

# Negative impact of chronic pain: The role of locus of control and perceived family validation of chronic pain

Health Psychology Open  
 July-December 2022: 1–9  
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 DOI: 10.1177/20551029221125170  
[journals.sagepub.com/home/hpo](https://journals.sagepub.com/home/hpo)  


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## Abstract

The present study investigates how participants' locus of control and their family and friends' validation of their pain influences participants' chronic pain experiences. Four thousand, 25 adults were recruited through the Chronic Pain In America survey. Results show that individuals who endorse an internal locus of control and experience family and friends' validation of their chronic pain reported better chronic pain outcomes and less negative life impact due to chronic pain. The current results indicate the locus of control and family and friends' validation of chronic pain experience plays an important role in chronic pain and the impact of chronic pain across the life course.

## Keywords

locus of control, family and friends' validation of pain, chronic pain, negative life impact, chronic pain outcomes

Chronic pain affects approximately 100 million adults in the U.S. (Skinner et al., 2012). Gaskin and Richard (2012) reported that the financial cost associated with chronic pain (i.e. treatment, financial loss due to missing work, disability cost) may exceed \$600 billion per year. After identifying challenges in effectively treating and managing chronic pain with a unidimensional and biomedical model, researchers around the world began to investigate psychological and social factors affecting chronic pain experiences (Kerns et al., 2011; Turk et al., 2016). It is still unclear why some individuals are more resilient in facing challenges such as chronic pain (Gentili et al., 2019), however, psychological factors such as internal locus of control, self-esteem, and optimism as well as social support can predict resilience and adjustment to chronic illness (Stewart and Yuen, 2011). Individuals with high self-esteem and optimism may anticipate positive health outcomes in the future, which help them to cope with their current illness better (Stewart and Yuen, 2011). Support from family and friends is also associated with positive health outcomes as social support enhances psychological health and the patients' ability to control their situations (Stewart and Yuen, 2011).

While this provides insight into chronic illness, researchers are focusing on factors that are specific to chronic pain such as catastrophizing, a sense of control, and specific types of social support such as family validation of chronic pain. The invisible nature of chronic pain makes it unique from other forms of chronic illness and creates the need to engage in focused research on chronic pain (Edmond and Keefe, 2015; Lee et al., 2020; Turk et al., 2016; Zuercher-Huerlimann et al., 2019).

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## Sense of control and chronic pain

Even though many chronic pain patients report experiencing psychological distress (Newton et al., 2013), individuals who feel more in control of their life in spite of their chronic pain experience less psychological distress, manage their chronic pain better, and function better in their daily lives because they are more proactive to utilize coping skills to manage their chronic pain and psychological distress associated with chronic pain and more actively participate their pain management treatments (Collins, 2008; Lee et al., 2020). Internal locus of control is defined as the degree to which people believe outcomes are the function of their own behaviors. This is in contrast to an external locus of control, which is defined as the belief that the outcomes can be attributed to others (or external factors such as luck) but not their own behaviors (Bonafé et al., 2018; Rotter, 1990). Locus of control is also known as a psychological construct that heavily impacts individuals' ability to cope with adversity (Rotter, 1990).

Nazareth (2016) found that locus of control is significantly associated with pain outcomes as well as adjustment outcomes. For instance, individuals who endorsed an internal locus of control reported lesser degrees of psychological distress and had more positive chronic pain outcomes while individuals with an external locus of control reported increased disability, psychological distress, and no significant pain improvement during an inpatient chronic pain treatment program (Bonafé et al., 2018; Heath et al., 2008; Lee et al., 2020; Zuercher-Huerlimann et al., 2019).

## Perceived family's understanding of their chronic pain experiences

Although individuals who feel in control of their life in spite of their chronic pain function better than individuals who feel a lack of control in their life relative to pain, battling chronic pain can still be a lonesome experience (Ressler et al., 2012). A growing number of researchers began to investigate the powerful relationship between social support and individuals' adjustment to chronic illness (Jensen et al., 2011). For instance, studies that examined the effects of social support on chronic pain patients' adjustment (Oraison and Kennedy, 2019; Wernicke et al., 2017) found that high levels of social support are associated with positive health and psychological outcomes. Many patients with chronic pain report experiencing psychological distress when their family and friends invalidate their chronic pain experience because their pain is invisible (Edmond and Keefe, 2015; Kool et al., 2009). Chronic pain patients may experience additional, and unique, harms by being misunderstood or invalidated by those in their close social circle. When those in the patient's close social network invalidate a patient's chronic pain experience, this type of social rejection can

