Observational Studies

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COVID-19 and processes of adjustment in people with persistent pain: the role of psychological flexibility

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Abstract

Objectives: The purpose of the current study was to investigate facets of Psychological Flexibility (PF) and Psychological Inflexibility (PI) and their relations with depression, anxiety, and insomnia in people with chronic pain during the COVID-19 pandemic. It was predicted that the full set of facets would significantly predict all three outcomes. The relative contributions of differing facets and dimensions was explored.

Methods: Participants with pain were selected from a sample of 1,657 Swedish adults responding to an online survey of health and COVID-19. Persistent pain was defined as pain on most days, present for three months or more. A total of 560, 33.8% of the total sample, were included in the analyses. Standardized and validated measures were used to measure depression, anxiety, and insomnia, and the Multidimensional Psychological Flexibility Inventory (MPFI) was used to measure both PF and PI.

Results: Significant rates of depression, anxiety, and insomnia, at 43.1, 26.4, and 64.2%, respectively, were found in this sample. These rates appear higher than those found in a general sample in Sweden. PF was negatively associated with these problems while PI was positively associated with them. Better prediction of outcome was obtained by PI compared to PF.

Conclusions: PF and especially PI appear to have played a role in relation to health outcomes in people with persistent pain during the COVID-19 pandemic. This group of people appears to have been especially vulnerable to the impacts of the pandemic. This study motivates further investigation and development of treatment approaches, possibly focusing on training PF, for people with persistent pain in the current pandemic context and in the future.

Keywords: COVID-19; Chronic pain; Depression; Anxiety; Insomnia; Psychological flexibility.

Introduction

The appearance of COVID-19 has had a large and continuing impact on people's lives [1]. This is particularly true for those in vulnerable circumstances, those with chronic health conditions, or already suffering restrictions in functioning [2], including those with chronic pain [3, 4]. It is apparent that the unprecedented circumstances of the COVID-19 pandemic will require new research directions and clinical approaches to address current priorities, future needs of those affected now, and to prepare for future pandemics [5, 6]. Because people with chronic pain appear to have been particularly affected, these priorities hold especially true for them [7–9].

Given that the COVID-19 pandemic remains recent history, the number of studies of related health impacts in people with chronic pain is remarkable. This includes studies conducted in Spain [10, 11] Canada [8, 12], the United Kingdom (UK) [3, 9] and the United States [13], to name a few. Quite consistently these studies document relatively poor health and functioning during the pandemic in the context of chronic pain and recommend better solutions to support people with chronic pain to improve their health and well-being. This is not to say that all people with chronic pain deteriorated in their health during the pandemic. Some will have clearly stayed the same, or even improved, in each of these cited studies, likely as a result of protective factors.

A set of psychological processes that might afford protection or facilitate recovery from the pandemic are those associated with psychological flexibility (PF) [14]. The PF model includes six facets: acceptance, cognitive defusion, contact with the present, self-as-context, values-based action, and committed action. These essentially entail, in

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turn, the ability to act with openness to unwanted experiences, without being adversely dominated by misleading thoughts, to be flexibly and purposely aware, to see experiences from a separate non-attached perspective, and know what one wants to do and how, and to build those actions into wider persisting patterns of behavior [14]. Psychological inflexibility (PI) facets, on the other hand, represent the opposing end of these dimensions or a lack of skills to do these things. Many of the PF and PI facets have been studied and applied in treatment for chronic pain outside of the context of COVID-19 [15] and have been recommended for application in this context [7].

In an earlier study conducted in the UK (n=555) three facets of PF, acceptance, self-as-context, and committed action, were examined and were shown to significantly correlate with depression, pain-related disability, and work and social adjustment [9]. Particularly acceptance and committed action made significant unique contributions in prediction of all outcomes, in multivariate prediction equations that included a wide array of background, pain-related, and COVID-19-related variables. No study has so far replicated these findings or investigated the full set of PF and PI factors in people with chronic pain during the time of COVID-19.

The purpose of the current study was to investigate the full range of six PF facets and six PI facets and their respective relations with depression, anxiety, and insomnia in people with chronic pain during the COVID-19 pandemic. We predicted that the full set of facets would significantly predict all three outcomes. We also explore the relative contributions of differing facets and overall PF and PI dimensions themselves without specific predictions regarding which would dominate.

