over the last week, a spot to select the areas that pain is felt on a body map, an open-ended question about medications being taken, and a '0%' No relief to '100%' Complete Relief scale of how much relief the medication/pain treatment provides. The pain severity scale score is an average of 4 severity items (e.g., worst pain in last 24 hours, average pain), with a higher score indicating greater pain severity. The pain severity scale score was the only piece of the measure used for analysis as a means to control for covariates.

Data Analysis

All data analyses were completed using SPSS version 25.0. Descriptive statistics were first run to assess participant demographic information and to screen for generalized pain. Once this was completed, an independent sample T-test was run to evaluate the differences in subjective cognitive functioning in mothers who met criteria for generalized pain compared to those with localized pain. Finally, multiple linear regression analyses were conducted to predict the association between the MISCI and individual parenting measures (CARE subscales, Inconsistent discipline subscale of the APQ and PCS-P) above and beyond pain severity. Step 1

of the regression analyses included the covariate, pain severity. Step 2 included the parenting variable. Separate regression analyses were conducted for each parenting behavior. Results were considered statistically significant if the *p* value was .05 or lower on a 95% confidence interval.

Results

Demographics and Pain Characteristics

Table 1 provides a summary of maternal demographic characteristics in the sample of mothers who completed Year 1 surveys as well as the optional follow-up task. The sample was predominately Caucasian (89.1%, *n* = 123), married (79%, *n* = 109), and an average age of 40.34 years-old (*SD* = 5.67, range 24.49-51.84).

Table 1. Maternal Demographics

Demographic Variable	
Maternal age in years, <i>M</i> (<i>SD</i>)	40.34 (5.67)
Maternal race, % (<i>n</i>)	
Caucasian	89.1 (123)
Asian	5.1 (7)
Black or African American	3.6 (5)
American Indian or Alaska Native	2.2 (3)
Other	5.1 (7)
Maternal ethnicity, % (<i>n</i>)	
Hispanic or Latina	5.1 (7)
Not Hispanic or Latina	93.5 (129)
Marital status, % (<i>n</i>)	
Married or remarried	79 (109)
Divorced or separated	17.4 (24)
Never Married	2.9 (4)
Work status, % (<i>n</i>)	
Full-time	28.3 (39)
Part-time	20.3 (28)
Unemployed	31.9 (44)
Receiving disability	17.4 (24)
Highest level of schooling completed, % (<i>n</i>)	
High school or less	5.8 (8)
Vocational school/Some college	29.7 (41)
College	39.1 (54)
Graduate/Professional school	24.6 (34)
Household income, % (<i>n</i>)	
\$25,000 or less	9.4 (13)

\$25,001-\$49,999	23.9 (33)
\$50,000-\$79,999	13.0 (18)
\$80,000-\$119,999	29.7 (41)
\$120,000-\$149,999	7.2 (10)
\$150,000 or more	12.9 (17)
Referral source, % (<i>n</i>)	
Pain clinic	32.6 (45)
Social media	42.0 (58)
Other (websites, support groups, word of mouth)	24.6 (34)

Table 2 provides a summary of maternal pain characteristics in the sample. Mothers had an average age of 24.21 years of age for pain onset ($SD = 10.10$, range 2.00-45.00), with an average severity score of 4.60 ($SD = 1.86$, range 0.00-8.00), and 53% ($n = 74$) had pain prior to having children. 43.5% ($n = 60$) of mothers met criteria for generalized pain.

Table 2. Pain characteristics

Demographic Variable	
Age of pain onset, M (SD)	24.21 (10.10)
Pain severity, M (SD)	4.60 (1.86)
Generalized Pain, % (n)	43.5 (60)
Pain prior to having children, % (n)	
Yes	53.6 (74)
No	44.9 (62)

Relation of MISCI to Parenting Factors and Maternal Pain Characteristics

On average, mothers who met criteria for generalized pain ($n = 60$) also reported lower subjective cognitive functioning ($M = 26.51$, $SD = 6.19$) compared to mothers with localized pain ($n = 77$) who reported higher levels of subjective cognitive functioning ($M = 29.79$, $SD = 10.24$). This difference showed to be significant ($p = .02$).

Table 3 reports the correlations between mothers' subjective cognitive functioning (assessed by the MISCI) and maternal pain characteristics and parenting behaviors. Higher subjective cognitive functioning was significantly associated with lower pain severity (BPI severity), better physical functioning (PROMIS physical functioning), lower catastrophizing

about children's pain (PCS-P), and less worry about the impact of pain on caregiving roles (CARE worry). Inconsistent discipline (APQ) and the putting others above own self-care (CARE self) did not correlate significantly with subjective cognitive functioning.

