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Measuring "Self": Preliminary Validation of a Short Form of the Self Experiences

Questionnaire in People with Chronic Pain

Lin Yu, PhD[1,2]; Whitney Scott, PhD[2,3]; Rupert Goodman, MSc[2]; Lizzie Driscoll,

MSc[4]; Lance M. McCracken, PhD[5]

[1]Middlesex University, Department of Psychology, UK, [2] INPUT Pain Management

Unit, Guy's and St Thomas' NHS Foundation Trust, UK [3]King's College London,

Health Psychology Section, Psychology Department, Institute of Psychiatry,

Psychology & Neuroscience, UK [4]Salomons Institute for Applied Psychology, UK

[5]Uppsala University, Department of Psychology, Sweden

Correspondence to:

Dr Lin Yu

Department of Psychology

Middlesex University

Town Hall

The Burroughs

Hendon, London, NW4 4BT

Email: l.yu@mdx.ac.uk

ORCID ID: https://orcid.org/0000-0003-0038-9266

Abstract:

Background: People with chronic pain often struggle with their sense of self and this can adversely impact their functioning and wellbeing. Acceptance and Commitment Therapy particularly includes a process related to this struggle with self. A measure for this process, the Self Experiences Questionnaire, was previously developed in people with chronic pain.

Purpose: The aim of the current study was to validate a shorter version of the Self Experiences Questionnaire in people with chronic pain to reduce respondent burden and facilitate further research.

Methods: Data from 477 participants attending an interdisciplinary pain management programme were included. Participants completed measures of treatment processes (self-as-context, pain acceptance, cognitive fusion, and committed action) and outcomes (pain, pain interference, work and social adjustment, and depression) at baseline and post-treatment. Confirmatory factor analysis was used for item reduction. Correlations between scores from the shorter Self Experiences Questionnaire and other process and outcome variables were calculated to examine validity. Change scores of the shorter Self Experiences Questionnaire and their correlations with changes in outcome variables were examined for responsiveness.

Results: An eight-item SEQ (SEQ-8) scale including two factors, namely Self-as-Distinction and Self-as-Observer, emerged, demonstrating good reliability (Cronbach's α=.87-.90) and validity (|r|=.14-.52). Scores from SEQ-8 significantly improved after the treatment (d=.15-21), and these improvements correlated with improvements in most outcomes.

Conclusions: The SEQ-8 appears to be a reliable and valid measure of self. This shorter format may facilitate intensive longitudinal investigation into sense of self and functioning and wellbeing.

Key words: Self Experiences Questionnaire; Self-as-context; Sense of self; Chronic pain; Acceptance and Commitment Therapy.

1. Introduction

Chronic pain and the interference it can impose can severely challenge the sense of self and identity of people who experience it.[1] People with chronic pain often experience a struggle with their sense of self.[2-6] Along with changes in their activities and roles, people with chronic pain often experience a loss of identity, and being incapable of embodying their roles, and "no longer feel like the persons they once were.[2, 5] At the same time, they experience the intrusion of "a new self" associated with pain that is considered diminished compared to "their old self".[3, 5] Under these threats to the self and identity, they struggle to hold onto the "real me".[2] This struggle can leave people with pain feeling confused and vulnerable, an experience that can be more difficult to manage than the pain sensation itself.[3] Such threats to sense of self are in turn associated with diminished health and wellbeing in various domains, such as emotional and social functioning, and life satisfaction.[4, 5, 7]

Acceptance and Commitment Therapy (ACT), a form of Cognitive Behavioural Therapy (CBT), includes a specific focus on a process related to sense of self. ACT is based on a unified model of psychological health and psychotherapy, called the psychological flexibility (PF) model.[8] Psychological flexibility is the ability to make conscious and full contact with the present moment, to be open to challenging experiences without unhelpful defence, and to persist or change one's behaviours, in the service of one's goals and values.[9] The PF model includes a set of practical organizing terms reflecting therapeutic processes to target: acceptance, cognitive defusion, present awareness, self-as-context (SAC), values, and committed action. These are often summarized as "open, aware, and active".[8] Among these processes,

SAC specifically addresses sense of self. SAC entails the experience of a sense of self that is bigger than and containing ones' thoughts, feelings, and sensations. It is like a perspective or point of view whereby one can observe these experiences rather than identifying with them. In the PF model, self can be regarded as something we do, rather than something we are. We can experience ourselves in one way or another, as being made up of our bodily sensations, thoughts, feelings, and roles, for example, or as the context where these occur.[10]

Randomised controlled trials demonstrate the effectiveness of ACT for people with chronic pain for a range of outcomes, including physical functioning, social functioning, emotional distress, and life satisfaction, with small to large effect sizes. [11, 12] Some PF processes, including acceptance, cognitive defusion, present awareness, and value-based action, have been investigated and found to be associated with treatment outcomes such as anxiety, depression and disability, in people with chronic pain.[13] However, evidence remains lacking for some of the key processes of PF, particularly SAC. This is mainly due to a historical lack of appropriately developed and validated measures.