Methods

The data for this study were collected in Sweden between 29st June to 23rd August 2021. It may be remembered that Sweden took a liberal approach to the pandemic at this time, without people being restricted to their homes, or facing other restrictions implemented in other countries. Most businesses remained open, but specialty pain services closed, many people chose to work from home, and face masks were used some of the time, particularly in health care settings. Participants were recruited via social media and through a regional healthcare website for a survey related to experiences of COVID-19 and health. All data were collected via online self-report. The study had ethics approval (Swedish national ethical board, dnr 2021-01647) and all participants provided consent. The analyses presented here are secondary analyses following the completion of primary planned analyses of depression, anxiety, and insomnia in Sweden 18 months after the start of the pandemic [16, 17]. These earlier studies did not focus at all on the subset of participants with persistent pain, and it was a pre-planned secondary study to specifically examine the health and potential health protective factors in this potentially vulnerable population.

Participants

The analyses presented here are based on selected survey participants with persistent pain. Persistent pain is defined here as pain on most days each month, present for three months or more, and rated at least 3 in the past week on a scale from 0 to 10. Participants with pain were selected from a total sample of 1,657 Swedish adults responding to the survey invitation. A total of 633, 38.2% of the total sample, reported the presence of pain for three months or longer. After removing those with low ratings of average pain in the last week and retaining only those with a rating of three or higher, 560, 33.8% of the total sample, remained and were included in the final analyses. Table 1 includes basic characteristics of the sample.

Measures

All participants provided information about their general background (see items included in Table 1). They responded to several questions about pain persistence and areas of pain in the body, and they were asked to rate their average level of pain in the past week from “no pain” to “worst pain imaginable,” rated 0 to 10. All of the main data analyzed were derived from well-known, standardized, and validated measure of depression, anxiety, sleep, and psychological flexibility and inflexibility, including the Patient Health Questionnarie-9 (PHQ-9) [18] to measure depression, the Generalized Anxiety Disorder-7 (GAD-7) [19] to measure anxiety, the Insomnia Severity Inventory (ISI) [20] to measure insomnia, and the Multidimensional Psychological Flexibility Inventory (MPFI) [21] to measure both PF and PI. The range of possible scores for the PHQ-9, GAD-7, and ISI was 0–27, 0 to 21, and 0 to 28, respectively, and the cutoff used for each to mark a significant problem was 10. We note that the study did not include pain-specific measures of functioning because the measures were chosen for the primary study of the general population in Sweden, and adding additional measures for the whole sample would have been unnecessarily burdensome. There were a total of 17 standardized scales, subscales, or dimensions included in the current analyses. Cronbach’s alpha for all of these was calculated in the current data. The values ranged from α=0.84 for the acceptance scale of the MPFI to α=0.96 for the fusion scale. All other values fell between these and all were clearly satisfactory.

Analyses

After the data were checked for outliers and normality, three primary sets of analyses were conducted. First, scores for the PHQ-9, GAD-7, and ISI were calculated to determine the proportions of participants screening positive for depression, anxiety, and insomnia. Next correlations were calculated looking at both all background variables (see Table 1) and PF and PI scores in relation to depression, anxiety, and insomnia. Finally, hierarchical multiple regression analyses were conducted to examine unique and overlapping associations with depression, anxiety, and insomnia based on equations constructed with relevant background variables (those obtaining significant correlations in the previous analyses), including COVID-19 status, and pain scores, and the full set of facets from the MPFI, looking first at the PF facets, in one model, and then the PI facets, in a separate model. Generally, $p<0.01$

Table 1: Sample characteristics (n=560).

Age	**SD**	**M**
	48.7	**11.7**
	n	**%**
Gender		
Women	522	93.2
Men	35	63
Non-binary	3	0.5
Country of origin		
Sweden	492	87.9
Other Scandinavian country	18	3.2
Other European country	37	6.6
Other	13	2.4
Education		
Less than secondary school	16	2.3
Secondary	248	44.3
University	276	49.3
Post university	20	3.6
Relationship status		
Single	95	170
Married or in a relationship	400	71.5
Separated/divorced/widowed	65	11.6
Work status		
Working part time	105	18.8
Working full time	314	56.1
Retired	51	9.1
Sick leave	44	79
Student	18	3.2
Other	28	5.0
Financial status		
Below average	104	18.6
Average	270	482
Above average	186	33.3
COVID-19 status		
Confirmed diagnosis	220	39.4
Assumed diagnosis	106	19.0
Not infected	233	41.7
Pain areas (not mutually exclusive)		
Low back	192	34.3
Shoulder/upper limbs	182	32.5
Neck	161	28.7
Head/face	141	25.3
Lower limbs	108	19.3
Whole body	95	17.0

is used here to signify statistical significance due to the relatively large sample size and large number of analyses conducted. Correlations are interpreted as small, r>0.10, medium, r>0.30, and large, r>0.50 [22].

