Illness cognitions, cognitive fusion, avoidance and self-compassion as predictors of distress and quality of life in a heterogeneous sample of adults, after cancer

Illness cognitions, Cognitive fusion, Avoidance and Self-Compassion as predictors of Distress and Quality of Life in a Heterogeneous sample of adults, after cancer.

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Highlights

- Fusion and avoidance influence distress and quality of life after cancer.
- Cognitive content represents a further source of influence.
- Self-compassion buffers some of these influences.
- These effects are interdependent, consistent with the ACT model.
- Content-based interventions that are theoretically coherent with CBS may be useful.

Abstract

Objective: This study explored the predictive power of illness cognitions, cognitive fusion, avoidance and self-compassion in influencing distress and quality of life in people who have experienced cancer.

Method: A quantitative cross-sectional design was used. 105 adults with various cancer diagnoses completed measures of cancer related thoughts, coping styles, self-compassion, cognitive fusion, distress and quality of life. Correlation, linear regression and conditional process analysis was used to explore relationships between predictor variables, distress and quality of life.

Results: Although predictors were individually related to distress and quality of life in theoretically consistent ways, regression analysis showed that cognitive fusion was the strongest predictor of anxiety symptoms, whilst cancer related cognitions and avoidant coping were the strongest predictors of depressive symptoms and quality of life. Threatening illness appraisals did not directly predict anxiety, rather cognitive fusion mediated this relationship. This path was also moderated by self-compassion, such that for those higher in self-compassion, the impact of threatening illness appraisals and fusion on anxiety was attenuated. Illness appraisals did not directly predict depressive symptoms, but their influence on depression was mediated by avoidant coping. For quality of life, both direct and indirect effects were observed. Illness cognitions, avoidance and fusion all directly influenced quality of life and this was not moderated by self compassion.

Conclusions: Threatening appraisals of cancer, cognitive fusion and avoidant coping were found to be the strongest predictors of distress and lowered quality of life after cancer. Interventions focused on reducing cognitive fusion and emotional avoidance, such as Acceptance and Commitment Therapy should be further explored in this population. Threatening illness cognitions directly influence both anxiety and quality of life. Conceptualisations of cognitive modification strategies from within contextual behavioural science could be useful in exploiting this potential treatment target, whilst staying theoretically consistent.

Key words: cancer, appraisals, avoidance, compassion, cognitive fusion, acceptance and commitment therapy.

INTRODUCTION

There are over 2 million people with a current or previous diagnosis of cancer in the UK (National Cancer Intelligence Network, 2010). These figures are rising due to a higher than expected incidence rate and increased survival rates (Maddams et al., 2009). Depression, anxiety and adjustment disorder contribute to longer duration in hospital, reduced adherence to medical care, reduced quality of life, and reduced survival rates (Bui, Ostir, Kuo & Freeman, 2005; Colleoni et al., 2000; Pinquart & Duberstein, 2010; Prieto et al., 2002). Emotional disorders are found in up to 38% of cancer patients (Mitchell et al., 2011).

A number of psychological constructs have been established as predictors of distress. These include coping strategies (Carver et al., 1993), cognitive appraisals (Parle, Jones & Maguire, 1996), rumination, worry and poor social support (Carver et al., 1993; Morris & Shakespeare-Finch, 2011). In particular, avoidant coping has been consistently found to predict poorer outcomes in terms of distress and quality of life (e.g. Stanton et al., 2012, Hulbert-Williams et al., 2015). Recently, constructs such as acceptance and mindfulness have begun to be explored (for a narrative review of this emerging field as applied to cancer, see Hulbert-Williams et al., 2015). These approaches represent a shift away from traditional attempts to change cognitions and behaviours to try and eliminate distress. Interventions based on these constructs aim instead to foster willingness to experience mental and physical events, as part of the human experience, which may then lead to a redirection of energies towards values-based living. Rather than attempting to modify appraisals, as in cognitive therapy, ACT uses a range of 'cognitive defusion' strategies. These involve perspective taking on distressing thoughts, unhooking thoughts as reasons for action or inaction and instead observing them as mental events (Gillanders et al., 2014). Interventions in this tradition also emphasise taking a kindly stance towards one's self in times of suffering, described as self-compassion (Neff, 2003). The current study examines predictors of distress and quality of life after cancer, and compares well established constructs such as avoidance, and illness cognitions to two constructs drawn from the acceptance and mindfulness tradition: self-compassion and cognitive fusion.

