



Original Reports

Potential Misfortunes in 'Making Sense': A Cross-Sectional Study in People with Chronic Pain

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Abstract: Making sense of one's circumstances is normally regarded as helpful, including in the context of chronic pain. However, sense-making may be associated with adverse impacts in daily functioning. To better understand the functions of sense-making, the objective of the current study was to develop, validate, and preliminarily examine a measure of potentially helpful and unhelpful forms of sense-making behavior in people seeking treatment for chronic pain. This measure is called the Sense Making Questionnaire (SMQ). Research participants included 451 adults consecutively attending a specialty interdisciplinary treatment for chronic pain. Data for this study derived from a standard set of measures participants completed prior to treatment. Exploratory Factor Analysis (EFA) produced a 3-factor solution based on 15 items, including Avoidance of Incoherence, Overthinking, and Functional Coherence. The first 2 of these factors and the total achieved adequate internal consistency. Construct validity of the SMQ scores was supported by significant correlations with measures of pain acceptance, committed action, cognitive fusion, and intolerance of uncertainty. The SMQ total score correlated significantly with pain interference, $r = .23$, depression, $r = .41$, and work and social adjustment, $r = .30$, all $P < .001$. In multiple regression analyses the total score also significantly predicted depression after age, gender, education, pain duration, pain intensity, and pain acceptance were statistically controlled, and it accounted for an additional 8.0% in explained variance. It appears that there is a distinction between *literal coherence* and *functional coherence*. In some situations, it may benefit people with chronic pain to shift focus from efforts to make literal sense of pain and instead to keep the focus on taking effective action even if this does not appear at first to make sense.

Perspective: This study in people seeking treatment for chronic pain includes development of a measure of behavior patterns related to making sense in chronic pain. It shows that sometimes these behavior patterns can be ineffective, as they appear negatively associated with emotional, physical, and social functioning.

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Chronic pain can be highly distressing, disabling, and costly.¹² For the treatment provider and the person with pain it also can be highly complex, uncertain, and confusing.⁹ This is experienced when

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healing and recovery do not happen, no clear source of pain is found, treatments fail, and activity is recommended but it hurts. Given this potential confusion it is only natural that a person will attempt to make sense of it, perhaps as a way to solve this problem. This is demonstrated frequently when people with chronic pain describe their experience.^{5,15,21,24,33} However, in this context of inherent confusion, it is unclear whether making sense is possible or helpful.

Sense-making is commonly taken to mean a process of finding coherence, understanding, or meaning in events.²⁵ It clearly overlaps with several similar concepts, including sense of coherence,² making meaning,³⁴ and reason-giving.¹⁶ It also overlaps with similar processes typically regarded as pathological, such as repetitive thinking or rumination³² and intolerance of uncertainty.³ In practice, the common thread among these is that a problem presents itself, no effective action is immediately available, and the person naturally proceeds with attempts to evaluate, analyse, and understand.³⁸

Previous research typically focused on beneficial effects of sense-making on functioning and well-being in people with chronic pain.^{1,6,26} However, recent theoretical developments point to potential adverse impacts in daily functioning from sense-making, based on the notion that behavior patterns, often including forms of avoidance, can reflect literal “good sense” and fail or cause problems.^{17,38} Thus, behavior patterns can reflect *literal coherence* without achieving *functional coherence* and vice versa.^{16,37} More simply, these terms reflect the difference between language, thoughts and behavior fitting together consistently, (thoughts agree with other thoughts and behavior) versus behavior and goals in life fitting together consistently (behavior patterns succeed in reaching goals even when this seems to contradict “good sense”).

Potential adverse impacts of sense-making have been demonstrated empirically in a laboratory study.³⁸ In this study, participants demonstrated a clear preference for solvable problems compared to unsolvable problems regardless of otherwise equal consequences. In a second study, both neutral and solvable problems were preferred to unsolvable problems all things being equal, suggesting that the preference is driven by avoidance of un-solvability. The authors concluded that making sense can be a form of experiential avoidance,³⁸ a facet of psychological inflexibility.¹⁷ Despite the frequent appearance of sense-making in patient narratives and its potential link with processes known to be relevant to chronic pain, there is little quantitative research that investigates potentially unhelpful effects of behavior related to sense-making.