A measure of SAC, the Self Experiences Questionnaire (SEQ), has been developed and validated in people with mixed chronic pain conditions[14] and fibromyalgia.[15] The SEQ includes 15 items reflecting two factors: one reflecting a sense of self separated/distinct from one's s thoughts and feelings, namely self-as-distinction (SAD), and one reflecting a sense of self as an observer of one's thoughts and feelings, namely self-as-observer (SAO). In these studies, SAC showed significant

correlations with pain interference, work and social functioning, and depression. In a single-group outcome study of ACT for chronic pain,[16] SAC, measured by the SEQ, significantly improved after the treatment, and the improvement maintained at nine-month follow-up. Furthermore, the change in SAC was significantly associated with the improvements in mood and daily functioning.

Preliminary results suggest the PF model and ACT may have the potential to address the fundamental struggle with sense of self, and to reduce its adverse impact on functioning in people with chronic pain. Nevertheless, while the availability of the measure of SAC, namely the SEQ, has facilitated the investigation of sense of self in ACT, a briefer measure of SAC may better support further research and application. This would reduce participants' response burden in research and in clinical settings, where a large battery of measures are often administered. This, in turn, could provide the opportunity for intensive repeated administration for longitudinal assessment, which could further improve our understanding of SAC, and its utility in addressing the struggle with sense of self.

The aim of the study was to create a shorter measure of SAC while maintaining a previously supported two-factor structure. An eight-item version was considered a reasonable target, as it would be short enough to allow efficient assessment, but sufficient for retaining a meaningful two-factor structure assessed using confirmatory factor analysis.[17] The specific objectives were (1) to examine previously supported two-factor structures for the SEQ and reduce items using confirmatory factor analysis, (2) to examine the reliability and validity of the newly validated,

shorter SEQ, (3) to examine if scores from the shorter SEQ appear sensitive to change after the treatment, and if the change is correlated with changes in treatment outcomes, to assess its responsiveness.

2. Methods

2.1 Participants

Participants were consecutive adults (>18 years old) attending an intensive interdisciplinary, group-based pain management programme at the INPUT Pain Management Unit at St Thomas' Hospital in London, UK, between January 2018 and August 2019. Figure 1 shows the data collection process. Table 1 shows the demographic characteristics of the participants. Participants underwent an initial assessment with both a psychologist and physiotherapist within the pain service to determine their eligibility to attend the pain management programme.

Eligibility criteria included having had pain for three months or longer that significantly impacted on participants' emotional, social, and/or physical functioning. All participants had to speak and understand English, be able to independently self-care during their stay on the residential programme, and to be able to participate in a group-based treatment (described further below). Patients at risk of suicide were excluded. Additionally, people with serious mental health problems, such as psychosis and severe post-traumatic stress symptoms, were excluded where these problems were judged to be poorly controlled and limiting their capacity to safely engage in a group-based pain self-management approach. Lastly, participants

seeking further medical investigations or surgical procedures to reduce pain were

excluded.

[Table 1 about here]

2.2 Study Design

The study was a prospective observational study. This study was approved by the

National Research Ethics Service Committee South Central – Oxford C (17/SC/0537)

and was conducted in accordance with the 1964 Declaration of Helsinki and its

amendments.

All participants completed a three-week residential group-based pain management

programme. Participants completed a standardized set of reliable and validated self-

report questionnaires on the first and last days of treatment. Measures included

core pain outcomes, namely pain intensity, pain-related interference, functioning,

and symptoms of depression.[18] They also included the SEQ and other measures of

psychological (in)flexibility (pain acceptance, cognitive fusion, and committed

action). All participants completed these measures as part of their clinical care; only

those who provided consent for their data to be used for research purposes were

included in the current study.

The treatment programme was delivered by an interdisciplinary team of

psychologists, physiotherapists, nurses, and occupational therapists. The team

provided treatment using principles of Acceptance and Commitment Therapy (ACT)

across the different disciplines, and focused on enhancing psychological flexibility.

Treatment included using metaphors, experiential exercises, mindfulness practice, exploration of values, and values-based goal setting, each to enhance openness, awareness, and engagement.[8] Treatment also focused on building SAC by fostering awareness of a sense of self that is bigger than and separate from one's thoughts, feelings and bodily sensations.

[Figure 1 about here]

2.3 Self-Report Measures

All participants were asked to provide basic demographic information (i.e., age, gender, ethnicity, education, and work status), and basic information about pain, including pain duration and their primary pain location.