Self-Compassion

Self-compassion means "being open to and moved by one's own suffering, experiencing

feelings of caring and kindness toward oneself, taking an understanding, non-judgmental attitude toward one's inadequacies and failures, and recognizing that one's experience is part of the common human experience" (Neff, 2003). It has been recognised as an emotional regulation strategy important in adaptive reactions to illness (Terry & Leary, 2011). Previous studies have found self-compassion to be a significant predictor of lower levels of depression and anxiety in a study of adults with anxiety (Van Dam, Shepherd, Forsyth & Earlywine, 2011) and a predictor of coping and well-being in older adults (Allen, Goldwasser & Leary, 2011).

Cognitive Fusion

Cognitive fusion is one of the six core processes of Acceptance and Commitment Therapy (ACT: Hayes, Strosahl & Wilson, 2012). It describes a process where a person becomes excessively entangled in their thoughts, such that these thoughts dominate behaviour (Gillanders et al., 2014). Cognitive fusion has been demonstrated to be strongly related to avoidance behaviour, distress and other unfavourable outcomes across a wide range of physical and mental disorders (Gillanders et al., 2014), but has not yet been investigated in a cancer population.

Existing Evidence for ACT following Cancer

The evidence base for considering ACT as a potential intervention following a cancer diagnosis is small and not well developed, though shows some promise. The evidence is presented in a narrative literature review by Hulbert-Williams and colleagues (2015). In summary, there have been six published intervention studies, applying ACT with cancer patients. Two of these are case studies in breast cancer patients (Montesinos et al., 2001; Karekla & Constantinou, 2010), one is a non randomised controlled trial in a heterogeneous sample (Feros et al., 2013), two are small randomised controlled trials (n=12) in breast cancer patients (Montesinos & Luciano, 2005; Paez et al., 2007) and the final paper is a randomised controlled trial of ACT compared to treatment as usual for 47 women with late stage ovarian cancer (Rost et al., 2012). These studies have produced preliminary evidence that ACT is effective in reducing distress and mood problems and improving quality of life, following cancer.

Cancer, Mindfulness and Compassion

The evidence for the use of other mindfulness-based interventions for cancer patients is systematically reviewed by Shennan et al. (2011). This review shows that the evidence base for mindfulness based interventions is better developed than that for ACT, with Shennan et al. (2011) finding 13 papers that describe three randomised controlled trials, two non-randomised control trials, and five pre- and post-test designs. The findings collated across these studies suggest that mindfulness based interventions are effective at reducing distress and mood disturbance across diverse populations of cancer patients and that effects for quality of life are weaker.

There are no studies specifically investigating compassion oriented interventions in cancer populations, though the concept of compassion is recognised as potentially important, both in the mindfulness literature more broadly (e.g. Tirch, 2010, Neff & Germer, 2013), in relation to the important qualities of cancer care providers (e.g. Moody et al., 2013) and in relation to cancer patients' own responses to cancer (Pinto-Gouveia et al., 2014). Pinto-Gouveia et al. (2014) report a correlational analysis between measures of self-compassion and psychopathology in a heterogeneous sample of cancer patients. Results showed that increased self-compassion was associated with less depression, less stress and better psychological quality of life.

Compassion can be seen as a treatment target in its own right (as in Compassion Focussed Therapy; Gilbert, 2010), as an emergent feature of acceptance and mindfulness-based interventions (e.g. Tirch, Schoendorf & Silberstein, 2014) and also as a mechanism of action of such therapies. Both of the reviews cited above (Hulbert-Williams et al., 2015; Shennan et al., 2011) call for greater theory building in the area of mindfulness and acceptance based interventions, in order that the promising effects of these interventions are better understood in terms of mechanism. Whilst controlled trials with mediation analyses are the gold standard method to test such hypotheses about mechanisms, cross sectional studies can provide useful initial findings prior to embarking on such complex studies.