The purpose of this study is to enable study of potential adverse impacts of sense-making behavior in the context of chronic pain. This is to ultimately examine whether the struggle to understand can in some cases lead to greater suffering and disability. This study includes the development and examination of a self-report measure of sense-making with a focus on factor structure, reliability, and construct validity. Additional

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analyses examine whether particularly persistent inflexible forms of sense-making behavior negatively correlate with outcomes, including pain interference, depression, and work and social adjustment.

Methods

Participants

The participants in this study were 451 adults consecutively attending a 3-week, group-based, interdisciplinary treatment program for chronic pain in a specialty center in London between 22 January 2018 and 5 August 2019. All participants were assigned to treatment based on an assessment by a psychologist and physiotherapist. To be offered treatment it was required that people (a) demonstrate significant chronic pain and related disability at a level of severity or complexity that warrants intensive specialty treatment, (b) demonstrate the ability to participate in a group treatment, and (c) show no physical, mental health, or social difficulties expected to adversely impact treatment outcome. Each of these is determined based on the experienced judgement of the assessing clinicians. Although all of the participants in this study were treatment participants, the data for this study derive from measures administered prior to treatment only. The study received ethics approval (Health Research Authority South Central – Oxford C Research Ethics Committee, 17/SC/0537) and all participants provided written consent for their data to be used.

Measures

All participants completed a survey of background characteristics and pain, including age, gender, personal and family background, home circumstances, work status, pain locations in their body, and pain duration. They also completed the item pool for the measure developed in this study and a series of additional standardized measures used for validation purposes and to examine potential consequences of sense-making behavior for health and daily functioning. Given their conceptual overlap with inflexible and potentially detrimental sense-making, measures of cognitive fusion, and intolerance of uncertainty, were used to investigate construct validity. Measures of pain acceptance and committed action, reflecting processes of psychological flexibility, which should be negatively correlated with inflexible sense-making, were also used to examine validity.

Sense Making Questionnaire (SMQ). The creation of a measure of sense-making behavior in the context of chronic pain was first formally undertaken in August 2017. An initial item pool was created by the research team, including 2 clinical psychologists active in clinical services and research and a psychology assistant, each with experience in chronic pain, psychometric principles, and contextual behavioral science. The development was undertaken particularly considering the results of Wray et al.³⁸ and the distinction between

literal versus functional coherence made within the contextual behavioral science approach.^{19,37} A systematic literature review (unpublished) was conducted to inform the instrument development, in which all studies of sense-making, coherence, meaning, and chronic pain were identified. Here several qualitative studies emerged,^{5,15,21,24,33} but no studies of instruments for the purpose of the current approach to measuring sense-making. An initial item pool was formed and discussed to assure relevance and comprehensiveness of items until a consensus was reached in the research team. An additional expert (YBH, see acknowledgements) in a functional contextual approach to language and cognition¹⁶ and in clinical assessment was also consulted for input. Results were discussed and modified until there was unanimous agreement on the final item set. The final result was a refined item pool including 20 items (see Appendix). These were then administered as a preliminary measure labelled the SMQ along with the other standardized measures described here. All item responses included a choice on a 7-point scale, between 0 (never true) and 6 (always true) in relation to "as it applies to you."

Cognitive Fusion Questionnaire (CFQ). The CFQ was used to measure cognitive fusion, a process of psychological inflexibility that describes dominating and restricting influences of thoughts on behavior.^{13,29} Example items include, "I get upset with myself for having certain thoughts" and "It's such a struggle to let go of upsetting thoughts even when I know that letting go would be helpful." The 7 items are rated on a 7-point scale from 0 (never true) to 6 (always true). Higher total scores indicate greater levels of cognitive fusion. CFQ scores are negatively correlated with processes of psychological flexibility (eg, pain acceptance and committed action) and daily functioning in people with chronic pain.²⁹ Reliability based on Cronbach's alpha in the current sample was .95.

Chronic Pain Acceptance Questionnaire (CPAQ-8). The CPAQ-8 was used to measure chronic pain acceptance, a part of psychological flexibility that includes willingness to experience pain when pain control efforts do not work, and engaging in meaningful life activities in the presence of pain.^{11,30} Example CPAQ-8 items include, "I lead a full life even though I have chronic pain" and "Although things have changed, I am living a normal life despite my chronic pain." All items are rated from 0 (never true) to 6 (always true). The CPAQ-8 is scored so that higher total scores indicate greater pain acceptance. The CPAQ-8 is a widely used measure of pain acceptance and consistently correlates with chronic pain outcomes.¹¹ Reliability based on Cronbach's alpha in the current sample was .77.