Table 3. Correlations between the subjective cognitive functioning (MISCI), pain, and parenting measures

	Mean (SD)	1	2	3	4	5	6
1. MISCI	28.38 (8.80)						
2. BPI Severity	4.60 (1.86)	-.42**					
3. PCS-P	13.36 (9.74)	-.23**	.19*				
4. Inconsistent Discipline (APQ)	2.13 (.74)	-.04	-.17	.07			
5. CARE worry	2.82 (.91)	-.32**	.31**	.34**	.02		
6. CARE self	2.79 (.85)	-.12	.09	.10	.06	.33**	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 4 presents models evaluating the contribution of subjective cognitive functioning on behaviors (Parent catastrophizing about child's pain, inconsistent discipline, guilt about the impact of pain on caregiving role, and putting others above own self-care) above and beyond that of pain severity. These analyses showed that subjective cognitive functioning was a significant predictor of decreased parent catastrophizing about child's pain ($\beta = .18, p = .047$) and lower guilt about the impact of pain on caregiving roles ($\beta = .23, p = .009$). Specifically, mothers who reported higher cognitive functioning also reported less catastrophizing about children's pain, and less guilt regarding the impact of pain on parenting roles when taking into account mothers' pain severity. As with the correlation models from table 3, inconsistent discipline and putting

others above own self-care were not significantly predicted by subjective cognitive functioning.

Table 4. Maternal perceived cognitive functioning predict self-report parenting and pain related behaviors

		Dependent Variable				R^2 change
		Parent Catastrophizing about Child's Pain (PCS-P)				
Independent variable		<i>B</i> (95% CI)	<i>SE</i>	β	<i>p</i>	
Step 1	Constant	8.72 (4.39, 13.05)	2.19			.04*
	Pain Severity Score	1.01 (.13, 1.88)	.44	.19	.024	
Step 2	Constant	16.35 (7.70, 24.99)	4.37			.03*
	Pain Severity Score	.61 (-.34, 1.56)	.48	.12	.210	
	Subjective cognitive functioning sum	-.20 (-.40, -.00)	.10	-.18	.047	
		Inconsistent Discipline (APQ)				
Step 1	Constant	2.43 (2.10, 2.77)	.17			.03
	Pain Severity Score	-.07	.03	-.17	.051	
Step 2	Constant	2.84 (2.17, 3.51)	.34			.01
	Pain Severity Score	-.09 (-.16, -.01)	.04	-.22	.019	
	Subjective cognitive functioning sum	-.01 (-.03, .00)	.01	-.13	.165	
		Guilt about Impact of Pain on Caregiving Roles (CARE worry)				
Step 1	Constant	2.11 (1.72, 2.51)	.20			.10**
	Pain Severity Score	.15 (.07, .23)	.04	.31	.000	
Step 2	Constant	3.01 (2.24, 3.79)	.39			.04**
	Pain Severity Score	.11 (.02, .19)	.04	.22	.015	
	Subjective cognitive functioning sum	-.02 (-.04, -.01)	.01	-.23	.009	
		Putting Others above Care of Own Self (CARE self)				
Step 1	Constant	2.61 (2.22, 2.99)	.19			.01
	Pain Severity Score	.04 (-.04, .12)	.04	.09	.315	

	Constant	2.96 (2.18, 3.73)	.39			
Step 2	Pain Severity Score	.02 (-.06, .11)	.04	.05	.626	.02
	Subjective cognitive functioning sum	-.01 (-.03, .01)	.01	-.10	.306	

** R^2 is statistically significant at the $p < 0.01$ level.

* R^2 is statistically significant at the $p < 0.05$ level.

Discussion

Results indicate that in this sample of mothers with mixed chronic pain conditions, SCF was lower among mothers with generalized pain compared to mothers with localized pain. Furthermore, SCF was associated with several aspects of parenting behaviors, including parent catastrophizing and worry/guilt about the impact of pain on parenting above and beyond the influence of pain severity. Both of these factors increased as SCF decreased (i.e. lower SCF is associated with more catastrophizing and guilt). SCF may serve as a protective factor for the intergenerational transmission of chronic pain as shown by mothers with higher SCF reporting parenting practices that are generally associated with more adaptive mental and physical health outcomes for offspring. There has been very limited literature studying parenting in the context of chronic pain and, to our knowledge, none have examined the impact of subjective cognitive functioning on parenting in those with chronic pain.