Self-as-Context and Other Psychological Flexibility Processes

2.3.1 SEQ-15

The Self Experiences Questionnaire (SEQ) is a 15-item measure of Self-as-Context (SAC), which is the capacity to take the perspective of being separate from, bigger than, and/or containing one's thoughts, feelings, and bodily sensations.[14, 19] Example items include, "Above all my experiences, there is a sense of myself who is noticing them" and "I am able to separate myself from my thoughts and feelings". Participants rated items on this measure from 0 (never true) to 6 (always true). Total scores indicate higher levels of SAC. The 15-item version was validated in an earlier sample of 528 adults with chronic pain attending the same interdisciplinary ACT-based treatment as described in the current study. Data from that validation study demonstrated that the 15-item SEQ had excellent internal consistency (α=0.9) and a two-dimensional factors structure reflecting 'Self-as-Distinction' and 'Self-as-

Observer'. Validity of the SEQ was supported by significant correlations with mood, functioning, and other psychological flexibility processes (i.e., pain acceptance and committed action).[14, 16]

2.3.2 CPAQ-8

The eight-item version of the Chronic Pain Acceptance Questionnaire[20] measures pain acceptance, which describes a willingness to experience pain and engage in personally meaningful activities alongside pain.[21] Example items include, "I am getting on with the business of living no matter what my level of pain is" and "When my pain increases, I can still take care of my responsibilities". Each item was rated from 0 (never true) to 6 (always true). Total scores on this measure reflect higher levels of pain acceptance. The CPAQ-8 showed sufficient internal consistency in the current sample (α=.76). Previous research indicates that the CPAQ-8 correlates with pain intensity and interference, depression, and anxiety, supporting its validity.[20]

2.3.3 CFQ-7

The seven-item version of the Cognitive Fusion Questionnaire was used to assess cognitive fusion,[22, 23] which reflects difficulties separating thoughts from the events to which they are associated and the excessive dominance of thoughts on behaviour.[19] Example CFQ-7 items include, "I get so caught up in my thoughts that I am unable to do the things that I most want to do" and "I get upset with myself for having certain thoughts". Items were rated from 0 (never true) to 6 (always true). Total scores indicate greater levels of cognitive fusion (i.e. an indicator of psychological *inflexibility*). As such, CFQ-7 scores are expected to be negatively associated with the

other measures where total scores reflect psychological flexibility. The CFQ-7

showed good internal consistency in the current sample (α=.95). The CFQ-7

correlates with measures of emotional, social, and physical functioning and is

associated with both general and pain acceptance, supporting its validity.[22]

2.3.4 CAQ-8

The eight-item version of the Committed Action Questionnaire was used to measure

committed action,[24] which describes flexible engagement in personally meaningful,

goal-directed behaviour in the presence of challenges.[19, 25] Example items include, "I

can remain committed to my goals even when there are times that I fail to reach

them" and "I prefer to change how I approach a goal rather than quit". Participants

rated CAQ-8 items from 0 (never true) to 6 (always true). Higher total scores indicate

greater levels of committed action. The CAQ-8 showed good internal consistency in

the current sample (α=.80). Supporting its validity, the CAQ-8 has been shown to

correlate with emotional, social, and physical functioning and general and pain

acceptance.[24]

Standard Pain Outcome Variables

2.3.5 Pain intensity

Participants rated their average pain intensity over the past week. Pain intensity was

rated on a scale from 0 (no pain) to 10 (pain as bad as you can imagine).[26]

2.3.6 BPI

The interference subscale of the Brief Pain Inventory[26] was used to assess the impact of pain on functioning. The BPI interference subscale has seven items to measure the impact of pain on general activity, mood, walking ability, normal work, relationships with other people, sleep, and enjoyment of life. Participants rated these items from 0 (does not interfere) to 10 (completely interferes). Higher scores indicate greater pain-related interference. The BPI interference subscale showed good internal consistency in the current sample (α= .86). The BPI is regarded as a core outcome measure for chronic pain research.[18]

2.3.7 WSAS

The Work and Social Adjustment Scale (WSAS) was used to measure the degree to which chronic pain impairs functioning in work, home management, social leisure activities, private leisure activities, and personal or family relationships.[27] Participants rated the five WSAS items from 0 (no impairment) to 8 (very severe impairment). Higher scores indicate more severe impairment in functioning. The WSAS is a reliable and well-validated tool to assess the impact of long-term health conditions on functioning.[27, 28] The WSAS showed good internal consistency in the current sample (α=.83).

2.3.8 PHQ-9

The Patient Health Questionnaire (PHQ-9) is a nine-item measure of depression symptom severity. Items reflect symptoms of depression as defined in standard diagnostic criteria.[29] Items were rated from 0 (not at all) to 3 (nearly every day), with higher scores reflecting greater severity of depression symptoms. The PHQ-9 is a

well-validated measure for assessing depression symptom severity in a medical

setting.[30]The PHQ-9 showed good internal consistency in the current sample (α=.83).

2.4 Statistical analysis

Skewness, kurtosis, histograms and Q-Q plots for each variable were examined for

normality. Scatter plots were examined for all process variables and outcome

variables for linearity. Participants who did and did not provide post-treatment data

were compared on categorical demographic variables using Chi-square, and

continuous demographic variables, all process variables, and all outcome variables,

using independent-sample T-test.