Committed Action Questionnaire (CAQ-8). The CAQ-8 was used to measure committed action, which is a process of psychological flexibility that has been defined as flexible persistence in meaningful goal-directed action in the face of challenges.^{27,28} Example CAQ-8 items include "I prefer to change how I approach a goal rather than quit" and "I am able to follow my long terms plans including times when progress is slow." The 8 items are

rated on a 7-point scale ranging from 0 (never true) to 6 (always true). The CAQ-8 is scored so that higher total scores reflect greater committed action. The measure has been shown to correlate with other facets of psychological flexibility and pain-related outcomes in people with chronic pain.²⁸ Reliability based on Cronbach's alpha in the current sample was .80.

Intolerance of Uncertainty Short Form (IUS-12). The IUS-12 measures responses to uncertainty, ambiguous situations, and the future.³ Example items include, "It frustrates me not having all the information I need" and "The smallest doubt can stop me from acting." The 12 items are rated on a 5-point scale ranging from 1 (not at all characteristic of me) to 5 (entirely characteristic of me) and summed so that total scores indicate greater intolerance of uncertainty.³ Reliability based on Cronbach's alpha in the current sample was .93.

Pain Intensity. Participants made a rating of their average pain intensity over the past week using an 11-point scale ranging from 0 (no pain) to 10 (pain as bad as you can imagine).⁷

Brief Pain Inventory Pain Interference Subscale (BPI). The BPI was used to measure pain interference with general activity, mood, walking, work activities (at home and outside the home), relationships with others, sleep, and life enjoyment in the past week.⁷ The 7 interference items are rated on an 11-point scale from 0 (does not interfere) to 10 (completely interferes). The average of the 7 items was computed with higher average scores indicating greater pain interference. The BPI is a widely used core outcome measure in chronic pain.¹⁰ Reliability based on Cronbach's alpha in the current sample was .86.

Patient Health Questionnaire Depression (PHQ-9). The PHQ-9 was used to measure the severity of 9 symptoms of depression that are consistent with diagnostic criteria for depression.²³ The 9 items are rated with reference to their frequency in the past 2 weeks on a scale from 0 (not at all) to 3 (nearly every day). The ratings from the items are summed to produce a total score with higher scores reflecting more severe depression symptoms. The PHQ-9 is widely used as a measure of depression symptoms in the context of long-term health conditions.¹⁴ Reliability based on Cronbach's alpha in the current sample was 83.

Work and Social Adjustment Scale (WSAS). The WSAS assesses impairment in functioning related to work, home management, leisure activities (social and private), and relationships because of one's condition.³¹ The 5 items are rated on a 9-point scale ranging from 0 (no impairment) to 8 (very severe impairment). Total scores are calculated from the sum of the items, and higher scores reflect greater impairment in functioning. The WSAS has been validated in samples with long-term health conditions and it widely used as a measure of impairment in functioning in this context.⁴ Reliability based on Cronbach's alpha in the current sample was .83.

Analyses

The methods and analyses conducted to develop the SMQ generally followed the guide provided by Jensen²²

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and the steps in earlier instrument development studies. eg.^{27,39} Once the data were obtained, they were cleaned through visual inspection and examination of frequency distributions to verify missing data and to find and correct out of range values. The next step was to examine all 20 items in the pool to determine whether any had high rates of missing data or highly skewed or inadequately variable responses. Then, Exploratory Factor Analysis (EFA) with maximum likelihood extraction and oblique rotation was conducted to identify possible dimensions underlying the set of items and eliminate items that did not fit into interpretable item sets. Item-item and item-total correlations, particularly items with the sum of remainder of items from their assigned factor, were also calculated, also to pinpoint ill-fitting items, and then internal consistency was calculated to assure that the items selected could form a consistent scale. After summary scores were calculated these were then examined in correlation analyses in relation to scores from the measures of psychological inflexibility and flexibility, and intolerance of uncertainty, to assess construct validity. Next, correlation analyses with pain intensity, pain interference, depression, and work and social adjustment measures were calculated to see if the scores that form the SMQ can predict these aspects of pain and daily functioning. It was expected that a score from the SMQ would emerge that would reflect inflexible sense-making and that this would correlate significantly in a negative direction with aspects of psychological flexibility, and positively with cognitive fusion and intolerance of uncertainty. We expected it to correlate positively with pain interference, depression, and impairment in work and social functioning. Correlations were interpreted as small (0.10), medium (0.30), and large (0.50).⁸ Finally, to examine whether the associations between sense-making and outcomes were independent and unique, we planned hierarchical multiple regression models to test the role of sense-making in interference, depression, and work and social adjustment after controlling for background variables, pain severity, and relevant, competing, theoretically consistent variables.

