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The contribution of psychological flexibility to functioning in people living with cancer-related pain

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Abstract

Background: Studies of individuals with non-cancer-related chronic pain find that higher levels of psychological flexibility (PF) are associated with less distress, better functioning, and a better response to treatment. People diagnosed with cancer are at a significantly increased risk of developing chronic cancer-related pain, the presence of which is associated with poorer health outcomes. Little is known about whether PF is applicable to cancer pain. The current study investigates the relationship between chronic cancer-related pain, distress and functioning, and three theoretical processes proposed by the PF model: pain acceptance, present-moment focus, and committed action.

Methods: Adults ($n = 246$) with a cancer diagnosis (current or previous), and living in Sweden, completed an online survey involving standardized measures of cancer-related pain (intensity and impairment), depression, fatigue, PF and social stigma.

Results: Moderate to strong correlations were found between PF and all variables. In regression analyses, PF, and particularly pain acceptance, accounted for a large and significant proportion of the observed variance in depression, pain-related and overall functioning, after controlling for cancer status, pain intensity and social stigma.

Conclusion: Consistent with studies of non-cancer-related pain, higher levels of PF were strongly associated with lower levels of distress and better functioning in individuals with cancer-related pain. Further studies are needed to further explore these relationships and to determine whether psychosocial treatments targeting PF may be of benefit to people with chronic cancer-related pain.

Significance: This study explores the relationship between cancer-related pain (intensity and impairment), depression, fatigue, overall functioning, social stigma and PF. The findings suggest that higher levels of PF are associated with lower levels of distress and improved functioning in chronic cancer-related pain, after controlling for cancer status (current, in remission), pain intensity and social stigma.

1 | INTRODUCTION

A meta-analysis found that 55% of those in cancer treatment and 39.5% of all cancer survivors suffer from chronic cancer-related pain (van den Beuken-van Everdingen et al., 2016), defined as persistent or recurrent pain lasting longer than 3 months and caused by primary cancer itself, metastases, or treatment (Bennett et al., 2019). Chronic cancer-related pain is in turn associated with an increased risk of fatigue, depression, anxiety, being unable to work and needing assistance with activities of daily living (Bower, 2014; Fitzgerald et al., 2013; Galloway et al., 2012; Sanford et al., 2019). Relatively little is known about what (if any) psychological factors may help to mitigate the negative effects of chronic cancer-related pain upon overall functioning. Previous studies have found modest associations between coping style broadly, pain catastrophizing and social support (amongst other variables) and levels of distress/functioning in individuals with acute and chronic cancer-related pain (e.g. Meints & Edwards, 2018).

Psychological flexibility (PF) is the ability to openly experience unwanted thoughts, feelings and sensations, to consciously and flexibly focus awareness and to change or persist in behaviours in the service of goals guided by one's values (Hayes et al., 2011). These qualities are sometimes described as reflected in behaviour that is 'open, aware, and active' (Hayes et al., 2011). In respect of individuals with non-cancer-related chronic pain, there is a large body of evidence which finds moderately strong associations between PF, well-being and overall functioning (e.g. Åkerblom et al., 2021; Baranoff et al., 2013; Gentili et al., 2019; McCracken & Gutiérrez-Martínez, 2011; Vowles et al., 2014; Wicksell et al., 2010). Acceptance and commitment therapy (ACT), a therapeutic intervention based on and targeting PF, has been shown to be an effective treatment for non-cancer-related chronic pain (Hann & McCracken, 2014; Hughes et al., 2017; Veehof et al., 2016) with treatment outcomes partially mediated by changes in the processes specified within the PF model (Åkerblom et al., 2016, 2021; Cederberg et al., 2016; Scott et al., 2016; Vowles et al., 2014; Wicksell et al., 2010). Thus, PF is increasingly recognized as playing a pivotal role in the adjustment to non-cancer-related chronic pain (McCracken et al., 2022). However, little is known about the role of PF in the well-being and functioning of people with chronic cancer-related pain. Two systematic reviews provide preliminary support for the effectiveness of ACT for psychological (depression, anxiety, fear of cancer recurrence) and physical distress (pain, fatigue) in people with cancer, and note that pain outcomes are understudied (Mathew et al., 2021; Zhao et al., 2021).