After these preliminary analyses, a series of confirmatory factor analyses were

conducted to test the adequacy of the previously supported two-factor model of the

15-item SEQ,[15] and to reduce items, using AMOS version25. In the initial SEQ,[15] two

moderately correlated factors were identified for the SEQ, including one factor

reflecting Self as Distinction (item1, 2, 3, 4, 5, 6, 7), and the other Self as Observer

(item8, 9, 10, 11, 12, 13, 14, 15). In a study of the SEQ in people with chronic pain

using CFA,[15] a bi-factor structure where a general factor predicted each item, and

each item loaded onto each sub-factors (Self as Distinction and Self as Observer)

respectively, was validated. Therefore, this previously supported bi-factor model was

first tested. Then the initial two-factor structure of the SEQ, with Self as Distinction

and Self as Observer correlated, was tested. Then item reduction was carried out

based on the identified factor-structure. Chi-square and several goodness of model

fit indices including comparative fit index (CFI), Tucker-Lewis index (TLI), and root

mean square error of approximation (RMSEA) were assessed. Assessment of

goodness of fit of these models was based on the following standard structural

equation modelling cut-off criteria: CFI > 0.92, TLI > 0.92,[31] and RMSEA < 0.08.[32] The

process of item reduction was guided by the goal of producing a reliable and valid

shorter scale, with potentially eight items, if statistically supported, while preserving

a meaningful two-factor structure. Items were selected based on standardized item-

to-factor loadings, modification indices, findings from previous validation studies,

and theoretical consistency of the content of the items.[14, 15] As AMOS does not

produce modification indices for incomplete datasets, only participants with

complete data on all SEQ items (*N*=352) were included in confirmatory factor

analyses.

Following these confirmatory factor analyses, the reliability of the shorter SEQ was

examined using Cronbach's α, and Pearson's correlation between the shorter SEQ

and the 15-item SEQ. Construct validity was examined using Pearson's correlations

with other PF process variables, including pain acceptance, cognitive defusion, and

committed action, and outcome variables, including pain, pain-related interference,

work and social adjustment, and depression. Missing data were deleted pairwise.

These PF processes were selected to examine the construct validity of the SEQ,

because they clearly reflect core processes (e.g., "open" and "active/engaged") of

the PF model and derive from reliable and brief measures that were validated in

chronic pain samples.

Additionally, change in SAC, as well as the correlations between change in SAC and changes in other process variables and outcome variables, were examined for the responsiveness of the shorter SEQ. T-tests were used to examine the changes in SAC. Within-subject effect sizes were calculated using the equation recommended for repeated measures to avoid inflation of effect sizes associated with non-independent design:[33] $d = t_{paired} \sqrt{2(1 - r12) / n}$.[34] Cohen's thresholds for interpreting effect sizes were adopted: d = 0.20 is considered as small effect size, d = 0.50 medium, d = 0.80 large.[35] Pearson's correlations were conducted with residualized change scores for all process and outcome variables. Missing data were deleted pairwise in these analyses. Standardized residualized change scores were calculated for the changes from baseline to post-treatment for SAC, other PF process variables and outcome variables. For each variable, baseline scores were used to predict post-treatment scores, and residualized change scores were calculated as the differences between predicted and observed scores. Cohen's thresholds for interpreting effect sizes were adopted: r = 0.10 is considered as small effect size, r = 0.30 medium, r = 0.50 large.[35]

3. Results

3.1 Preliminary analyses

The total scores of all measures were considered normally distributed and unimodal. No obvious non-linear relation was identified. Twenty-two participants were missing data for the SEQ, eleven CPAQ, ten CFQ, twelve CAQ, one BPI, and two WSAS. Overall, data missingness was not considerable. Participants who did and did not

provide post-treatment data did not differ on any demographic variables, process variables, or outcome variables.

3.2 Confirmatory factor analysis and item reduction

Table 2 shows the goodness of model fit indices for each model tested in the confirmatory factor analyses.

[Table 2 about here]

A previously supported bi-factor model,[15] in which a general factor predicts each item, and each item loads onto respective sub-factors, was tested. The bi-factor model (Model A) examined if there was a general factor that could account for the variance among these items and if each sub-factor accounted for unique variance over and above the general factor. CFI indicated marginally good fit for the bi-factor model, but the other fit indices did not (Table 2, Model A). Almost all items loaded significantly and highly onto the general factor (standardized loading =.55-.83 for all items except for item 12, standardized loading =.26). All items reflecting SAO loaded significantly onto SAO (standardized loading =.27-.71). However, amongst items reflecting SAD, item 4, 5 did not significantly load onto SAD, while item 6, 7 loaded negatively onto SAD, suggesting that these items did not explain variance beyond the general factor. Item 1,2,3 all showed relatively low loadings on to SAD (standardized loading =.35-.48). Therefore, the bi-factor model was not further explored, as the factor SAD would not be retained.

As in the initial development of the SEQ, two correlated factors, one reflecting SAD and one SAO, emerged.[14]A two-factor model, including one factor reflecting SAD and

one SAO, allowing SAD and SAO to correlate (Table 2, Model B), was tested. The

model fit indices did not suggest a satisfactory model fit. All items loaded

significantly and sufficiently onto the respective factors (standardized

loading=.58-.82 for SAD, standardized loading=.58-.81 for SAD). Model B was further

examined for item reduction and further improvement in model fit.