Aims

The current study aims to compare self-compassion and cognitive fusion as predictors of distress and quality of life following cancer, in comparison to already established

predictors such as avoidance and illness related cognitions. The contribution of this study is in clarifying the relative importance of different potential treatment targets and their inter-relations in predicting important outcomes such as anxiety, depression and quality of life.

Hypotheses

It was hypothesised that lower self-compassion and higher cognitive fusion would predict increased anxiety and depression and lower quality of life, after controlling for known predictors such as demographic and clinical variables, mental adjustment and coping styles. In addition, we sought to test a theoretically derived model in which appraisals of cancer as threatening would predict higher distress and lower quality of life both directly and indirectly via the process of cognitive fusion and avoidant coping. In addition we hypothesised that higher self-compassion would moderate the impact of these routes, buffering their effects on distress and quality of life.

MATERIAL & METHODS

Design

The study used a quantitative cross-sectional design. Participants completed six standardised self-report questionnaires measuring mental adjustment to cancer, coping, self-compassion, cognitive fusion, distress, quality of life and demographic characteristics. The study was conducted in accordance with codes of ethics and conduct specified by the British Psychological Society. Ethical approval was granted by the University of Edinburgh, the North of Scotland Research Ethics Committee and NHS Grampian Research & Development, application reference: 12/NS/0080.

Statistical Power and Sample Size

Power calculations carried out *a priori* estimated that 130 participants were needed in order to detect a medium effect size, using linear regression with 10 predictors at an alpha level of .05 ($p<.05$) and a power of .80 (Green, 1991).

Participants

Eligible participants had to have received a diagnosis of cancer no less than 30 days previously; be aged 18 or over; have awareness of their cancer diagnosis; and be

physically well enough to be able to complete a set of questionnaires taking approximately 20-30 minutes. Criterion for exclusion included a diagnosis of brain cancer or cognitive impairment as determined clinically by their treating health professional.

Measures

The following measures were completed:

1) **The Mini Mental Adjustment to Cancer** (Mini-MAC: Watson et al., 1994) assesses psychological response to cancer in the form of distressing cancer related cognitions and responses (e.g. "I think it's the end of the world", "I worry about cancer returning or getting worse") (Watson et al., 1994; Hulbert-Williams et al., 2012a). The scale has shown slightly different factor structures in different samples and different language versions. We used the 4 factor scoring method described by Hulbert-Williams et al. (2012), as it is based on a sample that is very similar to ours and its development and psychometric properties are more robust. It has 24 items measuring four domains: Cognitive distress, Cognitive Avoidance, Fighting Spirit, and Emotional distress. Despite the labelling of this final factor it is still interpreted as a cognitive appraisal based factor (Hulbert-Williams et al., 2012). Higher scores in each domain correspond to greater endorsement of that appraisal domain. The sub-scales' validity has been shown through modest to strong correlations with measures of quality of life, anxiety and depression (r = .21 - .70, Hulbert-Williams et al., 2012a) Previous studies report that the Cronbach's alphas for the subscales range from .58 - .86. (Hulbert-Williams et al., 2012). Cronbach's alphas for the current study were: Cognitive distress (.87), Cognitive avoidance (.77), Fighting spirit (.67) and Emotional distress (.76).

2) **The Brief-COPE Inventory** (COPE: Carver, 1997) is a 28-item scale measuring coping across three broad domains: Problem Focused Coping, Active Emotion Coping and Emotional Avoidance Coping. Higher scores reflect greater the use of that coping style. Reliability coefficients in previous studies range from .50 to .90 (Shapiro, McCue, Heyman, Dey & Haller, 2010). Validity of the COPE in cancer patients is established via correlation with measures of mood, anxiety and quality of life. In addition, adaptive coping at 3 months predicts quality of life at 6 months, after controlling for clinical, demographic and personality factors (Hulbert-William et al., 2012b) Cronbach's alphas for the current

study were: Problem Focused Coping (.77), Active Emotion Coping (0.71) and Emotional Avoidance Coping (0.74).