Another process associated with poorer physical and psychological well-being in cancer patients and patients with chronic pain is a social stigma (De Ruddere & Craig, 2016; Huang et al., 2021). Cancer patients with chronic pain may be at particular risk for the negative effects of social stigma because they are living with two stigmatized conditions. This has been referred to in the literature as intersectional health-related stigma and is associated with poorer physical and mental health outcomes in individuals living with both HIV and chronic pain (Goodin et al., 2019). As with PF, the impact of social stigma on cancer-related pain outcomes remains poorly understood.

The present study aims to explore the relationships between PF, as indexed by pain acceptance ('open'), present moment focus ('aware'), and committed action ('active'), and chronic cancer-related pain (intensity and interference), depression, fatigue, quality of life and social stigma. We anticipate that these PF processes will be moderately correlated with, and account for a significant proportion of the variance in, pain-related impairment, depression, fatigue and quality of life, after controlling for pain intensity, social stigma, cancer status, and other relevant psychosocial factors. These outcomes were chosen as they are associated with the presence and severity of cancer-related pain (Bamonti et al., 2018; Escalante et al., 2018; Mantyh, 2006).

2 | METHODS

2.1 | Participants

Participants were 246 adults with a cancer diagnosis (current or previous) between the ages of 24 and 82 years ($M = 55.80$, SD = 11.66; 82.1% female) living in Sweden. The most commonly reported cancer was breast ($n = 102$, 41.5%), followed by gynaecological ($n = 31$, 12.6%) and lung cancers ($n = 28$, 12.4%). Additional information on cancer type and demographics is provided in Table 1. The majority of participants received their cancer diagnosis within the last 5 years of completing the survey, specifically: within the last 12 months ($n = 63$; 26.5%); last 1–5 years ($n = 111$; 46.6%); 5–10 years ago ($n = 45$; 18.9%); and >10 years ago ($n = 19$; 8%). Approximately half ($n = 124$, 50.4%) reported being in remission, 36.2% ($n = 89$) reported current cancer and 13.4% ($n = 33$) reported they did not know. Slightly more than half ($n = 135$, 54.9%) were not currently receiving cancer treatment, with the remainder reporting some form of treatment ($n = 108$ participants; 43.9%) or did not know ($n = 3$; 1.2%). The majority ($n = 180$; 73.2%) reported a history of chronic cancer-related pain, and these 140 (77.8%) were currently experiencing this pain.

TABLE 1 Demographic and medical information.

	N	%
Education		
Primary	9	3.7
Secondary	76	30.9
University	140	56.9
Other	21	8.5
Employment		
Employee (full time)	92	37.4
Employee (part-time)	29	11.8
Unemployed	6	2.4
Retired	66	26.8
Students	2	0.8
Sick leave	51	20.7
Civil status		
Single	57	23.2
Married/cohabitant	172	69.9
Divorced	15	6.1
Widow/widower	2	0.8
Cancer type		
Breast	102	41.5
Gynaecological	31	12.6
Lungs	28	11.4
Colon	19	7.7
Lymphoma	15	6.1
Pancreas	13	5.3
Prostate	12	4.9
Blood	12	4.9
Liver	7	2.8
Bones	7	2.8
Head	7	2.8
Skin	6	2.4
Bladder	3	1.2
Stomach	3	1.2
Kidney	3	1.2
Myeloma	2	0.8
Brain	2	0.8
Thyroid	2	0.8
Testicles	1	0.4
Other	4	1.6

2.2 | Procedures

Participants were recruited using convenience sampling, via a secure online platform, through Swedish cancer patient associations, the Swedish Cancer Foundation, and social media. The inclusion criteria were being aged 18 years or above, having a current or former cancer diagnosis, and having the ability to read and understand Swedish. Having cancer-related pain was not an inclusion criterion for the study as the study also included questions about whether participants were informed about the possibility of cancer-related pain and treatments for the same. However, potential participants were informed that a primary focus of the study was our interest in learning about their experience of cancer-related pain.

After reading information about the anonymous study and providing informed consent, participants were asked to provide demographic and medical information and to complete several standardized self-reported questionnaires (described below). It took an average of 30 min to complete the questionnaires, and participants were informed they could stop at any time and return to the questionnaires later. The study was approved by the Swedish Ethical Review Authority (dnr 2021-00499).