Modification indices suggested that correlating the measurement errors between

item 9 and item 10, and those between item 6 and item 7, would lead to improved

model fit, suggesting that these items correlated above what could be accounted for

by the latent factor. This was also observed in a previous validation study, where

item 9 and 10 were found to correlate beyond what could be accounted for by

SAO.[15] Beyond a hierarchical relation to one's thoughts and feelings, these two items

also involve elements reflecting one's attachment/detachment to one's

psychological experience, or an over-dominant influence of these (e.g.

"overwhelmed", "caught up"). When these items (item 6,7,9,10) were removed, the

model fit improved, and some of the model fit indices suggested good model fit

(Table 2, Model C).

Model fit indices suggested regressing SAD onto item 12 ("I can notice that my mind

is thinking from moment to moment") would lead to model fit improvement. Item

12 appeared to reflect an overall awareness without clearly distinguishing between a

distinctive relation and a hierarchical relation to self. Therefore, item 12 was

removed due to lack of clarity which led to a further improved yet unsatisfactory

model fit (Table 2, Model D).

Modification indices further suggested correlating the measurement error of item 8 with those of item 14 and 15 would lead to model fit improvement. Furthermore, item 8 showed the lowest loading onto SAO, amongst all items reflecting SAO. Therefore, item 8 was removed. Modification indices further suggested regressing item 4 ("I have thoughts and feelings but am not defined as just my thoughts and feelings") onto SAO would lead to model fit improvement. This was also observed in a previous validation study,[15] where regressing item 4 onto SAO led to model fit improvement. It is arguable that item 4 ambiguously reflects either a distinction or a hierarchical relation to one's psychological experiences. SAD and SAO are two related dimensions of SAC, and it is perhaps difficult to delineate these two processes. As the goal of the study is to create a reliable, shorter scale for SAC, we decided to remove item 4. When item 8 and 4 were removed, a good model fit was achieved (Table 2, Model E).

A scale of eight items, including four items reflecting SAD, and four SAO emerged, and is referred to as the SEQ-8. All items loaded significantly and highly onto the two factors respectively, and the two factors were significantly and moderately correlated (.65 at baseline, .77 at post-treatment). This model was then tested using post-treatment data. The results showed a similar model fit and loading pattern. Table 3 shows the standardized factor loadings for the final scale (Model E).

[Table 3 about here]

3.3 Reliability

Both subscales and the total scale showed good internal consistency. Table 4 shows Cronbach's α of the subscales and the total scale of the SEQ-8. In addition, the total scores from the SEQ-8 significantly correlated with the total scores from the 15-item SEQ, r=.96, p<.001, further supporting the reliability of the SEQ-8.

[Table 4 about here]

3.4 Validity

A total score for each sub-factor (SAD and SAO) and a total score (SAC) for all items were calculated from the SEQ-8. Table 5 shows the correlations between scores from the SEQ-8 and measures of PF processes and outcomes. The subscale scores and the total scores from the SEQ-8 significantly correlated with all three measures of PF processes with small to large effect sizes: higher SAC was correlated with higher pain acceptance, less cognitive fusion, and higher committed action. Scores from the SEQ-8 also significantly correlated with most outcome measures with small to medium effect sizes: higher SAC was correlated with better mood and daily functioning. However, only SAD marginally significantly correlated with pain intensity (p=.045), but not SAO or SAC. Overall, these results supported the validity of the SEQ-8.

[Table 5 about here]

3.5 Responsiveness

Scores from the SAD subscale and the total scores from the SEQ-8 significantly increased from baseline to post-treatment. However, scores from the SAO subscale did not improve significantly after the treatment.

[Table 6 about here]

Table 7 shows the correlations between the changes in scores from the SEQ-8 and changes in outcome measures. The residualized change scores from both subscales and the total scale of the SEQ significantly correlated with the residualized change scores from all outcome measures with medium to large effect sizes, except for pain intensity. Overall, the SEQ-8 appeared responsive to detect change in SAC during the ACT-based treatment for chronic pain.

[Table 7 about here]

4. Discussion

The aim of the current study was to develop and validate a shorter version of the SEQ in people with chronic pain. An eight-item measure of SAC including two correlated factors, one reflecting self-as-distinction, and one reflecting self-as-observer, emerged. Each of the dimensions of the SEQ-8 demonstrated sufficient internal consistency. Construct validity was supported by small to large correlations with measures of other psychological flexibility processes and measures of treatment outcomes. Responsiveness was supported by significant changes in some SEQ scores after the treatment, and their associations with changes in measures of treatment outcomes. Overall, the newly validated SEQ-8 appears to be a reliable, valid, and responsive measure of SAC.

Findings from the current study appear consistent with previous investigations of SAC in chronic pain.[14-16] Similar patterns of relationships between SAC and other psychological flexibility processes and outcomes were observed in these development and validation studies of the SEQ.[14-16] SAD generally showed stronger correlations with other psychological flexibility processes including pain acceptance,

defusion, and committed action, compared with SAO. SAD also consistently showed stronger correlations with outcomes including pain-related interference and depression, compared with SAO. Furthermore, improvements in SAD after the treatment showed a stronger association with changes in pain-related interference and depression.