3) **The Self-Compassion Scale** (SCS: Neff, 2003) contains 26-items assessing how people typically act towards themselves in difficult times. Higher scores indicate greater self-compassion. The total SCS score shows good reliability and validity via moderate to strong correlations in theoretically predicted directions with measures of depression, life satisfaction, perfectionism and social connectedness (r = .45 - .65) (Neff, 2003; Neff, Hsieh & Dejitterat, 2005). In addition, the scale has high internal reliability (Cronbach's alpha= 0.93) (Wren et al., 2012). Cronbach's alpha for the current study was 0.87.

4) **The Cognitive Fusion Questionnaire** (CFQ: Gillanders et al., 2014) is a 7-item measure of cognitive fusion. It is generic to thinking rather than specific thought content. Items explore literality, engagement with thoughts, entanglement, struggle, and behaviour being dominated by thinking. Higher scores indicate higher levels of fusion. Validation studies show that the CFQ is reliable, with Cronbach's alpha between .88 and .93 depending on sample (mean α = .91). In addition, the concurrent validity of the CFQ has been demonstrated via correlations with measures of mindfulness, rumination, thought control strategies, distress, burnout, wellbeing, and quality of life (Gillanders et al., 2014). The Cronbach's alpha for the current study was 0.93.

5) **The Hospital Anxiety and Depression Scale** (HADS: Zigmond & Snaith, 1983) is a 14 item scale developed for patients with physical illness. Across a wide range of samples (including cancer populations) the reliability and validity of the HADS has been well established with Cronbach's alpha for each scale ranging between .67 and .93 (mean α = .83). In addition the HADS shows modest to strong predicted correlations with other measures of anxiety and depression (e.g. Beck Depression Inventory, SCL-90-R, State-Trait Anxiety Inventory) from .60 to .80 (Bjelland, Dahl, Haug & Neckelman, 2002): The Cronbach's alpha for the current study was 0.89 for anxiety and .83 for the depression scale.

6) **The Functional Assessment of Cancer Therapy - General** (FACT-G: Cella et al., 1993) is a 27-item scale measuring health related quality of life in cancer patients. The

scale has four domains of well-being: physical, social/family, emotional and functional, as well as a total score. High scores represent better quality of life. A review of the FACT-G found the reliability of the total scale score to have a range of .80 - .96 across 78 individual studies, with a mean alpha of .88 (Victorson, Barocas, Song & Cella, 2008). In addition, the validity of the FACT-G has been well established via correlation with other health related quality of life measures, as well as measures of mood and anxiety (for a review of the psychometric properties of the FACT-G see Luckett et al., 2011). The Cronbach's alpha for the current study was 0.79.

Demographics

Gender, age, relationship status, education, ethnicity, first language, year of first diagnosis, cancer type, type(s) of treatment(s) received, current treatment(s) received and any other physical or mental health difficulties was also gathered.

Recruitment

Clinicians within an NHS oncology service in Scotland distributed 280 questionnaire packs to patients who met the inclusion criteria. 114 completed questionnaire packs were returned, indicating a 41% return rate. Two were excluded due to not meeting the inclusion criteria, seven were excluded due to missing data >20%, resulting in a total sample of 105.

Analytic Plan

After excluding the seven participants described above, no case had more than 5% missing values. The total proportion of missing data was 0.6% and Little's MCAR test showed that the data was missing completely at random (Little's MCAR test: Chi-Square = 158.825, $df = 143$, $p = .173$. Estimation maximisation was used to impute this missing data.

Preliminary analysis confirmed that there were no violations of the assumptions of linearity, homoscedasticity or multicollinearity. All variables were normally distributed. All analyses were conducted using SPSS (version 20). Planned analyses included descriptive data, covariate analysis, correlational analyses and three regression analyses,

testing the prediction of anxiety, depression and quality of life by all of the predictor variables that were shown to correlate with the dependent variable.

A number of methods of regression were considered. Hierarchical regression is the most conservative, in which the most important or well established predictors are entered first. A disadvantage of this method is that it can obscure the contribution of newer concepts, as variance is already accounted for by the first predictors. Stepwise regression was considered, as the model enters or removes variables along purely mathematical criteria. Field (2013) cautions against the use of stepwise methods, as they can lead to models that are mathematically correct but theoretically or logically nonsensical. In addition, stepwise methods can be highly influenced by random variation in the data and can lead to models that will not replicate in other samples (Field, 2013, p. 321). We decided to therefore use a simultaneous forced entry method. This tests the individual predictive capacity of each variable, whilst controlling for the presence of other variables in the equation. In essence this method gives the unique explanatory power of each variable, to predict the dependent variable and is useful in model building and comparing the importance of constructs (Field 2013, p. 321).