Results

Mean and standard deviation values for the PHQ-9, GAD-7, and ISI were M=9.3, SD=6.3, M=6.8, SD=5.3, and M=12.5, SD=6.6, respectively. According to standard cutoff value of 10 for each of these, the percentages of participants with significant depression, anxiety, and insomnia were 43.1, 26.4, and 64.2%, respectively.

Correlation analyses

A series of correlations were calculated involving background variables with depression, anxiety and insomnia. Here categorical variables were dichotomized into interpretable and typically evenly-split categories. Despite the large sample size, most background variables were not correlated with the outcome variables at a level that was small or higher. Exceptions included age, which correlated with depression and anxiety at $r=-0.24$, $p<0.001$ and $r=-0.32$, $p<0.001$, respectively, and being unemployed, again with depression, anxiety, and insomnia, $r = 0.21$, $p<0.001$, $r = 0.16$, $p<0.001$, and $r = 0.19$, $p<0.001$, respectively. Somewhat more marginal relations were obtained for self-rated financial status, with those rating themselves as “well off” or “very well off” also significantly correlated with depression and anxiety, $r=-0.13$, $p<0.01$., $r=-0.11$, $p<0.05$. Similarly, having been COVID-19 positive was correlated with depression and anxiety, $r=0.18$, $p<0.001$, $r=0.10$, $p<0.05$. The health outcome variables were uncorrelated with education, relationship status, or gender.

Table 2 includes the results of correlation analyses involving depression, anxiety, insomnia, and pain, with all of the scores derived from the MPFI. Overall, pain was significantly but weakly associated with each of depression, anxiety and insomnia, and was mainly uncorrelated with MPFI scores. It is strongest correlation with the latter, small in magnitude, was with the inflexibility composite score. The flexibility composite score demonstrated small to medium correlations with depression, anxiety, and insomnia, while the inflexibility score demonstrated large correlations with depression and anxiety and a medium correlation with insomnia. Flexibility facets including defusion, self-as-

Table 2: Correlation analyses of depression, anxiety, and insomnia with facets and dimensions of psychological flexibility and inflexibility.

	Depression	Anxiety	Insomnia	Pain (0–10)
Pain (0–10)	0.26[b]	0.19[b]	0.28[b]	–
MPFI scales				
Acceptance	−0.02	−0.03	−0.05	−0.03
Defusion	−0.44[b]	−0.47[b]	−0.31[b]	−0.10
Awareness	−0.09	−0.11	−0.09	−0.07
Self/context	−0.24[b]	−0.29[b]	−0.23[b]	−0.06
Values	−0.29[b]	−0.29[b]	−0.24[a]	−0.03
Commit/act	−0.37[b]	−0.35[b]	−0.27[b]	−0.05
Avoidance	0.11	0.11	0.11	0.08
Fusion	0.61[b]	0.64[b]	0.42[b]	0.14[a]
Lack contact	0.26[b]	0.21[b]	0.25[b]	0.11
Self/content	0.52[b]	0.53[b]	0.34[b]	0.15[a]
Lack values	0.52[b]	0.51[b]	0.38[b]	0.09
Inaction	0.58[b]	0.57[b]	0.39[b]	0.10
Flexibility	−0.29[b]	−0.32[b]	−0.25[b]	−0.08
Inflexibility	0.62[b]	0.62[b]	0.45[b]	0.16[b]

The six scales of the MPFI listed first represent the psychological flexibility facets. The second set of six scales represent the psychological inflexibility facets. The two rows at the bottom of the table represent the overall summary dimensions of flexibility and inflexibility, including six facets each. [a]p<0.01, [b]p<0.001.

context, values, and committed action correlated at a small to medium level with the three primary outcomes, while acceptance and awareness did not correlate with them at all. For the inflexibility facets, large correlations with depression and anxiety were demonstrated for cognitive fusion, self-as-content, lack of values, and inaction. Correlations with insomnia were generally small to medium. Lack of contact correlated at a small level with depression, anxiety, and insomnia, and avoidance correlated with none of the outcomes. The correlation between the flexibility and inflexibility dimension scores was r=−0.39, p<0.001.