From the perspective of Relational Frame Theory,[36] SAD entails a deictic relation of distinction to one's psychological experiences, and SAO entails a hierarchical relation to one's psychological experiences. Both SAD and SAO operate in the perspective taking process of 'I being here now', while psychological experiences 'being there then'.[10, 37] Foody et al. investigated distinction versus hierarchal relations in a self-based ACT exercise in naïve students.[38] Here a hierarchal relation based exercise was found superior to distinction relation based exercise of the same intensity, for stress reduction. If hierarchical relation based self was superior to distinction-relation based self, our finding here perhaps reflects a relatively weaker treatment intensity for SAO compared with SAD. However, it is also possible that SAD is more strongly correlated with other PF processes and the measures of functioning adopted in our study, compared with SAO. Nevertheless, SAC is not an experience that naturally emerges in an ordinary language environment. Accurate reporting on these processes, especially SAO, can be challenging. The difference we observed in the relations between different dimensions of SAC and other measures of PF and functioning may reflect, to some extent, participants' performances in responding to these items.

On the other hand, SAO showed a similar or stronger association with work and

social functioning, compared with SAD, which indicates a hierarchical relation to

one's thoughts and feelings can be particularly relevant for the social aspect of

functioning. Indeed, the social aspect of the impact of pain on sense of self has been

identified in qualitative and quantitative studies,[1, 3, 5, 39] suggesting people with

chronic pain not being able to embody their roles, having difficulty maintaining

family relationships, and worrying about other people's perceptions of them in social

contexts, among other challenges. This social element can be particularly challenging

for people with chronic pain, as it involves not only one's own self-descriptions and

self-evaluations experienced privately, but also one's thoughts and feelings about

the perceptions of others, often experienced in public/social contexts.[39,40] Perhaps a

"transcendent" sense of self, beyond separation and detachment from one's

thoughts and feelings, is needed to address this particularly complex struggle with

sense of self in social contexts. Again, no definitive conclusion on the relations

between SAC and functioning can be drawn at this stage given the preliminary and

correlational nature of the data. Future studies with experimental designs are

needed to delineate the role of each dimension of the self in relation to different

aspects of functioning.

It is notable that SAC generally did not appear to be associated with pain intensity

either at baseline or during the treatment. This finding is not unexpected. ACT does

not focus directly on symptoms, but rather the common processes (i.e. the PF

processes) that underlie the way these exert their disabling and distressing effect [41].

In other words, ACT does not aim to reduce pain symptoms, but to improve

functioning via targeted therapeutic processes. Here what was observed in our data suggested that to foster SAC in people with chronic pain can potentially improve their mood and daily functioning without any direct impact on pain intensity.

While SAD significantly improved with a small effect after the treatment, SAO did not improve significantly. Although not expected, this finding is perhaps not surprising. Again, SAC is not a process that naturally emerges in an ordinary language environment. In a study of behavioural measurement of self and rules [42], semi-structured interviews were conducted to facilitate participants talking about one's experiences from their own point of view. Behaviours related to self and rules were then identified and their occurrences calculated. SAC was only presented in 2% of the sentences, while another self process, namely self-as-story (i.e. conceptualization of the self), was presented in 7% of the sentences. SAO might be a dimension of SAC that is particularly difficult to foster and assess. Perhaps more intensive treatment targeting SAO is required to create an impact on this process. For instance, in the interdisciplinary pain management programme, exercises aimed at fostering SAC were introduced during group sessions. It is possible that additional individual sessions on SAC would help some participants enhance this particular aspect of PF; these may enable greater opportunity to examine patterns of personally relevant responding to self experiences that may be difficult to identify in a group context. Furthermore, greater linking and repetition of SAC-promoting strategies with processes that tend to be introduced earlier in treatment, such as openness and values, might further build and reinforce this capacity.

It is also possible that the SAO subscale is not sensitive enough to detect the change in this dimension of SAC. Further validation and refinement of the measure in different samples are needed, including investigation of the SAC in non-clinical samples,[43] while other assessment methods for SAC should be explored. Nonetheless, SAC as measured by the SEQ-8 total score, and SAD significantly improved after the treatment, and the improvements were significantly correlated with improvements in outcome variables. This indicates the responsiveness of the SEQ-8 to detect change in SAC.

It ought to be noted that this investigation of SAC adopted a mid-level-term approach to self, thus it is difficult to delineate the role of each dimension of the self, or to strictly interpret the findings within an RFT framework of self.   Further experimental studies with fine-grained investigations on these deictic relations [38] are needed to help bridge the mid-level-term approach to the self and the RFT account of language and cognition. Such experiments will enable a fundamental understanding of the relative role of each dimension of sense of self in relation to different aspects of functioning. More comprehensive measurement of self is also needed to further our understanding of sense of self and its impact on functioning and wellbeing. For instance, Moran et al. [44] investigated the three-selves (self-as-content, self-as-process, and self-as-context) [10, 37] in relation to wellbeing in adolescents, through combining several measures to reflect all three dimensions of self. All three selves were found to predict wellbeing in adolescents. This investigation provided preliminary evidence on the role of the three selves in health and wellbeing. Yet future studies on comprehensive, specific, yet brief measures of

the self are needed for investigations of the self. Further research on other forms of measurements of self, such as behavioural measurement, are needed to better understand the role of sense of self in people with chronic pain.