2.3 | Measures

2.3.1 | Pain intensity and pain interference

Pain intensity and interference were measured with items adapted from the Brief Pain Inventory (Cleeland & Ryan, 1994). Pain intensity over the past week (0 = no pain; 10 = worst possible pain) was assessed using the single-item Numerical Rating Scale (NRS). The NRS is widely used in pain research and has been found to be a valid measure of pain intensity and sensitive to changes in pain in different contexts (Ferreira-Valente et al., 2011). Pain interference (0 = no interference; 10 = interferes completely) was measured in relation to seven aspects of function over the past week: general activity, mood, walking ability, normal work, relations with other people, sleep and enjoyment of life. A pain interference score is calculated from the mean of the seven pain interference items. Internal reliability for the total pain interference score in this study was 0.88.

2.3.2 | Brief Fatigue Inventory (Mendoza et al., 1999)

The Brief Fatigue Inventory (BFI) is a 9-item, 11-point rating scale developed to assess subjective fatigue over the past 24 h. The first three questions measure fatigue severity (0 = no fatigue; 10 = as bad as you can imagine) at current, usual, and worst levels. Six questions then assess the level of fatigue-related interference (0 = no interference; 10 = completely interferes) in daily activities: general activity, mood, walking ability, normal work (both inside and outside the home), relations with other people

and enjoyment of life. A total fatigue score is calculated from the mean of the 9 items; higher scores correspond to greater fatigue (1–3 = mild; 4–7 = moderate; 8–10 = severe). High levels of internal reliability were found for the original (α = 0.96; Mendoza et al., 1999) and the Swedish language version used in this study (α = 0.89).

2.3.3 | Patient Health Questionnaire (PHQ-9; Kroenke et al., 2011)

The PHQ-9 is comprised of nine items assessing the frequency (0 = not at all; 3 = nearly every day) over the past 2 weeks of the nine DSM-IV symptoms for major depression (APA, 2000), and a single item assessing the impact of symptoms on functioning (not difficult at all, somewhat difficult, very difficult, extremely difficult). A total score is calculated (0–27) from the nine symptom items, with higher scores indicating greater depression severity (0–4 = none/minimal; 5–9 = mild; 10–14 = moderate; 15–19 = moderately severe; 20–27 = severe). High levels of internal reliability were found for the original (α = 0.90; Hansson et al., 2009) and the Swedish language version used in this study (α = 0.84).

2.3.4 | EuroQol Health Questionnaire (EQ-5D-5L; Herdman et al., 2011)

The EQ-5D is comprised of a descriptive system and a visual analogue scale (EQ VAS). The descriptive system assesses the degree of difficulties (1 = some problems; 2 = problems; 3 = extreme problems) along five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The responses are combined into a 5-digit number that describes the patient's health state and which is converted into a health index (EQ Index) based on the Swedish value set (Burström et al., 2014). The EQ VAS records the patient's self-rated health on a VAS, where the endpoints are labelled 'The best health you can imagine' (=0) and 'The worst health you can imagine' (=100).

2.3.5 | Chronic Pain Acceptance Questionnaire 8 (Fish et al., 2010)

The Chronic Pain Acceptance Questionnaire 8 (CPAQ-8) is comprised of eight items assessing pain acceptance (1 = never true; 7 = always true). A total score is calculated with higher scores reflecting greater pain acceptance. High levels of internal reliability have been found for the original (α = 0.80; Fish et al., 2010; Rovner et al., 2014) and Swedish-language version used in this study (α = 80).

2.3.6 | Five Facets Mindfulness Questionnaire (Baer et al., 2006)—Act with awareness subscale

The 8-item Act with Awareness subscale of the Five facets mindfulness questionnaire (FFMQ) measures the respondent's ability to attend to one's present moment activity, rather than being on 'autopilot', or behaving automatically, whilst attention is focused elsewhere (1 = never or very rarely true; 5 = very often or always true). A total score is calculated with higher scores indicating greater present moment focus. High levels of internal reliability have been found for the original (α = 0.82; Lilja et al., 2011) and the Swedish language version used in this study (α = 0.96).

2.3.7 | Committed Action Questionnaire (CAQ-8; McCracken et al., 2015)

The CAQ-8 is comprised of eight statements assessing the degree of flexible persistence, or committed action, in the pursuit of one's goals (0 = never true; 6 = always true). Four statements are negatively worded and reverse-scored. A total score is calculated with higher scores indicating greater levels of committed action. High levels of internal reliability have been found for the original (α = 0.89; Åkerblom et al., 2016; McCracken et al., 2015) and the Swedish language version used in this study was (α = 0.78).