Results

The majority of participants were women, 79.1%, and the mean age was 48.4 years ($SD = 13.0$). Most were White, 74.3%, followed by Black, 13.0%, Asian, 6.6%, and other, 6.2%. Most were married or living with a partner, 49.9%, followed by living alone, 23.3%, living with children, 15.2%, or other, 11.7%. Mean years of education completed was 13.4 ($SD = 3.5$). A significant number of participants completed the mandatory 11 years of education only, 30.3%, a small number did not reach that level, 9.2%, and the remainder completed 1 or more years beyond it, 60.5%. Most were unemployed due to pain, 52.9%; some were working part time due to pain, 13.6%, or were retired, 12.2%; only a small proportion remained in full time work, 9.8%, and the remainder reported a wide range of

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roles, 11.5%. The most common primary pain complaint was pain in the lower back, 43.1%, followed by generalized pain, 19.3%, or lower extremity pain, 12.0%, neck, 7.2%, or other, 18.4%. In response to a separate question about the presence of generalized pain, 66.3% answered "yes." Finally, the median duration of pain was 10.0 years, range 1 to 55.

Each of the items in the SMQ item pool was examined for missing data and for the shape of the frequency distribution. The item with the most missing data was item 18 "I would rather succeed than be 'right' about a situation," with 35 missing responses. The item with the next most missing responses was Item 19 "Thinking about a situation too much stops me doing what I want to do," which had 29 missing responses. As the item with the most missing data only had 7.8% missing, none of the items were excluded on this basis. Skewness and kurtosis statistics for all 20 items were considered acceptable as they were all within -2 to +2, and in only 3 instances did these statistics reach the threshold of $|1.0|$.

An initial EFA with oblique rotation was performed on the full item set to see if this could aid in item selection. The Kaiser Meyer Olkin measure of sampling adequacy, $KMO = .86$, and Bartlett's Test of Sphericity, $P < .001$, were both satisfactory, supporting the factorability of the item set. Initially, 5 factors were extracted with eigen values greater than one accounting for 47.1% of the variance. The scree plot, however, clearly indicated a 3-factor solution and this was the solution retained (See Fig 1). One item obtained a low communality and no salient loadings, and thus was eliminated. On repeated recalculation of the factor solution, an additional 4 items were eliminated due to a low factor loadings or significant cross-loadings. An additional EFA with oblique rotation including 15 items again produced good KMO , .84, and sphericity values, $P < .001$, and 3 factors were extracted, accounting for 46.2% of the variance in the item set. The factors were interpreted as Avoidance of Incoherence (7 items), Overthinking (3 items), and Functional Coherence (5 items). Results of the EFA are included in Table 1.

Calculation of item-item and corrected item-total correlations supported the inclusion of all of the items within the factors as potential subscales. Cronbach's alpha reliability for factors 1 and 2 and the total of the 15 items were all acceptable, $\alpha = .85, .85, .78$, respectively. The alpha for factor 3, however, was marginal at best, .64. Hence, total scores were calculated for each of the 3 factors and the total, plus a total of the 10 items from factors 1 and 2, with items from factor 3 left out. The total item set based on the 10 items achieved an alpha of .87. To form the total score based on the 15 items, the Functional Coherence items were reverse scored before summing them with the other 10 items. We note that we proceeded to analyze both the scores from the component-based subscales and the total even though we had not preplanned these additional variables.