magnify pain by activating the neural structure that is responsible for pain experience (Kool et al., 2009). Thus, rejection by those close to the patient may actually exacerbate the pain experience and decrease a patient's pain-related internal sense of control. A previous study (Wernicke et al., 2017) defined invalidation of pain as overt rejection and disbelief of pain. This study found that invalidation of the chronic pain experienced is more harmful to patients than not receiving any social support. Invalidation of pain experiences has been shown to negatively impact not only pain outcomes and psychological distress (Edmond and Keefe, 2015), but also individuals' ability to cope (Vaughn et al., 2014). In contrast to invalidation and social rejection related to pain, validation of chronic pain is the communication method that focuses on understanding and accepting the patient's experience (Vangronsveld and Linton, 2012). Previous studies indicate that when patients experience social validation of their chronic pain experience, they have a decrease in negative affect and pain (Edlund et al., 2015; Vangronsveld and Linton, 2012). Validation, or invalidation, of the pain experience by an individual's social network may play a vital role in the mental and physical health outcomes for those living with chronic pain.

## Summary and rationale for the present study

A previous study (Yazdi-Ravandi et al., 2013) indicated that chronic pain has a negative impact on quality of life; however, protective factors such as an internal locus of control (Heath et al., 2008; Lee et al., 2020; Zuercher-Huerlimann et al., 2019) and social factors such as validation of pain experiences by others (Edlund et al., 2015; Vangronsveld and Linton, 2012) can diminish the negative impact of chronic pain. The present study expands upon these previous studies to investigate how participants' internal locus of control and their family and friends' validation of their chronic pain, influence chronic pain experiences (i.e. frequency of pain, severity of chronic pain), and the negative impact of chronic pain on various domains of life (e.g. isolation and depression due to pain, sleep disturbance due to pain, interference in relationship, vocational functioning, and spending time with family and friends).

Drawing on factors that previous studies have found to be associated with positive chronic pain outcomes, the present study also investigated whether the protective effect of internal locus of control was sustained even when chronic pain patients' family and friends invalidated their pain experiences. Previous studies (Darshani, 2014; Kool et al., 2009; Wernicke et al., 2017) indicated that an internal sense of control may decrease sense of isolation and social rejection of chronic pain patients because they would actively utilize coping strategies and communication skills to manage their distress associated with chronic pain.

## Hypothesis

We hypothesized that (1) people with chronic pain who are in the internal locus of control group would report better chronic pain outcomes (i.e. lower levels of negative life impact due to their chronic pain, fewer days experiencing severe pain, and less frequent pain) compared to individuals in external locus of control group; (2) chronic pain participants who reported family and friends' validation of their pain would report better chronic pain outcomes (i.e. lower levels of negative life impact due to their chronic pain, fewer days experiencing severe pain, and less frequent pain) compared to chronic pain patients who reported their family and friend invalidating their pain; (3) participants who reported both an internal locus of control and family and friends' validation of their chronic pain would report the best chronic pain outcomes (i.e. lower levels of negative life impact due to their chronic pain and fewer days experiencing severe pain) compared to other groups (i.e. external locus of control  $\times$  family and friends' invalidation of chronic pain group, internal locus of control  $\times$  family and friends' invalidation of chronic pain group, external locus of control  $\times$  family and friends' validation of chronic pain group). The present study conducted a secondary analysis of a subset of the larger Chronic Pain In America survey (Chronic Pain Foundation and Health Union, 2019). The findings of the present study would expand the literature by elucidating the important role of protective factor such as locus of control within the context of family and friends' validation of pain in chronic pain management and can enhance our ability to develop more effective treatment plans that empowers chronic pain patients and their family members.

## Method

### Sample

The total 4754 participants US adults aged 18 years or older were recruited through the Chronic Pain In America survey. A total of 1694 participants were removed due to their responses on the screening questions. Participants were removed for responding "neutral" on: (1) only the locus of control statement ( $N = 708$ ); (2) only the family and friends' validation statement ( $N = 888$ ); or (3) both statements ( $N = 98$ ). This resulted in a remaining total of 3060 individuals who were included in the analyses. All participants who were included in the present study reported that they experienced chronic pain more than 3 months and had at least one chronic pain condition that was diagnosed by a health care provider.