2.3.8 | Stigma Scale for Chronic Illnesses-Short Form (SSCI-8; Molina et al., 2013)

The SSCI-8 is comprised of eight items assessing enacted stigma (negative attitudes expressed by members of the public that are experienced by an individual with devalued characteristics) and internalized stigma (endorsement of negative public stereotypes, prejudice, and resulting self-discrimination). Each item is rated on a 5-point frequency scale (1 = Never; 5 = Always), with a higher total score reflecting greater stigma. High levels of internal reliability have been found for the original (α = 0.89; Molina et al., 2013) and the Swedish language version used in this study (α = 0.85).

2.4 | Statistical analyses

Assumptions of normality, linearity and multicollinearity were assessed via various means. The association between the variables were explored using Pearson's coefficient

correlations and hierarchical linear regressions. The unstandardized coefficient (B), standard error, standardized coefficient (β), t statistic, and p-value are reported. The strength of each independent variable was based on its standardized beta value (β). An a priori power analysis conducted using the software G*Power for linear multiple regression with six independent variables, assuming a medium effect size ($f^2 = 0.15$), an alpha level of 0.05 and a power of 80%, suggested that a sample size of 98 participants was sufficient to detect a significant effect.

3 | RESULTS

3.1 | Descriptive statistics

Skewness and kurtosis values for all scale scores were in the acceptable range, suggesting a normal distribution. Mean values for pain intensity/interference, fatigue and quality of life were within the normal range. Depression scores were in the moderately severe range. Although there are no available cut-off scores for the social stigma scale, the mean for this sample is higher than that found for individuals with epilepsy ($M = 14.56$, SD = 7.03), multiple sclerosis ($M = 12.23$, SD = 4.34), and Parkinson's disease ($M = 12.07$, SD = 4.28; Molina et al., 2013). Descriptive statistics are described in detail in Table 2.

3.2 | Mean differences between groups

We conducted several independent sample t tests to explore differences between groups.

We found that people with active cancer scored significantly higher on depression ($M = 18.75$, SD = 5.80 vs. $M = 16.38$, SD = 5.67; $t_{(205)} = 2.92$, $p = 0.004$, confidence interval [CI, 0.77–3.96]) and social stigma ($M = 16.59$,

SD = 5.51 vs. $M = 14.12$, SD = 5.45; $t_{(209)} = 3.22$, $p = 0.002$, CI [0.95–3.98]), and lower on pain acceptance ($M = 30.60$, SD = 7.55 vs. $M = 34.56$, SD = 8.85; $t_{(159)} = -2.99$, $p = 0.003$, CI [−6.60 to −1.34]), when compared to people in remission.

There were no significant differences in the outcome measures between people currently experiencing chronic pain and those who suffered from chronic pain in the past but are not currently experiencing pain, or between people currently in cancer treatment and those no longer in cancer treatment.

3.3 | Bivariate correlations between symptoms, functioning, PF, and stigma

Table 3 presents the Pearson correlation coefficients between the study variables. All but two pairwise correlations were significant and in the moderate to large range. Consistent with expectation, higher scores on three PF measures were positively correlated with quality of life and negatively correlated with symptom measures. The exception was that scores on the measures of committed action and acting with awareness were not significantly correlated with pain intensity. Of the three PF measures, pain acceptance was most strongly correlated with both symptoms and functioning variables. Finally, social stigma scores were significantly associated with all other variables and most strongly associated with a greater frequency of depression symptoms and a lower level of acting with awareness.

3.4 | Amount of variance in functioning explained by PF and stigma

Table 4 presents the results from the hierarchical regression analyses used to evaluate the amount of variance in pain interference, fatigue, depression and quality of life

TABLE 2 Descriptive statistics for the variables in the study.