One disadvantage of using linear regression in this way however is that it can not test for interaction and mediation effects between variables which are likely to be related to each other, and to the dependent variables, in complex and interdependent ways. For this reason, conditional process analysis (Hayes, 2013) was used to explore a theory-driven model in which cognitive appraisals of cancer threat (based on the Mini-MAC) predict depression, anxiety and quality of life directly, as well as indirectly via cognitive fusion and avoidant coping. The impact of these direct and indirect routes was also hypothesised to be moderated by self-compassion. The model was tested using the syntax supplied by A.

F. Hayes (2014).

RESULTS

Sample Characteristics

Of the 105 participants included in the study 55% were male, 93% were white British and the majority (60%) were within the 60-79 age bracket. There was a wide range of time since diagnosis (1year to 24 years). 22% of the sample had received their diagnosis 5 years or more previously. The mean time since diagnosis was 3.70 years (*SD* 4.7 years) with 62% diagnosed within the last two years. Thirty-four per cent of the sample reported that they were not in active treatment for cancer, with 66% in treatment. .Demographics are provided in table 1.

Insert Table 1 here

The sample was made up of relatively similar proportions of participants with breast cancer (23%), haematological cancers (25%), and urological cancers 38%). Given that there were small numbers of participants with lung, bowel, gynaecological and throat / neck cancer (approximately 4 – 6% each), these participants were grouped together to form a miscellaneous cancer group (15%), in order to compare if type of cancer influenced predictor or outcome variables. The reason for grouping these patients together was statistical, rather than clinical.

Prevalence of distress

24% (n=25) of the sample were experiencing clinical levels of anxiety and 19% (n = 20) clinical levels of depression on the HADS using the threshold of ≥9 and ≥8 respectively (Bjelland, Dahl, Haug & Neckelmann, 2002). Scores ranged between 0 to 20 for anxiety and 0 to 16 for depression, with a mean anxiety score of 5.83 (*SD*: 4.31) and a mean depression score of 4.18 (*SD:* 3.62). Scores on all measures were similar to known population values (see Table 2).

Insert Table 2 here

Covariate analyses

Table 1: Participant characteristics (n=105)

		Current sample		National Statistics[1]	
Characteristic		N	%	N	%
Gender	Male	58	55	14500	48
	Female	48	45	15600	52
Age	18-39	5	5	1154	3
	40-59	36	34	8070	20
	60-79	64	60	22251	55
	80+	1	1	9144	22
Marital Status					
Single/separated/widowed		23	22	-	
Married/co-habiting		80	76	-	
Highest Level of Education					
GCSE/O Level		25	24	-	
A Level		15	14	-	
Diploma		14	13	-	
Bachelor's Degree		21	20	-	
Master's Degree		8	8	-	
Doctor's Degree		3	3	-	
Other		12	11	-	
Missing		8	8	-	
Ethnicity	White British	98	93	-	
	Missing	8	7	-	
Years since diagnosis		Mean: 3.59	*SD*: 4.607	-	
		Range: 1-24 years		-	
1 – 2 years		63	60	-	
3-4 years		19	18.1	-	
5-10 years		18	12.6	-	
11 + years		9	8	-	

Characteristic		Current sample N	Current sample %	National Statistics[1] N	National Statistics[1] %
	Missing	1	1	-	
Cancer Type	Urological	39	37	4432	15
	Breast	25	24	4604	15
	Haematological	24	23	1001[d]	3
	Lung	6	6	5069[a]	17
	Bowel	6	6	3986	13
	Gynaecological	5	5	583[c]	4
	Throat/neck	1	1	1186[b]	4
Type of treatment(s) received					
	Surgery	61	58	12119	40
	Radiation Therapy	35	33	2769	8
	Chemotherapy	67	63	3823	13
	Hormone Therapy	20	19	2227	7
	Other	16	15	1621	5
	In active treatment	69	66	-	-
	Not in active treatment	36	34	-	-
Comorbidity	Physical	21	20	-	-
	Mental health	8	8	-	-