Naturally, this study has its limitations. First and foremost, the single group design of the study limited our ability to infer direction of influence in the relations between SAC, other PF process variables and outcome variables. Future studies with experimental design are needed to understand the impact of ACT on SAC, and its association with functioning. Secondly, SAC was only measured twice, before and after the treatment. The data only reflected a snapshot of SAC over the course of treatment, which limited our ability to infer stable change in SAC over time. Intensive longitudinal assessment methods are needed for a more nuanced understanding of the pattern of change of SAC over time. The availability of this newly validated SEQ-8 could provide the opportunity for such investigation.

Thirdly, the bi-factor structure identified in a previous validation study of the SEQ in people with fibromyalgia[15] was not was not validated in the current study. In the current study, participants completed questionnaires in clinic with assistance when needed, while in the previous study data was collected through online survey. Again, SAC is a process that does not appear in an ordinary language environment. Therefore, some assistance may be needed for accurate assessment, especially before treatment/training. However, facilitated by the development in technology and as a result of the impact of the COVID-19 pandemic, remote assessments may be more common moving forward, and questionnaires such as the SEQ-8 can be

readily delivered through online survey. In such context, more detailed guidance for completing the SEQ-8, being developed based-on relevant clinical experience, could improve the assistance for patients and consequently the accuracy of the reporting. Nevertheless, the in-clinic assistance available in the current study may have led to improved accuracy in assessment. In addition, the two-factor structure identified in the baseline data was also validated in the post-treatment data in the current study. Finally, while this self-report measure of SAC can facilitate clinical investigation of self, it is subject to common concerns over self-report measurement such as social desirability bias. Again, other forms of measurements of self, such as the behavioural measurement developed by Atkins et al.[42], are also needed to further our understanding of sense of self, and its association with functioning and wellbeing.

Conclusions

One's sense of self has long been argued to be central to human health and well-being, and it features centrally in ACT and psychological flexibility processes [45]. There has been some empirical evidence supporting the role of sense of self as conceptualised in ACT and the PF model. Further studies including an experimental design and intensive measurements are needed to understand the role of sense of self in health and wellbeing. The current data support the potential reliability and validity of the SEQ-8 to measure SAC. The availability of this measure can facilitate further investigation of sense of self.

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Table 1 The Demographics of the Participants.

		Mean (SD) or N (%)
Gender	Women	380 (79.7%)
	Men	97 (20.3%)
Age (years)		47.61(13.38)
Ethnicity	White	344 (73.3%)
	Black	62 (13.2%)
	Asian	33 (7.0%)
	Mixed/Other	30 (6.4%)
Years of education		13.45 (3.5)
Work status	Unemployed due to pain	250 (54%)
	Employed part-time due to pain	60 (13%)
	Retired	55 (11.9%)
	Employed full time	45 (9.7%)
	Unemployed due to other reasons	13 (2.8%)
	Homemaker	12 (2.6%)
	Employed part-time due to other reasons	11 (2.4%)
	Unpaid volunteer	7 (1.5%)
	Student/trainee	5 (1.1%)
	Student/trainee part-time due to pain	2 (.4%)
	Carer	2 (.4%)
Pain Duration (years)		Median= 10 (range: .83-78.5)
Primary pain location	Lower back/spine	186 (42.3%)
	Widespread	83 (18.9%)
	Lower limbs	54 (12.3%)
	Neck region	31 (7.0%)
	Upper shoulder/limbs	23 (5.2%)
	Head, face or mouth	20 (4.5%)
	Abdominal region	18 (4.1%)
	Pelvic region	10 (2.3%)
	Chest region	5 (1.1%)

Table 2. Goodness of model fit for each model tested in confirmatory factor

analyses.

Model	Number of Items		X^2	df	p	TLI	CFI	RMSEA
A	15	Bi-factor	330.63	75	<.000	.90	.93	.10
B	15	Two-factor correlated	663.50	89	<.000	.81	.84	.14
C	11	Two-factor correlated (item6,7, 9,10 removed)	190.14	43	<.000	.92	.93	.09
D	10	Two-factor correlated (additional item12 removed)	119.30	34	<.000	.94	.96	.09
E	8	Two-factor correlated (additional item8,4 removed)	46.27	19	<.000	.98	.98	.06
E	8	Post-treatment (N=352)	54.48	19	<.000	.98	.98	.07

Note. TLI: Tucker–Lewis Index; CFI: comparative fit index; RMSEA: root mean square error of approximation.

Table 3 Loadings of the selected 8 SEQ items onto each factor in the final model

(Model G) at baseline and post-treatment.