Overall, our hypothesis that mothers with generalized pain are more likely to have lower levels of subjective cognitive functioning than mothers with localized pain was supported. This result is consistent with previous subjective research on participants with fibromyalgia compared to participants with other chronic pain disorders. In their study with patients with fibromyalgia, Suhr (2003) found that participants with fibromyalgia reported significantly more subjective cognitive complaints than the other participants with chronic pain.

Our hypothesis that mothers with lower subjective cognitive functioning would report higher levels of catastrophizing about their child's pain was also supported. This finding is consistent with previous studies on catastrophizing and cognitive functioning in chronic pain populations (Baker, Georgiou-Karistianis, Gibson, & Giummarra, 2018; Caes et al., 2012; Roth, Geisser, Theisen-Goodvich, & Dixon, 2005; Wilson et al., 2014). In a study regarding the impact of affect-related variables on cognitive impairments in those with fibromyalgia, pain catastrophizing was found to be a significant predictor of performance on psychological tests due to focusing attention on pain rather than on the test, increasing attentional interference and affecting processing ability (Galvez-Sanchez, Reyes Del Paso, & Duschek, 2018). While the present study focused on maternal catastrophizing about their child's pain rather than their own, with the inability to divert attention away from their child's pain and exaggerating potential outcomes of the pain, the ability to focus on other aspects of parenting decreases. Due to this, a negative external reaction may lead the child to catastrophize about their own pain, as well as report greater pain severity and pain-related disability, even in a healthy adolescent.

Regarding the impact on parenting, lower subjective cognitive functioning related to an increase in maternal worry and guilt about the impact of pain on relationships, supporting the hypothesis. As the scale used to assess this was only recently developed, there have been no other quantitative analyses examining guilt/worry about the impact of pain on relationships. Despite the lack of quantitative studies, this conclusion is consistent with previous qualitative research that showed 37% of the recruited parents with chronic pain felt guilt, perceiving that their pain had a negative impact on their parenting ability (Wilson & Fales, 2015). Additionally, this qualitative research had found that parents with chronic pain perceive that they are more inconsistent in discipline (Wilson & Fales, 2015), but no prior investigations have used validated

self-report scales to examine this perception. Contrary to expectations garnered by previous qualitative findings, the hypothesis that lower subjective cognitive functioning would be associated with inconsistent discipline in mothers with chronic pain was not supported. It is possible that since previous findings were collected using qualitative data, parents with chronic pain may perceive that they are more inconsistent in disciplining their child, but do not actually report inconsistent discipline when measured quantitatively.

The present study is not without a number of limitations. First and foremost, the results from the study are cross-sectional, so no temporal effects can be concluded regarding subjective cognitive dysfunction and the assessed parenting aspects. Our study also relied exclusively on self-report data, which presents the possibility of response bias. However, this is not unusual as in these types of studies self-report is common and each of the measures used have been heavily validated, with the exception of the CARE scale, which was only recently developed, thus has had limited testing conducted (Ziadni et al., 2018).

Lastly, the present study only looked at pain severity when controlling for confounding variables. However, we note that other factors could have also contributed to the results seen, such as symptoms of depression, which is known to often be associated with cognitive impairment (Galvez-Sanchez et al., 2018; Lee, Kang, & Cho, 2017; Roth et al., 2005). Despite this, compared to pain-related factors, depression may not play as large a role in cognitive impairment (B. D. Dick, Verrier, Harker, & Rashed, 2008; Galvez-Sanchez et al., 2018; Reyes Del Paso, Pulgar, Duschek, & Garrido, 2012). Further study is needed to determine the extent to which other psychological factors account for cognitive impairment in this sample.

Despite these limitations, this is the first study to examine subjective cognitive function in relation to parenting in people with chronic pain. The overall pattern of results has several

implications for research and clinical care. Maternal chronic pain is a risk factor for chronic pain in children. Additionally, parenting behaviors and general family functioning is thought to be one of the mechanisms that contributes to the intergenerational transmission of chronic pain. With the knowledge mothers with higher SCF reported parenting practices that were consistent with more adaptive outcomes for children, future research and intervention strategies need to address the impact of cognitive functioning on parenting and day-to-day activities. This way, mothers with lower SCF can participate in interventions to boost their perceived cognitive functioning so as to decrease the risk for the development of chronic pain and adverse health outcomes in their children. Additional work might also investigate mothers who have higher subjective cognitive functioning despite experiencing chronic pain, as their experiences and perspectives might inform intervention development. Chronic pain is a complex disorder that impacts emotional, physical, and mental aspects of life. Future interventions must focus on treating not just the pain, but the mental and emotional toll that pain takes on well-being, as well as the impact that pain has on the family.

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