The present study utilized the IASP classification of chronic pain (Nicholas et al., 2019). Inclusion criteria for the present study were (1) the presence of pain that lasts for

3 months or more, and (2) the presence of at least one or more chronic pain conditions which were diagnosed by a healthcare provider and those chronic pain symptoms are not accounted by another diagnosis. One of the criteria for the IASP classification of chronic pain (i.e. pain is associated with significant emotional distress and/or functional disability) was not included in the original dataset for this secondary data analysis study.

### Procedures

Participants were invited to the Chronic Pain In America survey through Health Union's online communities and the U.S. Pain Foundation's touchpoints, including various online recruitment, Email newsletters, and social media posts. Health Union, LLC, and the U.S. Pain Foundation are non-profit groups that are designed to advocate, research, provide education/training, and support chronic pain patients and their caregivers. Their research recruitment network includes patients, caregivers, and mental and physical health specialists (e.g. National Coalition of Chronic Pain Providers and Professionals). Participants completed a 15–20 min self-report survey in September 2019 using the Qualtrics platform. The informed consent was obtained online and no compensation for completing this survey was provided. . XX [details omitted for double-anonymized peer review] identified this study as Exempt (Protocol #16–1979) for this secondary data analysis of de-identified data.

### Instrument

The present study utilized a subset of the larger Chronic Pain In America survey, which included participant demographics, and measures of chronic pain, negative life impact, locus of control, and family and friends' invalidation of pain experiences. The survey used in the present study was originally developed by a combined team of mental health professionals, physical health professionals, and chronic pain patients in conjunction with the US Pain Foundation and Health Union.

**Chronic pain experiences.** Participants were asked (1) how long have you had been experiencing pain, (2) in the past 6 months, how often have you had chronic pain, (3) during the past 30 days, how many days did you experience severe pain, and (4) what areas of your body have been impacted by chronic pain.

**Negative impact of chronic pain on different domains of life.** Quality of life is defined as global well-being in various domains of life including physical, emotional, mental, and social components (Yazdi-Ravandi et al., 2013). The present study assessed the negative life impact on the quality of life including physical, emotional, vocational, and social

domains of life. Participants were asked five statements indicating aspects of life that are impacted negatively by chronic pain (e.g. depression and feeling of isolation due to chronic pain, my pain interferes with my ability to get a good night's sleep, my pain prevents me from spending time with my family or friends, my pain prevents me from working, my pain interferes with my relationships with others). Each statement was rated on a 7-point scale from *strongly disagree* (1) to *strongly agree* (7). The total score of the negative life impact was calculated to the sum score of five statements mentioned above. Higher scores indicated a greater negative life impact. The Cronbach alpha for the current study was 0.77.

**Locus of control.** We divided participants into two groups (i.e. internal locus of control group ( $N = 1546$ ) vs. external locus of control group ( $N = 1514$ ) based on their response to a locus of control statement (i.e. I feel in control of my life despite my pain). This statement was rated on 7-point scale from *strongly disagree* (1) to *strongly agree* (7). If participants endorsed *completely disagree* (1) to *slightly disagree* (3) on the locus of control statement, they were assigned to the external locus of control group while participants who endorsed *slightly agree* (5) to *completely agree* (7) on the locus of control statement were assigned into the internal locus of control group. Eight hundred six individuals who reported a *neutral* (4) were excluded from the analysis.

**Family and friends' validation of chronic pain.** We divided participants into two groups (i.e. invalidating chronic pain ( $N = 1103$ ) vs. validating chronic pain ( $N = 1957$ ) based on their response to the following statement (i.e. My friends and family don't believe that I am in pain). This statement was rated on 7-point scale from *strongly disagree* (1) to *strongly agree* (7). If participants endorsed *completely disagree* (1) to *slightly disagree* (3) on the statement, they were assigned to validating chronic pain group while participants who endorsed *slightly agree* (5) to *completely agree* (7) on the statement were assigned to invalidating chronic pain group. Eight hundred 88 study participants who reported a *neutral* (4) were excluded from the analysis.