Correlation Results: Preliminary

Preliminary correlations were calculated between the scores from the SMQ and gender, age, years of

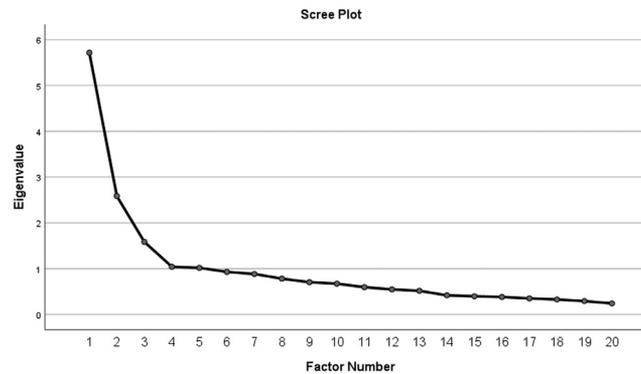


Figure 1. Scree plot based on exploratory factor analysis of the items of the sense making questionnaire.

education, and duration of pain. In general, most of these correlations were very small and nonsignificant. In terms of significant correlations, women had higher scores than men on Overthinking $r = .10$, $P < .05$, and the 2-factor total score for the SMQ, $r = .10$, $P < .05$; age positively correlated with Avoidance of Incoherence, $r = .11$, $P < .05$, and the 10-item total score, $r = .11$, $P < .05$; and years of education also positively correlated with Overthinking, $r = .12$, $P < .05$. The factors and total scores of the SMQ were, to an extent, intercorrelated as one would expect, with Avoidance of Incoherence correlated with Overthinking, and the 15-item total SMQ, and the 10-item total, at $r = .49$, $.88$, $.95$, respectively, all $P < .001$. Overthinking was correlated with Functional Coherence, $r = -.16$, $P < .01$, and correlated with the 15-item total SMQ, $r = .61$, and 10-item total, $r = .74$, both $P < .001$. Finally, Functional Coherence correlated with the 15-item total at $r = -.36$, $P < .001$, but not the 10-item total (See Table 2). Consideration of these intercorrelation results, particularly the low correlations of Functional Coherences with other scores from the SMQ,

led to a decision to proceed with analyses of the 2-factor, 10-item, summary score as the total of the SMQ.

Correlation Analyses: Construct Validity

Correlations between the SMQ scores with the measures of psychological flexibility and inflexibility and intolerance of uncertainty are included in Table 2. Looking first at the total scores for the 10-item SMQ, clearly construct validity is supported by significant medium to large correlations with psychological flexibility and intolerance of uncertainty, range $r = |.34|$ to $|.64|$, all $P < .001$. Here, sense-making behavior was negatively correlated with acceptance of pain and committed action, and positively correlated with cognitive fusion and with intolerance of uncertainty. The correlation with the latter is particularly noteworthy as it reflects 41% overlapping variance. Generally, all of the correlations were significant between SMQ scores and the measures to assess construct validity, $r = |.15|$ to $|.68|$, all $P < .01$, with the exception that the Overthinking

Table 1. Results of Exploratory Factor Analysis with Oblique Rotation of Items of the Sense Making Questionnaire (SMQ)

ITEM	ITEM CONTENT	COMMUNALITY	COMPONENTS		
			1	2	3
4	I find contradiction unacceptable	.58	.69	-.18	-.00
14	It bothers me a great deal when situations do not make sense	.53	.69	-.11	.00
2	I avoid situations that are confusing	.47	.67	-.05	-.04
12	If a situation does not make sense to me, there is no way I can take action	.49	.67	-.07	-.09
19	Thinking about situations too much stops me doing what I want to do	.37	.61	.02	-.03
7	Conflicting information or advice is intolerable	.44	.59	-.18	-.01
10	I struggle to make sense of my situation	.33	.58	.02	-.03
5	If there is a situation that is unclear to me, I will analyze it until I understand it	.73	.16	-.80	.05
6	If I do not understand a situation, I will think about it until I do	.74	.16	-.80	.03
9	I think about situations until they are clear in my mind	.50	.25	-.60	-.01
11	Reaching my goals is more important than being clear in my mind	.40	-.11	.01	.62
18	I would rather succeed than be "right" about a situation	.31	-.10	.01	.55
13	Sometimes life is confusing and this does not stop me doing what I want to do	.47	.36	.28	.51
15	I don't let moments of confusion stop me doing what I want or need to do	.42	.33	.22	.51
16	Thinking about situations too much can be a waste of time and energy	.16	-.09	-.15	.39
Variance accounted for by factors			27.4%	11.5%	7.3%

Factors 1, 2, and 3, labelled Avoidance of Incoherence, Overthinking, and Functional Coherence, respectively.