	M	SD	Min	Max	Skew	Kurt
Pain severity	5.00	1.77	1	10	0.07	−0.49
Pain interference	5.41	2.16	0.57	9.29	−0.41	−0.55
Fatigue	6.15	1.62	1.67	9	−0.41	0.11
Depression	17.51	5.73	9	36	0.58	0.04
Depression interference	1.93	0.73	1	4	0.31	−0.46
EQ5D index	0.80	0.14	0.40	0.97	−0.71	−0.21
EQ5D VAS	58.28	20.93	3	100	−0.36	−0.58
Pain acceptance	32.81	8.64	9	55	0.08	0.23
Committed action	36.88	7.06	18	56	−0.01	−0.06
Mindfulness	27.68	7.72	8	40	−0.32	−0.50
Social stigma	15.28	5.54	8	37	0.70	0.40

TABLE 3 Pearson correlation coefficients between the variables in the study.

	1	2	3	4	5	6	7	8	9	10	11
1. Pain intensity	1										
2. Pain interference	0.54**	1									
3. Fatigue	0.40**	0.65**	1								
4. EQ5D index	−0.33**	−0.40**	−0.35**	1							
5. EQ5D VAS	−0.31**	−0.61**	−0.46**	0.62**	1						
6. Depression	0.18*	0.42**	0.46**	−0.52**	−0.57**	1					
7. Depression interference	0.25**	0.44**	0.48**	−0.54**	−0.56**	0.69**	1				
8. Pain acceptance	−0.38**	−0.58**	−0.45**	0.51**	0.57**	−0.41**	−0.47**	1			
9. Committed action	−0.03	−0.28**	−0.33**	0.33**	0.27**	−0.51**	−0.41**	0.40**	1		
10. Acting with awareness	0.13	−0.20**	−0.24**	0.25**	0.40**	−0.53**	−0.37**	0.25**	0.55**	1	
11. Social stigma	0.22**	0.36**	0.34**	−0.37**	−0.41**	0.59**	0.45**	−0.32**	−0.38**	−0.53**	1

*$p < 0.05$.; **$p < 0.001$.

explained (separately) by scores on the measures of social stigma and PF. Only participants experiencing current chronic cancer-related pain were included in these analyses. One-way analysis of variance tests indicated that employment and marital status/living arrangement had a significant effect on depression and quality of life and were therefore entered as step 1 in these models. Employment status was coded as 0 (=unemployed/not working) and 1 (=employed), and civil status was coded as 0 (=single/separate) and 1 (=married/cohabiting). Cancer status was coded as 0 (=in remission) and 1 (=active) and was also added as a covariate in the regression models.

3.4.1 | Interference from cancer-related pain

Psychological flexibility accounted for a significant amount of variance in pain interference (R^2 change = 0.32, $p < 0.001$) after adjusting for the influence of cancer status, pain intensity and social stigma.

Of the PF variables, pain acceptance and acting with awareness had significant and negative beta coefficients (−0.31 and −0.23, respectively), suggesting higher levels of PF were associated with lower levels of interference from cancer-related pain.

3.4.2 | Depression

Psychological flexibility accounted for a significant amount of variance (R^2 change = 0.14, $p < 0.001$) when adjusting for the influence of cancer status, employment, pain intensity and social stigma. Committed action had a significant negative beta coefficient (−0.27), suggesting

that higher levels of PF were associated with lower levels of depression. However, social stigma had the largest R^2 change (0.29) and β (0.34) in this model.

3.4.3 | Quality of life

Psychological flexibility accounted for a significant amount of variance in quality of life as measured by the VAS of the EQ5D (R^2 change = 0.15, $p < 0.001$) when adjusting for the influence of cancer status, demographic variables, pain intensity and social stigma. Of the psychological variables, only pain acceptance was significant with a positive beta coefficient (0.40) suggesting that a greater levels of pain acceptance were associated with greater quality of life.

Similarly, PF accounted for a significant amount of variance in quality of life as measured by the Index score from the EQ5D (R^2 change = 0.21, $p < 0.001$) when adjusting for the influence of cancer status, demographic variables, pain intensity and social stigma. Chronic pain acceptance and acting with awareness were significant predictors (0.50 and 0.18, respectively), and the positive beta value indicates that more acceptance and awareness predict more quality of life.

3.4.4 | Fatigue

Psychological flexibility did not account for a significant proportion of variance in fatigue. Only pain intensity was a significant predictor (0.30) with the negative beta coefficient suggesting that more pain intensity was associated with more fatigue.

TABLE 4 Hierarchical linear regressions.