[a] = trachea and bronchus; [b] = head and neck; [c] = ovary; [d] = non-Hodgkin's lymphoma
[1] Statistics provided by the Information Services Division, NHS Scotland

Given the very large range of time since diagnosis, we investigated whether this variable was correlated with any of the clinical variables, other demographic, outcome or predictor variables. In addition we split the sample into those who had received their diagnoses less than five years previously or equal to or greater than five years, in order to determine if there were differences between those participants that could be considered 'cancer survivors' or 'cancer patients'. In addition we analysed participants according to those that reported they were currently in treatment or not in treatment, as part of this exploration of potential covariates.

Time since diagnosis was not correlated with any clinical, demographic, predictor or outcome variable. Splitting the sample into survivors (diagnosed ≥5 years previously) and patients revealed that survivors were lower in Mini-MAC Fighting Spirit (Survivors mean: 10.96 [*SD:* 2.23], Patients mean: 12.45 [*SD:* 2.38], $t = 2.69$, $df = 104$, $p = .008$, $d = .65$). Survivorship was therefore controlled for in analyses involving Fighting Spirit.

The difference between survivors and patients on the variables 'Quality of Life' (FACT-G Total score) approached significance: (Quality of Life: Survivors mean: 75.88 [*SD*: 18.48], Patients mean: 83.39 [*SD:* 15.90], $t = 1.93$, $df = 104$, $p = .056$, *ns,* $d = .44$).

The difference between these groups for the variable 'Depression' also approached significance: (Depression: Survivors mean: 5.43 [*SD*: 4.45], patients mean: 3.83 [*SD*: 3.30], $t = 1.90$, $df = 104$, $p = .06$, *ns,* $d = .41$). Examining the normative data in Table 2 shows that for Quality of Life, differences of this magnitude are less than half of a standard deviation of the population. Similarly, the difference between the survivor and patient groups for depression is clinically small and both are within the non-clinical range for the measure. These differences were therefore interpreted as unlikely to be meaningful. and no further attempt to control for them was undertaken.

Examining those participants who reported being in active treatment, versus no longer being in active treatment, revealed only one significant difference and no differences approaching significance. Those in active treatment used more active emotion focussed coping strategies than those not in treatment: (Active Emotion Focussed Coping: active

Table 2: Descriptive statistics for predictor and outcome variables with normative data for comparison

Variable	Possible range	Min	Max	Mean	*SD*	Normative Data	
						Mean	*SD*
Predictor Variables:							
Mini MAC Cognitive distress	12 - 48	12	37	20.43	5.61	19.44[a]	5.99
Mini MAC Cognitive Avoidance	5 - 20	5	20	12.03	3.13	12.91[a]	3.26
Mini MAC Fighting spirit	3 - 12	3	12	9.05	1.97	9.99[a]	1.81
Mini MAC Emotional distress	6 - 24	7	23	14.06	3.52	12.95[a]	3.52
Brief COPE Problem Focused Coping	8 - 32	8	32	18.46	5.61	Not available	
Brief COPE Active Emotional Coping	10 - 40	14	37	24.78	5.72	Not available	
Brief COPE Avoidance Coping	10 -40	10	26	15.48	4.23	Not available	
Self Compassion Scale	6 - 30	12	30	20.40	3.40	18.25[b]	3.75.
Cognitive Fusion Questionnaire	7 - 49	7	43	18.71	8.9	21.22[c]	10.36
Outcome Variables:							
HADS anxiety	0 - 21	0	20	5.83	4.31	6.14[d]	3.76
HADS depression	0 - 21	0	16	4.18	3.62	3.68[d]	3.07
Functional Assessment of Cancer Therapy - General	27 - 108	47	107	81.75	8.93	86.5[e]	15.2

[a] Mini MAC Normative data from Hulbert-Williams et al., 2012; [b] SCS Normative data from Neff, 2003; [c] CFQ Normative data from Gillanders et al., 2014(MS Sample); [d] HADS normative data from Crawford et al., 2001; [e] FACT-G normative data from Holzner et al., 2004.

treatment mean: 25.61 [*SD*: 5.36], finished treatment mean: 23.21 [*SD*: 6.13], $t = 2.06$, $df = 104$, $p = .04$, $d = .42$).