Table 2. Means, Standard Deviations, and Correlations of SMQ Scores with Scores of Facets of Psychological Flexibility, Intolerance for Uncertainty, and Pain Outcomes (N = 451)

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11
1. Avoidance of Incoherence (SMQ)	26.6	9.0											
2. Overthinking (SMQ)	13.0	4.0	.49 [§]										
3. Functional Coherence (SMQ)	14.5	5.7	-.00	-.16 [‡]									
4. Sense Making Total (SMQ)*	39.7	11.4	.95 [§]	.74 [§]	-.07								
5. Pain Acceptance (CPAQ)	16.4	8.2	-.37 [§]	-.15 [‡]	.18 [§]	-.34 [§]							
6. Cognitive Fusion (CFQ)	32.2	11.3	.53 [§]	.25 [§]	.07	.50 [§]	.42 [§]						
7. Committed Action (CAQ)	25.7	8.1	-.43 [§]	-.05	.22 [§]	-.35 [§]	.42 [§]	-.54 [§]					
8. Intolerance of Uncertainty (IUS)	37.6	12.0	.68 [§]	.31 [§]	.05	.64 [§]	-.38 [§]	.63 [§]	.15 [‡]				
9. Pain Intensity (0-10)	7.9	1.4	.16 [‡]	.08 [†]	-.07	.16 [‡]	-.11 [†]	.087	-.032	.15 [‡]			
10. Pain Interference (BPI)	7.8	1.5	.28 [§]	.05	.08	.23 [§]	-.36 [§]	.23 [§]	-.21 [§]	.23 [§]	.53 [§]		
11. Depression (PHQ-9)	17.9	5.5	.45 [§]	.16 [§]	.10 [†]	.41 [§]	-.35 [§]	.49 [§]	-.37 [§]	.40 [§]	.30 [§]	.53 [§]	
12. Work and Social Adjustment (WSAS)	32.5	6.3	.34 [§]	.09 [†]	.07 [†]	.30 [§]	-.41 [§]	.24 [§]	-.24 [§]	.28 [§]	.37 [§]	.68 [§]	.54 [§]

*The total for the SMQ calculated based on the sum of the 10 items from Avoidance of Incoherence and Overthinking only.

† $P < .05$,

‡ $P < .01$,

§ $P < .001$.

component did not significantly correlate with committed action and Functional Coherence was not correlated with cognitive fusion. The correlations of Avoidance of Incoherence and the total score with the variables being employed to examine construct validity are stronger and more consistent than the results that involve Overthinking and Functional Coherence.

Correlation Results: Relations of Sense Making with Chronic Pain Outcomes

Table 2 also includes 16 correlations that speak to associations between scores from the SMQ with 4 outcome variables important in people with chronic pain. First, in terms of the 10-item SMQ total score, the correlations across these 4 outcomes are all significant at $P < .001$ and small to medium in magnitude, and the largest of these is the correlation with depression, $r = .41$. Here higher levels of sense-making behavior were associated with higher pain intensity, pain interference, depression, and impairment in work and social adjustment. Correlations between the Avoidance of Incoherence component and these outcomes were also significant and similar in magnitude and direction. Overthinking and Functional Coherence achieved only small correlations, the former did not correlate with pain interference and the latter did not correlate with pain intensity or pain interference.

Regression Analyses

Three hierarchical multiple regression equations were calculated with pain interference, depression, and work and social adjustment as the dependent variables. Age, gender (0 = women, 1 = men), years of education, and duration of pain in months were entered first. Average pain intensity in the past week was entered next, followed by pain acceptance, following the conventional approach of first entering static personal characteristics, then a reflection of the severity of the pain condition, a comparison established psychological variable, and

then the newly investigated variable last.³⁵ Pain acceptance was chosen here because this process, from among the 4 theoretically related process variables included, achieved the highest average correlation with the 3 dependent variables. After all of these were entered, the total score from the SMQ was entered to see if it added a significant increment of variance. Results are shown in Table 3.

To summarize relevant results from the regressions, it was only in the equation for depression that the sense-making total score accounted for a significant unique proportion of variance after background variables, pain intensity, and pain acceptance were statistically controlled. It did not account for significant unique variance in pain interference or impairment in work and social adjustment. The variance accounted for by sense-making in depression was 8.0% and it achieved the highest standardized regression coefficient of all the entered variables. The final row of Table 3 shows that sense-making did make a significant contribution to all 3 dependent variables when pain acceptance was not included in the equation, but the 5 other covariates were included. The variance accounted for was 3.2%, 18.0%, and 7.6% for pain interference, depression, and work and social adjustment, respectively.