Outcomes	Step	Predictors	R^2	R^2 change	F change (df)	Sig. F change	Standardized beta with all variables entered		
							β	t	Sig
Pain interference	1		0.02	0.02	2.03 (1, 110)	0.157			
		Cancer status					0.09	1.26	0.212
	2		0.33	0.32	51.14 (1, 109)	<0.001			
		Pain intensity					0.46	5.60	**<0.001**
	3		0.40	0.07	12.68 (1, 108)	0.001			
		Social stigma					0.07	0.86	0.391
	4		0.53	0.13	9.34 (3, 105)	<0.001			
		Pain acceptance					−0.31	−3.38	**0.001**
		Committed action					0.02	0.24	0.807
		Acting with awareness					−0.23	−2.62	**0.010**
Depression	1		0.01	0.01	0.87 (1118)	0.352			
		Cancer status					0.11	1.42	0.160
	2		0.01	0.00	0.33 (1, 117)	0.566			
		Employment					0.18	2.24	**0.027**
	3		0.05	0.04	4.54 (1, 116)	0.035			
		Pain intensity					0.11	1.26	0.211
	4		0.34	0.29	51.01 (1, 115)	<0.001			
		Social stigma					0.34	3.98	**<0.001**
	5		0.48	0.14	9.65 (3, 112)	<0.001			
		Pain acceptance					−0.14	−1.44	0.153
		Committed action					−0.27	−3.07	**0.003**
		Acting with awareness					−0.13	−1.43	0.156
Health (EQ5D VAS)	1		0.02	0.02	2.57 (1, 118)	0.112			
		Cancer status					−0.05	−0.55	0.583
	2		0.07	0.05	3.15 (2, 116)	0.047			
		Employment					−0.00	−0.03	0.974
		Civil status					0.17	2.10	**0.038**
	3		0.14	0.07	8.61 (1, 115)	0.004			
		Pain intensity					−0.07	−0.74	0.459
	4		0.16	0.03	3.76 (1, 114)	0.055			
		Social stigma					−0.10	−0.98	0.327
	5		0.31	0.15	7.80 (3, 111)	<0.001			
		Pain acceptance					0.40	3.57	**0.001**
		Committed action					0.15	1.50	0.136
		Acting with awareness					−0.15	−1.50	0.137

(Continues)

TABLE 4 (Continued)

Outcomes	Step	Predictors	R^2	R^2 change	F change (df)	Sig. F change	Standardized beta with all variables entered β	t	Sig
Health (EQ5D Index)	1		0.03	0.03	2.93 (1, 116)	0.090			
		Cancer status					−0.01	−0.14	0.887
	2		0.10	0.07	9.26 (1, 115)	0.003			
		Employment					0.10	1.26	0.211
	3		0.17	0.07	9.95 (1, 114)	0.002			
		Pain intensity					−0.12	−1.37	0.175
	4		0.23	0.06	8.49 (1, 113)	0.004			
		Social stigma					−0.04	−0.42	0.672
	5		0.44	0.21	13.64 (3, 110)	<0.001			
		Pain acceptance					0.50	4.98	**<0.001**
		Committed action					−0.02	−0.24	0.809
		Acting with awareness					0.18	1.8	**0.050**
Fatigue	1		0.01	0.01	0.78 (1, 90)				
		Cancer status					0.08	0.76	0.449
	2		0.16	0.15	16.30 (1, 89)	<0.001			
		Pain intensity					0.30	2.46	**0.016**
	3		0.27	0.10	12.25 (1, 88)	0.001			
		Social stigma					0.17	1.42	0.158
	4		0.32	0.06	2.50 (3, 85)	0.065			
		Pain acceptance					−0.17	−1.42	0.215
		Committed action					−0.09	−0.76	0.452
		Acting with awareness					−0.13	−1.08	0.282

Statistically significant p values ($p < 0.05$) are presented in bold.

4 | DISCUSSION

Psychological flexibility has previously been shown to play an important role in adjustment to non-cancer-related chronic pain (e.g. Åkerblom et al., 2021; Baranoff et al., 2013; Gentili et al., 2019; McCracken & Gutiérrez-Martínez, 2011; Vowles et al., 2014; Wicksell et al., 2010) but little is known about the role of PF in the context of cancer-related pain. Consistent with the broader pain literature, three PF facets (pain acceptance, present-moment focus and committed action) were all moderately to strongly correlated with interference from cancer-related pain, levels of fatigue and depression, and quality of life. PF, and in particular pain acceptance, made significant contributions to the levels of the observed variance in pain interference, depression and quality of life after controlling for cancer status, pain intensity, and social stigma.