## Analysis

First, we calculated means and percentages for demographic variables. Second, we conducted Pearson's R correlations to investigate the relationship among locus of control, family and friends' validation of chronic pain, pain outcomes, and negative life impacts. Last, in order to test both hypotheses 1 and 2, we conducted ANOVA to analyze differences in outcomes across four different groups (i.e. internal sense of control  $\times$  family and friends validating chronic pain, internal sense of control  $\times$  family and friends invalidating chronic pain, external sense of control  $\times$  family and friends

validating chronic pain, external sense of control  $\times$  family and friends invalidating chronic pain). In order to further investigate which group is significantly different from one another and test hypothesis 3, a post hoc test (i.e. Scheffe test) was conducted after the ANOVAs. We analyzed the data with IBM-SPSS Statistics software (version 22). The present study was conducted to provide more information regarding why some individuals adjust better than others in managing chronic pain and in order to answer that question, we chose the statistical analyses that enable us to determine differences in chronic pain outcomes and the negative impact of chronic pain in life across individuals with different psychosocial characteristics (internal vs external locus of control, family and friends' validation vs family and friends' invalidation).

## Results

As shown in [Table 1](#), participants were largely female (84%) and 50+ years old (74%). Half of the participants reported chronic pain for more than 10 years, and 72.9% of participants experienced pain daily in the past 6 months and also experienced severe pain approximately 10 days a month. Almost 90% of participants reported chronic pain in three or more body areas (e.g. head, shoulder, back, hips, ankles, and other body parts).

As shown in [Table 2](#), locus of control status is positively correlated with family and friends' validation of pain status. The internal locus of control group reported higher levels of validation from their family and friends regarding chronic pain compared to the external locus of control group. Additionally, locus of control status is negatively correlated with pain frequency, the number of days experiencing severe pain, and negative life impact scores. These results indicate that the internal locus of control group reported less frequent pain, fewer days experiencing severe pain, and less negative life impact due to chronic pain compared to the external locus of control group. Similar patterns were observed between family and friends' validation status and other outcomes. Participants who identified their family and friends as validating their chronic pain reported less frequent pain, fewer days experiencing severe pain, and fewer negative life impacts due to chronic pain compared to participants who identified their family and friends invalidating their chronic pain.

As shown in [Table 3](#), one-way ANOVA test and Chi-squared test results indicated that there were significant differences between the four groups (locus of control status  $\times$  family and friends' validation of chronic pain status) on all outcomes (i.e. age, pain frequency, pain length, severe pain, negative life impact of pain).

In order to explore individual group differences further, Scheffe Test was performed (See [Table 4](#)). In general, results indicated that the internal locus of control group tended to

**Table 1.** Patient demographics, and chronic pain outcomes (total = 3060).

	N	%
Gender		
Female	2574	84.1
Male	486	15.9
Age in years		
<18	0	0
18–29	97	2.8
30–39	206	7.1
40–49	483	15.8
50–59	853	30.8
60–69	975	31.9
70–79	312	10.2
80>	43	1.4
How long have you been experiencing pain		
<1 year	74	3.2
1–5 years	583	19.1
6–9years	602	19.7
10> years	1801	58.8
Pain frequency in past 6 months		
Some days	79	2.6
Most days	750	24.5
Every days	2231	72.9
How many days a month do you have severe pain	10.91 (8.55)*	
Chronic pain location		
Head and/or jaw	1629	53.2
Eyes	938	30.7
Neck	2175	71.1
Shoulders	2152	70.3
Back	2530	82.7
Chest	798	26.1
Hips	2032	66.4
Buttocks/sacroiliac joint	1599	52.3
Arms and/or elbows	1562	51.0
Hands and/or wrist	1992	65.1
Fingers	1629	53.2
Legs and/or knees	2385	77.9
Ankles	1460	47.7
Feet, toes, and/or heels	2046	66.9
Other organs and/or areas of my body (e.g. heart, lungs)	765	25.0

Participants could select multiple responses for their chronic pain locations, \* = Mean/SD.

be older and the internal locus of control  $\times$  family and friends' validation group reported the best chronic pain outcome (i.e. fewer days experiencing severe pain), and lower levels of negative life impact due to chronic pain compared to the other three groups. In other words, regardless of their family validation status, the internal locus of control group was older than the external locus of control group. Furthermore, internal locus of control  $\times$  family and

friends' validation of chronic pain group reported significantly fewer days experiencing severe pain and less negative impact of chronic pain compared to an external locus of control  $\times$  family and friends' invalidation of the chronic pain group.