Items		Standardized regression weights			
		Baseline		Post-treatment	
		SAD	SAO	SAD	SAO
1	Although I can get caught up with my own thoughts, emotions and sensations, I can also separate myself from them	.78		.85	
2	I am able to step back from my emotions and observe them from a separate point of view	.88		.94	
3	I am able to separate myself from my thoughts and feelings	.84		.91	
5	I can experience a distinction between my experiences and the "I" who notices these experiences	.75		.79	
11	Above all my experiences, there is a sense of myself who is noticing them		.76		.85
13	I can observe experiences in my body and mind as events that come and go		.82		.83
14	I am able to remain aware of my experiences from moment to moment		.83		.85
15	My roles change depending on time, place and setting, but the sense of myself who has the roles stays the same		.77		.71

Note. SAD: Self-as-Distinction; SAO: Self-as-Observer.

Table 4 The reliabilities of the subscales and the total scale of the 8-item SEQ.

	Cronbach's α	N
Self as Distinction (total scores from subscale)	.87	397
Self as Observer (total scores from subscale)	.86	404
Self as Context (total scores from all eight items)	.90	376

Table 5 Pearson's correlations between scores from the SEQ-8 and measures of Psychological Flexibility processes and outcomes at baseline.

	Psychological Flexibility processes			Outcomes			
	Pain acceptance	Cognitive fusion	Committed action	Pain	Pain interference	Work and Social functioning	Depression
SAD	.41***	-.46***	.52***	-.09*	-.21***	-.14**	-.31***
SAO	.22***	-.25***	.39***	-.01	-.16**	-.15**	-.24***
SAC	.36***	-.40***	.51***	-.06	-.22***	-.16***	-.30***

Note. N=441-458. *$p<.05$** $p<.01$, *** $p<.001$. SAD: Self-as-Distinction; SAO: Self-as-Observer; SAC: Self-as-Context.

Table 6 The changes in scores from the SEQ-8 from baseline to post-treatment

	Baseline		Post-treatment					
	M	SD	M	SD	*t*	*df*	*d*	*p*
Self-as-Distinction	10.95	5.33	12.04	4.97	-4.23	387	-0.21	<.001
Self-as-Observer	13.61	5.26	13.97	4.81	-1.38	379	-0.07	.167
Self-as-Context (All 8 items)	24.52	9.51	25.93	9.08	-3.22	388	-0.15	.001

Table 7 Correlations between changes in SEQ-8 scores and changes in outcome measures.

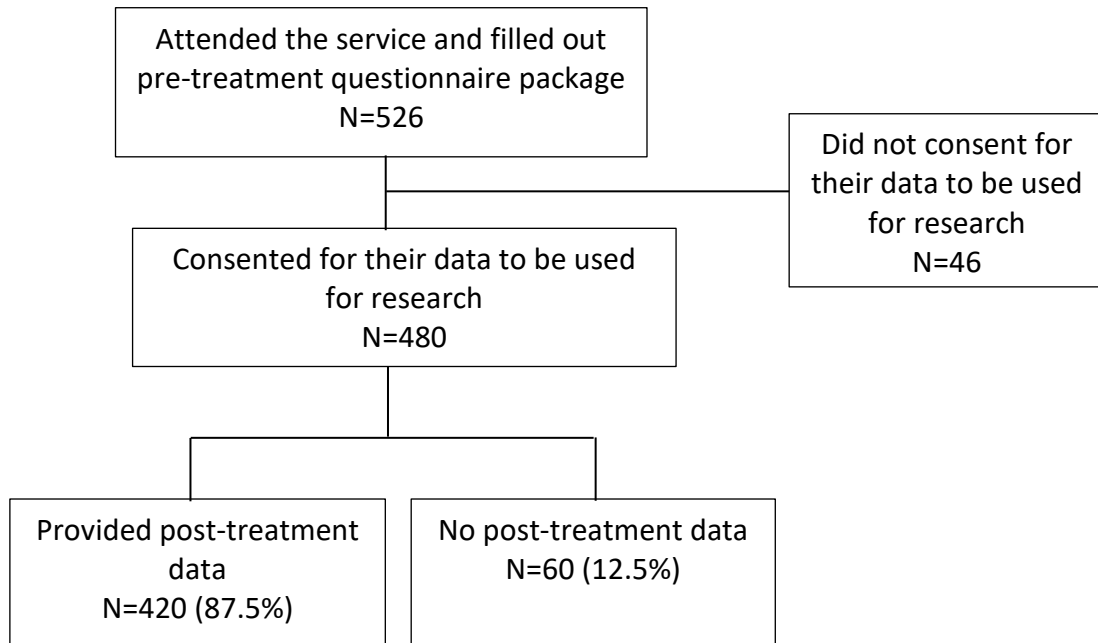|	Pain	Pain interference	Work and social adjustment	Depression
Self-as-distinction	-.09	.52***	.42***	.52***
Self-as-Observer	-.05	.37***	.50***	.47***
Self-as-Context (All 8 items)	-.07	.51***	.53***	.57***

Note. N=387-389. *** *p*<.001.

Figure 1 Flowchart of data collection process

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Figure 1. Flowchart of data collection process