Regression analyses

In regression analyses of depression, anxiety, and insomnia, the entry of predictor variables was done hierarchically, starting with age, unemployment, and self-rated financial status in as the first block as these significantly correlated with the health outcome variables. Next COVID-19 infection status was entered, and then pain severity, to statistically control for the role of these variables in the analyses. Finally, the PF facets were entered as a final block in the first set of the of analyses, and then in a second set of analyses the PI facets were entered as a final block in the same way. Regression results are included in Tables 3 and 4.

Table 3 includes the analyses of PF. In these analyses, the PF facets as a block contribute significant increments in explained variance for each health outcome, at 17, 17 and 8% for depression, anxiety, and insomnia, which were the largest increments obtained from any block of predictors. In all three equations, cognitive defusion obtained significant regression coefficients that were among the largest of all coefficients obtained in the three equations. Committed action also obtained a significant regression coefficient for depression and there was a trend for anxiety at p<0.05. Finally, self-as-context also had a significant coefficient in the equation for depression. No other facet obtained any significant coefficients.

Table 4 includes the regression results with respect to PI facets. Generally speaking the variance accounted for by the PI facets was twice as much as that accounted for by the PF facets, at 32, 35, and 16% for depression, anxiety, and insomnia. Once again these were the largest increments obtained in explained variance from among all blocks of predictors entered. Cognitive fusion performed well as an individual facet, obtaining significant regression coefficients across the board. Self-as-content also performed well as an individual unique predictor with significant coefficients in the equations for depression and anxiety. And finally, the coefficient for inaction was significant in the equation for depression. No other facets were significant individual predictors. The total variance accounted for in the equations constructed with the PI facets was 51, 51, and 28% for depression, anxiety, and insomnia, respectively.

Discussion

While there have been many studies of the experience of COVID-19 in relation to people's health and wellbeing, there are relatively few that have focused specifically on pain as was the main purpose of the current study. In this survey study conducted in Sweden during the summer of 2021 we show first that 38.2% of unselected participants reported pain most days in the past three months and 33.8% reported significant persistent pain, which included pain rated at a three out of 10 or higher in the past week. In the selected sample of people with significant persistent pain we found significant rates of depression, anxiety, and insomnia, at 43.1, 26.4, and 64.2%, respectively. In turn we showed that PF was negatively associated with these problems while PI was positively associated with them.

The rates for depression, anxiety, and insomnia found here are substantially higher than levels previously found in a general sample of Sweden [2] and in the larger sample from which these data were selected, where the rates were 27, 16,

Table 3: Regression analyses of depression, anxiety, and insomnia showing the role of psychological flexibility.

		Dependent variables					
		Depression		Anxiety		Insomnia	
Block	Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β
1	Background	0.10		0.13[b]		0.043[b]	
	Age		−0.14[c]		−0.22[b]		−0.018
	Unemployed		0.098		0.052		0.11
	Finances above average		−0.040		−0.032		0.003
2	COVID infection	0.031[b]	0.17[b]	0.008	0.079	0.013	0.11
3	Pain (0–10)	0.049[b]	0.21[b]	0.027[b]	0.14[b]	0.061[b]	0.24[b]
4	Psychological flexibility	0.17[b]		0.17[b]		0.080[b]	
	Acceptance		0.10		0.12		0.026
	Defusion		−0.41[b]		−0.44[b]		−0.22[b]
	Awareness		0.070		0.044		0.10
	Self/context		0.18[a]		0.069		0.010
	Values		0.050		0.088		−0.061
	Commit/act		−0.27[b]		−0.19		−0.096
	Total R^2	0.35[b]		0.33[b]		0.20[b]	

Beta is from final equation. [a]p<0.01; [b]p<0.001.

Table 4: Regression analyses of depression, anxiety, and insomnia showing the role of psychological inflexibility.

		Dependent variables					
		Depression		Anxiety		Insomnia	
Block	Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β
1	Background	0.10[b]		0.13[b]		0.043[b]	
	Age		−0.10[a]		−0.18		0.002
	Unemployed		0.086		0.033		0.098
	Finances above average		−0.029		−0.014		0.007
2	COVID infection	0.031[b]	0.18[b]	0.008	0.10[a]	0.013	0.10
3	Pain (0–10)	0.049[b]	0.16[b]	0.027[b]	0.10[a]	0.061[b]	0.20[b]
4	Psychological inflexibility	0.32[b]		0.35[b]		0.16[b]	
	Avoidance		0.019		0.030		0.039
	Fusion		0.24[b]		0.34[b]		0.21[a]
	Lack contact		−0.038		−0.092		0.056
	Self/content		0.15[a]		0.14[a]		0.035
	Lack values		0.10		0.14		0.12
	Inaction		0.21[a]		0.12		0.061
	Total R^2	0.51[b]		0.51[b]		0.28[b]	

Beta is from final equation. [a]p<0.01; [b]p<0.001.

and 45% [16]. This suggests a particular vulnerability toward impacts on wellbeing in those with persistent pain during the COVID-19 pandemic.