Discussion

This study included development of a measure of sense-making behavior rooted in functional contextualism and preliminary evaluation of its psychometric properties in people with chronic pain. From an initial pool of 20 items, a 15-item measure emerged with 3 components labelled as Avoidance of Incoherence, Overthinking, and Functional Coherence. Acceptable internal reliability was demonstrated for the Avoidance of Incoherence and Overthinking factors and the items overall. However, the Functional Coherence subscale failed in several respects, including inadequate internal consistency and small or nil correlations with the other factors. A SMQ total score was therefore derived based on the Avoidance of Incoherence and Overthinking factors. Significant bivariate

Table 3. Regression Analyses of the Role of Sense Making in Pain Outcomes Independent of Background Variables, Pain Intensity, and Pain Acceptance

BLOCK	PREDICTOR	DEPENDENT VARIABLES					
		PAIN INTERFERENCE		DEPRESSION		WORK & SOCIAL ADJ.	
		ΔR^2	β	ΔR^2	β	ΔR^2	β
1	Background	.015		.025		.041 [†]	
	Age		-.010		-.14 [†]		.038
	Gender		.008		.036		-.025
	Education		-.055		-.14 [†]		-.14 [‡]
	Pain Duration		-.012		.044		.031
2	Pain Intensity	.23 [§]	.46 [§]	.053 [§]	.19 [§]	.076 [§]	.25 [§]
3	Pain Acceptance	.091 [§]	-.30 [§]	.098 [§]	-.21 [§]	.15 [§]	-.35 [§]
4	Sense Making	.001	.033	.080 [§]	.31 [§]	.008	.10
Total R ²		.33		.26		.27	
3*	Sense Making	.032 [‡]	.18 [§]	.18 [§]	.43 [§]	.076 [§]	.28 [‡]

Note: Beta is from final equation.

*The final row of this table shows the results for sense making as a predictor without including pain acceptance in the equation.

[†] $P < .05$,

[‡] $P < .01$,

[§] $P < .001$.

correlations, in the expected directions, between this SMQ total score and measures of psychological flexibility processes, intolerance of uncertainty, depression symptoms, and functioning provide initial support for its construct validity and potential utility.

Previous conceptualizations of constructs related to sense-making, such as a sense of coherence, have largely focused on the beneficial impact of coherence,² including for people with chronic pain.^{1,6,26} This previous conceptualization of coherence focuses on literal coherence or a sense of comprehensibility and controllability. The development of the SMQ in the current study drew on a functional contextual perspective that recognizes that sense-making behavior may be helpful or unhelpful, depending on an individual's goal and the situation at hand. The inclusion of items related to functional coherence reflects the capacity to experience a lack of literal coherence and still act in a way that serves one's goals. However, this factor within the item set did not perform very well. The fact that the Avoidance of Incoherence and Overthinking subscales were generally correlated with worse pain outcomes, suggests that processes of *literal* coherence can have negative impacts in daily functioning. Given the pattern of correlations between the SMQ factors and measures of psychological flexibility and inflexibility in the current study, the sense-making behaviors assessed with the SMQ subscales might be thought of in terms of flexible (Functional Coherence) and inflexible (Avoidance of Incoherence and Overthinking) sense-making. We hasten to add that the performance of the Functional Coherence factor was inconsistent.

The focus in the current study is unlike previous clinical or self-report-based studies of coherence or sense-making. It is similar, however, to the focus of the experiment by Wray and colleagues³⁸ in which a potentially unhealthy form of sense-making was demonstrated. Particularly, results in the current study show that the

Avoidance of Incoherence component of sense-making seems to predominate in relations with outcomes. We note that the correlations with pain interference, depression, and work and social adjustment are strongest for this component. This is consistent with Wray et al.³⁸ and their interpretation that experiential avoidance appears to be at work in this context. This component of psychological inflexibility includes "attempts to alter the form, frequency, or intensity of private experiences such as thoughts, feelings, bodily sensations, or memories, even when doing so is costly, ineffective, or unnecessary" (p. 184).²⁰ In this particular situation involving sense-making, the experiences people are attempting to alter are their own specific thoughts, feeling, sensations, or memories occasioned by the context of un-solvability.