Regarding the other group comparisons, the key finding is the external locus of control  $\times$  family and friends' validation group reported more days experiencing severe pain and higher scores on the negative life impact of chronic pain compared to both the internal locus of control  $\times$  family and friends' invalidation group and the internal locus of control  $\times$  family and friends' validation group. In other words, regardless of family and friends' validation status, when participants endorsed external locus of control status, those individuals reported more days experiencing severe pain and higher scores on the negative life impact of chronic pain compared to participants who endorsed internal locus of control status.

## Discussion

The results of this study support the hypothesis 1 that individuals who endorse an internal locus of control reported better chronic pain outcomes and less negative life impact due to chronic pain compared to individuals who reported external locus of control over their pain. This result is consistent with previous studies (Heath et al., 2008; Lee et al., 2020; Zuercher-Huerlimann et al., 2019). This result may indicate that individuals who feel more in control of their life despite chronic pain will be more proactive in utilizing coping skills to manage their chronic pain, and as a result, will experience less distress associated with chronic pain (Collins, 2008; Lee et al., 2020). Due to the unpredictability and complexity, living with chronic pain can be extremely challenging (Jensen and Turk, 2014). Persistent, intractable, and fluctuating pain can trigger emotional distress such as anxiety and hopelessness, which can lead the chronic pain patients to take a passive role in pain management (Newton et al., 2013). Therefore, establishing and enhancing beliefs that what chronic pain patients do will make difference in their pain management will be a crucial factor for successful chronic pain management.

In addition to a psychological factor such as locus of control, the present study investigated a social factor that is uniquely pertinent to chronic pain (i.e. family and friends' validation of pain). Results indicate that individuals whose family and friends validated their chronic pain reported significantly less negative life impact due to chronic pain and less frequent pain, and experienced fewer days experiencing severe pain compared to those whose family and friends invalidated their pain. This finding supports the hypothesis 2 of the present study and is also congruent with results from previous research (Edmond and Keefe, 2015; Waugh et al., 2014). Having their pain rejected and

**Table 2.** Correlations among sense of control, family and friends' validation of chronic pain and other variables (total = 3060).

	LOC	Family validation	Pain frequency	Severe pain	N-Life impact
LOC	1	0.130**	-0.188**	-0.209**	-0.415**
Family validation		1	-0.035*	-0.046*	-0.207**
Pain frequency			1	0.310**	0.305**
Severe pain				1	0.311**
N-Life impact					1

LOC = locus of control status. For LOC, the external locus of control group was coded as one and the internal locus of control was coded as 2. For family and friends' validation, the family and friends' invalidation of chronic pain group was coded as one and the family and friends' validation of chronic pain group was coded as 2. Pain Frequency is the frequency participants experienced pain in the past 6 months, Severe Pain is days in month participants experience severe pain, N-Life impact: total numbers of negative life impact due to chronic pain. \* $p < 0.05$ , \*\* $p < 0.01$ .

**Table 3.** Mean (SD) and One-Way ANOVA result on demographic information, pain outcomes, family validation, and negative life impact by four groups (locus of control status  $\times$  family validation of chronic pain status).

	I-LOC		E-LOC		$F/\chi^2$
	Family valid (N = 1084)	Family invalid (N = 462)	Family valid (N = 873)	Family invalid (N = 641)	
P- frequency	4.5%	3.0%	1.0%	1.1%	119.01 <sup>a***</sup>
	31.8%	30.7%	18.3%	16.7%	
	63.7%	66.3%	80.6%	82.2%	
P-length	3.0%	2.1%	2.3%	1.9%	30.54 <sup>a*</sup>
	21.4%	23.1%	16.1%	16.8%	
	17.5%	17.5%	22.3%	21.2%	
	58.1%	58.2%	59.3%	60.1%	
Age	58.96 (11.48)	57.45 (11.93)	54.59 (12.16)	52.95 (11.98)	42.70 <sup>b***</sup>
Severe pain	9.13 (8.17)	9.17 (7.97)	12.16 (8.53)	13.52 (8.68)	50.31 <sup>b***</sup>
N-Life impact	49.67 (7.25)	53.11 (6.06)	55.61 (5.53)	57.07 (4.29)	227.84 <sup>b***</sup>