No other significant differences in outcome measures were seen for any demographic or treatment variables. A one-way ANOVA found significant differences for cancer type as participants in the miscellaneous cancers group reported significantly higher levels of distress and significantly lower quality of life compared to other types of cancer. We therefore statistically controlled for cancer type in subsequent regression analyses, by adding the variable 'cancer type' as the first step in each equation (thereby removing variance of the dependent variable associated with cancer type), and in the conditional process analyses by adding cancer type as a covariate. In each analysis, cancer type did not significantly predict the dependent variable, nor affect the conditional process model. These analyses were therefore re-run without cancer type as a covariate and these are the analyses reported here.

Correlation Analyses

Table 3 shows a pattern of strong correlations in predicted directions, consistent with previous research and theory. A number of variables that were expected to correlate with anxiety, depression and quality of life did not. These were: Mini MAC Fighting Spirit, Problem Focussed Coping, and Active Emotion Focussed Coping. The finding that Fighting Spirit does not correlate strongly with other indices is consistent with other research that questions the utility of the Fighting Spirit construct (e.g. Hulbert-Williams et al., 2012a; 2012b). It is also counter intuitive that active emotion focussed coping strategies and problem focussed coping strategies are not associated with anxiety, depression and quality of life.

Variables that did not significantly correlate with the outcome variables were excluded from regression analysis, as suggested by Tabachnick & Fidell (2006). Only including variables that correlate with the outcome variables also preserves power, which is important given that recruitment fell short of the target of 130 participants. The final sample of 105 participants is sufficiently powered to detect medium sized effects or larger with the 6 predictor variables retained ($\alpha = .05$, $\beta = .80$: Green, 1991).

Insert Table 3 here

Table 3: Correlation matrix between predictor variables and outcome variables

	1	2	3	4	5	6	7	8	9	10	11
1. Mini MAC Cognitive Distress	1										
2. Mini MAC Cognitive Avoidance	.44**	1									
3. Mini MAC Fighting Spirit	.13	.36**	1								
4. Mini MAC Emotional Distress	.75**	.37**	.11	1							
5. Brief COPE Problem Focused Coping	.11	.01	.40**	.01	1						
6. Brief COPE Active Emotion Coping	.04	.04	.20*	-.04	.49**	1					
7. Brief COPE Avoidance Coping	.59**	.53**	.09	.45**	.10	.22*	1				
8. Self-Compassion Scale	-.41**	-.14	.23*	-.42**	.10	-.05	-.43**	1			
9. Cognitive Fusion Questionnaire	.62**	.37**	.04	.56**	.11	.13	.64**	-.72**	1		
10. HADS Anxiety	.56**	.36**	.04	.48**	.09	.06	.58**	-.50**	.72**	1	
11. HADS Depression	.54**	.23*	-.03	.41**	.08	.11	.53**	-.44**	.50**	.64**	1
12. FACT-G	-.62**	-.30**	-.01	-.54**	-.09	-.11	-.57**	.39**	-.58**	-.60**	-.85**

**p<.05 and ** p<.01; All correlations are Pearson's r ; n=105* MAC: Mental Adjustment to Cancer, HADS: Hospital Anxiety and Depression Scale, FACT-G: Functional Assessment of Cancer – General Scale.

Multivariate Analyses

Prediction of anxiety and depressive symptoms

To test the relative strength of these constructs in predicting symptoms of anxiety, depression and quality of life, they were entered in three forced entry linear regression models. The six predictors accounted for 53% of the variance in anxiety (Adj. R^2=.53). The equation was highly significant ($F_{(6,98)}$ = 20.63, p<.0001) and represented a large effect size of f^2=1.12. Of the individual predictors, only cognitive fusion (CFQ) was a significant predictor of anxiety symptoms when compared with the other five predictors (β = .544, p<.001).

In predicting depression, the six predictors accounted for 36% of the variance (Adj. R^2=.364). The equation was highly significant ($F_{(6,98)}$ = 10.91, p<.0001) and represented a large effect size of f^2=.56. Of the individual criterion variables, Mini MAC Cognitive Distress (β = .337, p<.05) and Brief COPE Emotional Avoidance Coping were significant predictors of depressive symptoms (β = .304, p<.05).