The results from the present study also suggest that social stigma arising from cancer and cancer-related pain may contribute to current levels of pain and distress, particularly depression, and poorer quality of life.

Consistent with a large body of literature which finds that pain acceptance is an important moderator and possible mediator of chronic pain outcomes (Cook et al., 2015; Jensen et al., 2016; McCracken et al., 2005; Vowles et al., 2008), pain acceptance was the most consistent and strongest facet associated with variance in pain interference and quality of life. The two other PF facets in this study (present moment focus and committed action) showed strong bivariate relationships with the symptom and functioning measures and made small but significant contributions to functioning in a multivariate context dependent upon the outcome measure. These findings are broadly consistent with previous

studies which find that less pain catastrophizing (analogous to greater pain acceptance) and coping styles defined by a positive, active engagement approach (analogous to greater committed action) are associated with lower levels of depression and anxiety, and impairment from cancer-related pain (see Meints & Edwards, 2018 for a review). To our knowledge, this is the first study exploring the contributing role of pain acceptance, present-moment focus and committed action in chronic cancer-related pain.

Another important finding that emerged from this study was the significant contribution of social stigma to functioning, particularly to depression. Correlation analyses also suggested significant associations between social stigma and symptom intensity, lower quality of life, and less PF. These results suggest that social stigma related to cancer represents an additional and significant burden for those also living with chronic pain, in line with previous studies on other chronic conditions (Scott et al., 2019). Interestingly, and with the exception of depression symptom severity, the contribution of social stigma to functioning becomes non-significant when the PF variables are entered in the models, which could suggest potential moderating and/or mediating effects of PF on the other outcome variables (pain interference, fatigue, and quality of life). Finally, we found that people with active cancer reported higher levels of depression and social stigma, as well as lower levels of pain acceptance when compared to those who reported their cancer as in remission. However, cancer status (active, in remission) was not a significant predictor of functioning in the regression models when the other variables were taken into account.

Our results point to PF processes as potential targets for treatment aimed at improving functioning in people with chronic cancer-related pain. ACT, a therapeutic intervention designed to promote PF, has shown large effects on psychological distress (depression, anxiety, fear of cancer recurrence), hope and quality of life for people with cancer. Results for physical distress (pain, fatigue), have been inconsistent, particularly due to the small number of studies to date (Mathew et al., 2021; Zhao et al., 2021). Some preliminary evidence also suggests that ACT may be effective in reducing disease-related stigma (Gul & Aqeel, 2021; Masuda et al., 2007), a variable we found to contribute to lower levels of functioning in this study, particularly for depression.

The results of the present study must be viewed within the context of certain limitations. The cross-sectional design means that we are unable to draw causal inferences about the role of PF on distress/functioning, or to specify the direction of influence (e.g. greater functioning may lead to improved PF or vice versa). The results are based entirely on self-report questionnaires and thus the

current findings may partly reflect response bias, common method bias, and the various outcome measures assessed outcomes over different time frames (e.g. past 24 h, past week, past month). The study is based on a convenience sampling approach involving recruitment from national cancer patient organizations and charities. However, the resultant sample was primarily women (83%), with a high proportion of participants reporting a history of breast cancer over other cancer types, and with the whole sample reporting higher levels of education than the national average for Sweden. Finally, the current study examined only three of the six facets of the PF model (Hayes et al., 2011). Firmer conclusions about the relationship between PF and distress/functioning in individuals with cancer-related pain require studies involving longitudinal and experimental designs, larger and more representative (diverse) samples, both patient and clinician-rated outcomes, measures of all six PF facets and employing sophisticated modelling procedures.

Despite these limitations, the present study provides preliminary data suggesting that PF may play an important role in adjustment to cancer-related pain, as it has previously been shown with other forms of chronic pain. Whilst further studies are needed, the present findings suggest that PF may be an important target for interventions aimed at improving overall functioning in individuals with cancer-related pain and significant comorbidities in the form of fatigue and depression.

AUTHOR CONTRIBUTIONS
Joana Duarte, Frida Köhler Björkstrand, Lance McCracken and Sean Perrin all contributed to the design of the study, data collection/analysis and discussed the results, prepared and commented on the manuscript.

CONFLICT OF INTEREST
The authors do not report any conflict of interests.

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