1644 participants who endorsed neutral for either the locus of control question or/and the family and friends' validation question were excluded from this analysis as those participants were not categorized into any four group that is listed above. LOC = locus of control status (E-LOC= external locus of control, I-LOC = internal locus of control), a = Chi-squared test, b = One-way ANOVA test, P-Frequency is the frequency participants experienced pain in the past 6 months, Pain-Length is the length of time participants have been experienced pain, Severe Pain is days in a month participants experience severe pain, Family (and friends) Invalidation is the response participants endorsed to a question "my friends and family don't believe that I am in pain" on a 7-point Likert scale (1 = Strongly disagree to 7 = Strongly agree), N-Life impact is the total numbers of negative life impact due to chronic pain. \* $p < 0.05$ , \*\*\* $p < 0.001$ .

discounted by their close social network can be a more negative experience than not receiving social support at all (Kool et al., 2009; Wernicke et al., 2017). It can also intensify emotional triggers associated with pain. Because pain is invisible, family members and friends may think chronic pain patients are faking or exacerbating their symptoms, using their pain as an excuse to avoid their responsibilities, or are experiencing mental health issues (Edmond and Keefe, 2015; Kool et al., 2009; Lee and Cho, 2020). Caretakers and health care providers need to understand the deleterious effect of family and friends' invalidation on pain management and daily life functions of chronic pain patients.

We also found support for our third hypothesis. Chronic pain patients who reported both, (1) they feel in control of their life in spite of pain and, (2) their family and friends validate their pain, showed the most favorable outcomes (i.e. endorsed fewer days experiencing severe pain and

experienced a less negative impact on their daily life compared to other groups). As predicted, two protective factors (i.e. internal locus of control and family and friends' validation of pain) together might have a synergistic effect by helping the chronic pain patients to utilize both internal and external resources to optimally manage their chronic pain.

In addition to the main analysis, additional analyses were conducted to further investigate differences of locus of control  $\times$  family and friends' validation on participants' pain and life adjustment outcomes. Results indicated that the general effects of locus of control status on chronic pain and negative life impact outcomes were sustained beyond the impacts of family and friends' validation status. In other words, an internal sense of control might help chronic pain patients to communicate more effectively with their family and friends (Darshani, 2014), and may result in fewer feelings of isolation or misunderstanding (Kool et al., 2009;

**Table 4.** Multiple comparison outcomes by groups: Scheffe test (total N = 3060).

Outcomes	Group		p levels
Age	E-LOC family invalid group	E-LOC family valid group	NS
	E-LOC family invalid group	<b>I-LOC family invalid group</b>	<0.001
	E-LOC family invalid group	<b>I-LOC family valid group</b>	<0.001
	I-LOC family invalid group	I-LOC family valid group	NS
	E-LOC family valid group	<b>I-LOC family invalid group</b>	<0.05
	E-LOC family valid group	<b>I-LOC family valid group</b>	<0.001
Severe pain	<b>E-LOC family invalid group</b>	E-LOC family valid group	<0.05
	<b>E-LOC family invalid group</b>	I-LOC family invalid group	<0.001
	<b>E-LOC family invalid group</b>	I-LOC family valid group	<0.001
	I-LOC family invalid group	I-LOC family valid group	NS
	<b>E-LOC family valid group</b>	I-LOC family invalid group	<0.001
	<b>E-LOC family valid group</b>	I-LOC family valid group	<0.001
NLife impact	<b>E-LOC family invalid group</b>	E-LOC family valid group	<0.001
	<b>E-LOC family invalid group</b>	I-LOC family invalid group	<0.001
	<b>E-LOC family invalid group</b>	I-LOC family valid group	<0.001
	<b>I-LOC family invalid group</b>	I-LOC family valid group	<0.001
	<b>E-LOC family valid group</b>	I-LOC family invalid group	<0.001
	<b>E-LOC family valid group</b>	I-LOC family valid group	<0.001

E-LOC = external locus of control; I-LOC = internal locus of control; NLife Impact = Negative Life Impact; NS = not significant. The bolded group indicates a higher score on the variable than the non-bolded group.

Wernicke et al., 2017) even when they face another's invalidation of their pain experience. This, in turn, would reduce the energy and cognitive resources required for justifying their pain experiences to others in their close social network. As a result, chronic pain patients could focus their energy solely on developing effective chronic pain management strategies. The results of the present study may explain why some chronic pain patients experience no or a low amount of psychological and physical impairments associated with chronic pain while some chronic pain patients struggle with more impediments associated with chronic pain (Sturgeon and Zautra, 2010). Those who believe in their own self-efficacy are more likely to try different pain management strategies and remain more open to actively using these tactics to address their chronic pain. This may result in better adjustment outcomes even when they are faced with a lack of validation for their pain experiences from family and friends.