Despite the focus on capturing functional coherence, only 5 SMQ items loaded onto this subscale and it had inadequate internal consistency reliability. It also demonstrated small or no correlations with the other factors. For these reasons it was not included in the total score for the SMQ. The lack of correlations observed between the Functional Coherence and Avoidance of Incoherence and Overthinking subscales suggest that these may be partially distinct facets of sense-making. Therefore, further development of functional coherence items may be warranted. This could entail refinement to the wording of existing items alongside the development of additional items and further investigating the structure and construct validity of the subscales. In a way, functional coherence reflects the heart of psychological flexibility, a sense of taking action guided by what one wants to achieve without being unduly stopped by what one's thoughts say or whether what they say is currently making literal sense.¹⁷ However, further work is needed to provide a psychometrically sound measure that adequately captures this aspect of sense-making.

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Setting aside the conceptually interesting subscales, the total score was internally reliable, as mentioned, and uniquely contributed to explained variance in key pain outcomes. In models that controlled for demographics and pain intensity, the 10-item SMQ total score significantly accounted for 3.2 to 18% of the variance in outcomes. However, the SMQ only contributed significant unique variance, 8.0%, for depression when pain acceptance was also included in the model. Thus, sense-making behavior may be particularly relevant for depression. Perhaps when one is more in emotional turmoil, one is more likely to struggle to make sense and/or to do so in a way that unwittingly exacerbates that turmoil. The moderate negative bivariate correlation between the SMQ total and pain acceptance indicates a degree of shared variance between these variables and the regression models controlling for acceptance are therefore a conservative evaluation of the predictive utility of the SMQ. Further efforts to develop the SMQ items, such as to extend the functional coherence subscale, could perhaps consider ways to keep new items distinct from the CPAQ-8 to increase the predictive utility of the SMQ. Also, it is possible that correlation results, including all of the potential parts of the SMQ could have been stronger if the items were framed in a more pain-specific fashion as this could lend more precision and homogeneity to the analyses.

It may be too early to talk about practical clinical implications of the results obtained here, until they are further developed and replicated. On the other hand, in many ways potential problems of literal sense-making and being stuck in one's own thinking are already highlighted as targets in treatment in forms of Cognitive Behavior Therapy, particularly in Acceptance and Commitment Therapy (ACT).¹⁹ The current results perhaps further highlight the potential importance of these processes and encourage clinicians to be more sensitive to them. Perhaps with further evidence in future it may be possible to develop more precisely targeted and impactful treatment methods to counteract harmful processes of literal coherence in the behavior of people with chronic pain.

Several limitations must be considered when interpreting the results. Firstly, as discussed, the internal consistency of the Functional Coherences items was below the typically acceptable level and further development of this subscale may be needed. Additionally, the current item set was developed by researchers with expertise in contextual behavioral science and substantial clinical

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experience working with people with chronic pain. However, people with chronic pain were not directly involved in the development of the items. It could have improved content validity, if they had been, consistent with the COSMIN guidelines for developing patient reported measures.³⁶ Of course, the cross-sectional design of the study precludes causal statements about the nature of the relationships between SMQ scores and pain-related outcomes. Further longitudinal and experimental research is needed to investigate the nature of these associations more rigorously. The data were collected from people seeking treatment at a specialty service that aims to help people improve functioning and quality of life in the presence of pain. Therefore, the current findings may not generalize to people who are not referred to treatment in this context or who decline this approach to treatment for pain. Investigation of the psychometric properties among people with pain presenting in other contexts, such as primary care, is needed.

To conclude, there is initial support for the reliability and validity of data from the 10-item SMQ, when computed as a total score, as a preliminary measure of inflexible sense-making. Further refinements to the SMQ will enable more nuanced and context-specific understanding of the role of sense-making behavior in people with chronic pain. A functional and contextual analysis¹⁸ of other commonly accepted behavior patterns in chronic pain is recommended. This is particularly because, as suggested here, not all concepts or behavior patterns that make sense are necessarily helpful in all situations, at all times, for all people. Wanting to make sense of confusion or uncertainty and to reduce the inherent threat associated with these is an entirely normal human response. Therefore, it could be a benefit to treatment participants if treatment providers are aware that this very normal behavior might at times cause problems.

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Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jpain.2022.09.008>.

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