It is notable to see that pain severity itself obtained small correlations with the health outcomes here, none higher than r=0.28. On the other hand, the overall flexibility dimension score correlated at a similar or higher level with outcomes while the inflexibility score clearly surpassed pain as a correlate with these outcomes. Multiple facets of PF and PI achieved medium or large correlations, especially with depression and anxiety. For insomnia the PI facets reached this level but the PF facets did not. These results seem to show that it is not just the pain itself that leads to difficultly but rather the combination of pain and the context of the individual's capacity to respond with flexibility or inflexibility to whatever difficulties life presents. The demonstrated potential role of PF and PI in relation to health outcomes during the pandemic is consistent with a previous

study in people with chronic pain in the UK [9] and large prospective general population studies in the UK [23] and Italy [24].

Results of the regression analyses once again demonstrate the superiority of PF and PI facets in predicting health outcomes, beyond contributions of background, pain, and even COVID-19 infection. The PF facets accounted for significant variance in depression, anxiety, and insomnia, 17, 17, and 8%, respectively. For the PI facets variance accounted for was significantly greater for these outcomes, 32, 35, and 16%, respectively. The greater variance accounted for by PI is consistent with findings from other studies during the pandemic in a general population, using the same measure [24]. As well as highlighting the greater prediction entailed by the PI facets, particular facets that make strong unique contributions in explained variances included cognitive defusion from among the PF facets, and cognitive fusion and self as content among the PI facets. These results reinforce the well-known role of thoughts and beliefs in human suffering and behavior problems, and highlight a particularly functional contextual way to consider these. According to the processes highlighted, it is both what we think AND how we respond to what we think that matters.

A particularly notable result here is the much better prediction of outcome obtained by PI rather than PF. In some ways this is also consistent with a long history in psychology and chronic pain where "negative" variables such as catastrophizing and fear and avoidance have always performed well in studies while the list of positive variables that achieve a similar status has always been small [25]. We speculate that there may be at least two different reasons for superiority of PI here. One is that the outcomes are negatively framed and so this might create the greater association with the negatively framed PI variables. Second, it may be that the negative instances of behavior patterns and related problems may simply be more salient and assessible than the, in some ways, more subtle aspects of openness, awareness, and engagement. Unless one is aware or is clear on their values, for example, it is difficult to report on how aware one is or how well one is following one's values.

There are several limitations in the methods of this study. This study employed online and social media-based recruitment methods. This is therefore a selected sample that excludes all those who cannot be recruited this way. The sample is mainly women and well-educated. It is also the case that we cannot independently verify any of the information respondents provide. Because the study was first designed as a study of COVID-19 in Sweden and only secondarily as a study of those with persistent pain, we were limited in gathering some of the information that one might be used to see in pain studies. This is not a clinical sample. We did not collect information on medication or diagnoses per se. Although we defined persistent pain in a conventional way, and even excluded from our analyses those with low levels of pain, we do not know the history of the persistent pain, nor how many precisely had persistent pain that preceded the pandemic and was not brought on in some way by COVID-19 or the pandemic circumstances. So, the population is clearly those with significant persistent pain now, not only those with pre-existing persistent pain. Other standard caveats apply. We note that the results in the regression models in particular are vulnerable to influence of variables selected for inclusion as well as characteristics of the current sample, and should be replicated. These are one-time cross-sectional observation data and we cannot claim direction of relations or cause and effect. Longitudinal and treatment outcome studies are recommended [e.g., 23, 24]. Likewise, we have no pre-pandemic data on the same people so we cannot call the results a change or claim that results represent a direct effect of the pandemic.

In summary, PF and especially PI may play a role in relation to health outcomes in people with persistent pain during the COVID-19 pandemic. This is relevant as this group of people appears to be especially vulnerable to the impacts of the pandemic. This study should motivate further investigation and development of treatment approaches, possibly focusing on training PF, for people with persistent pain in the current pandemic context and for the future.

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Informed consent: Informed consent has been obtained from all individuals included in this study.

Ethical approval: The research reported here complied with all relevant national regulations, institutional policies and is in accordance with the tenets of the Helsinki Declaration (as amended in 2013), and has been approved by Swedish National Ethical Board (dnr 2021-01647).

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