An interesting result was observed in the present study with respect to the impact of age on the subgroup status. Notably, older participants tended to report more control in their lives and report more validation from their family and friends. This result may indicate that older individuals adjust better to chronic pain because they may perceive major changes in their body as a normal process of aging and engage in more health-related behaviors (Janowski et al., 2013). An alternative explanation of the present results is that the longer participants live with chronic pain, the more they gain skills and insight that help them to better cope with chronic pain. However, the latter explanation is less likely since the most adjusted group (I-LOC family and

friends' valid group) reported the shortest length of chronic pain experience compared to other groups (I-LOC family and friends' invalid group, E-LOC family and friends' valid group, E-LOC family and friends' invalid group). This means that the coping skills to manage chronic pain do not spontaneously improve as the amount of time that they are struggling with chronic pain increases. Therefore, an additional explanation may be that chronic pain is viewed as "normal" for older individuals and thus more easily accepted by friends and family as a "normal" stage of life compared to younger individuals with chronic pain.

### Clinical implications

Individuals who feel less in control of their chronic pain and report family and friends' invalidation of chronic pain may be at greater risk for chronic pain management issues as well as other life adjustment issues due to chronic pain. When healthcare providers encounter chronic pain patients who demonstrate an external locus of control (e.g. patients stating no matter what they do, their chronic pain and health status will not change), they may need to provide more specific pain management suggestions to those patients (e.g. teaching pain suppression imagery or mindfulness-based meditations, educating behavioral-based coping skills such as pace activities and avoiding triggers and flares). Moreover, those patients will benefit from information and specific suggestions about how they can effectively communicate with their family about their chronic pain in order to solicit the support of those family members. Unlike the family's solicitous behaviors that unintentionally reinforce

pain behaviors (e.g. taking over household chores, offering help), the family's validation of the chronic pain not only can decrease high levels of negative emotional arousal associated with chronic pain but also can increase chronic pain management without reinforcing pain behaviors (Edlund et al., 2015). This may lead to a delicate balance for family members to validate the pain experience, without engaging in activities that may inadvertently reinforce pain behaviors. This leads to a point of intervention for pain psychologists and therapists to help patients and their families walk that line to best help the patient. These patients could also benefit from a brief intervention that targets the locus of control prior to moving into active pain management psychology interventions in order to increase the effectiveness of the pain psychology intervention.

### Limitations of the present study

One limitation of this study is that the locus of control construct and the family and friends' validation of chronic pain were measured by a single item. However, in using patient-reported measures of locus of control and the family and friends' validation of chronic pain, health literacy for chronic pain patients was a primary consideration, thus supporting the use of a simplified single-question measure. Furthermore, the question that assessed internal and external locus of control was based on a rating on a 7-point scale to a single locus of control statement (i.e. I feel in control of my life despite my pain) so this single question might not have been sufficient in assessing the entire external locus of control construct. Second, the results must be interpreted cautiously as the results did not address causality between a psychological factor (i.e. locus of control status) and a social factor (i.e. family and friends' validation status) with the outcome variables. It is possible that participants who experienced more frequent severe pain may have suffered from a feeling of helplessness and a decreased sense of control because their chronic pain is not effectively managed. Therefore, future studies could be designed to determine the causal and intermediate relationships among psychological factors, social factors, and chronic pain outcomes. Finally, the effect of age on locus of control status and family and friends' validation status may be explained by selective effects. Older individuals who utilized online resources such as Health Union's online communities may be better adjusted and more proactive in their health behaviors and coping skills compared to older individuals who are not active in similar communities.

### Conclusion

The present study can increase our insight regarding the roles that locus of control and family and friends' validation have on chronic pain, the impact of chronic pain across the

life course, and chronic pain outcomes. The findings of the present study suggest that psychological or psychosocial interventions that enhance a sense of agency and address potential family and friends' invalidation of the chronic pain experience may be beneficial for individuals with chronic pain. Such interventions may improve not only the quality of life of people living with chronic pain, but also their chronic pain outcomes.

### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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