Insert Table 4 here

Prediction of Quality of Life

The overall model accounted for 45% of the variance in quality of life (Adj. R^2=.453) and was highly significant ($F_{6,98}$ = 15.38, p<.0001) with a large effect size of f^2=.84. Mini MAC Cognitive Distress (β = -.268, p<.05) and Brief COPE Emotional Avoidance Coping were significant predictors of quality of life (β = -.276, p<.05). Cognitive Fusion approached significance (β = -.206, p=.08, *ns*).

For all regression analyses, the variance inflation factor (VIF) was less than 3.3, tolerance statistics were all .296 or above (Menard, 1995; Myers, 1990). Examination of standardized residual plots indicated that the assumptions of normality and linearity were met. Durbin Watson statistics were close to 2 suggesting that the assumption of homogeneity of variance was met. Finally, Cook's distance and Mahalanobis distance

Table 4: Linear Regression for the prediction of anxiety, depression and quality of life

Variables	β	t	p	R^2	Adj. R^2	$F_{(6,98)}$	p
Dependent variable: HADS Anxiety							
Mini MAC Cognitive distress	.106	.926	.357	.558	.531	20.63	<.001
Mini MAC Cognitive Avoidance	.030	.368	.714				
Mini MAC Emotional distress	.016	.150	.881				
COPE: Avoidance Coping	.157	1.57	.119				
Self Compassion Scale	.012	.132	.895				
Cognitive Fusion Questionnaire	.544	5.06	**<.001**				
Dependent Variable: HADS Depression							
Mini MAC Cognitive distress	.337	2.52	**.014**	.401	.364	10.91	<.001
Mini MAC Cognitive Avoidance	-.101	1.06	.294				
Mini MAC Emotional distress	-.046	.379	.706				
COPE: Avoidance Coping	.304	2.62	**.010**				
Self Compassion Scale	-.168	1.65	.103				
Cognitive Fusion Questionnaire	.053	.427	.671				
Dependent Variable: FACT-G Quality of Life							
Mini MAC Cognitive distress	-.268	2.16	**.033**	.485	.453	15.38	<.001
Mini MAC Cognitive Avoidance	.093	1.04	.300				
Mini MAC Emotional distress	-.140	1.24	.219				
COPE: Avoidance Coping	-.276	2.57	**.012**				
Self Compassion Scale	-.016	.170	.866				
Cognitive Fusion Questionnaire	-.206	1.77	.079				

Method: Simultaneous forced entry

were within acceptable limits for both models (Field, 2013).

Conditional Process Analysis

Whilst linear regression can clarify the strength of individual predictors, relative to others, it cannot test more complex relationships between variables at arriving at outcomes. Conditional process analysis (Hayes, 2013; 2014) is a method for determining direct influences between predictor and criterion variables, whilst simultaneously modelling indirect effects via mediating variables, and moderating effects of other variables. Based on the pattern of correlations and regressions, as well as theoretical predictions, we specified a model prior to analysis in which we hypothesised that a predictor variable conceptualised as threatening illness cognitions would influence anxiety, depression and quality of life directly, and also indirectly via cognitive fusion and avoidant coping. In addition we hypothesised that both of these paths (having threatening appraisals of cancer, being entangled in thinking and high levels of avoidant coping strategies) would be moderated by self-compassion, such that the negative effects of threatening appraisals, fusion and avoidance would be buffered by higher levels of self-compassion.

Though conditional process analysis can model multiple indirect effects (mediators) at a time, it can only model one predictor variable and one criterion variable at a time. For this reason a composite variable was created using the raw scores of the Mini MAC variables: Cognitive Distress, Cognitive Avoidance and Emotional Distress. 21 items make up these subscales. The variable 'Threatening Illness Appraisals' (or Threat) had a Cronbach's alpha of .87, and a mean item total correlation of .48. The variable was normally distributed with a mean of 46.57 and a standard deviation of 10.32. Range was 26 – 77.

Diagrammatic representations of these models are depicted in Figure 1, 2 & 3.

Insert Figure 1 here

Insert Figure 2 here

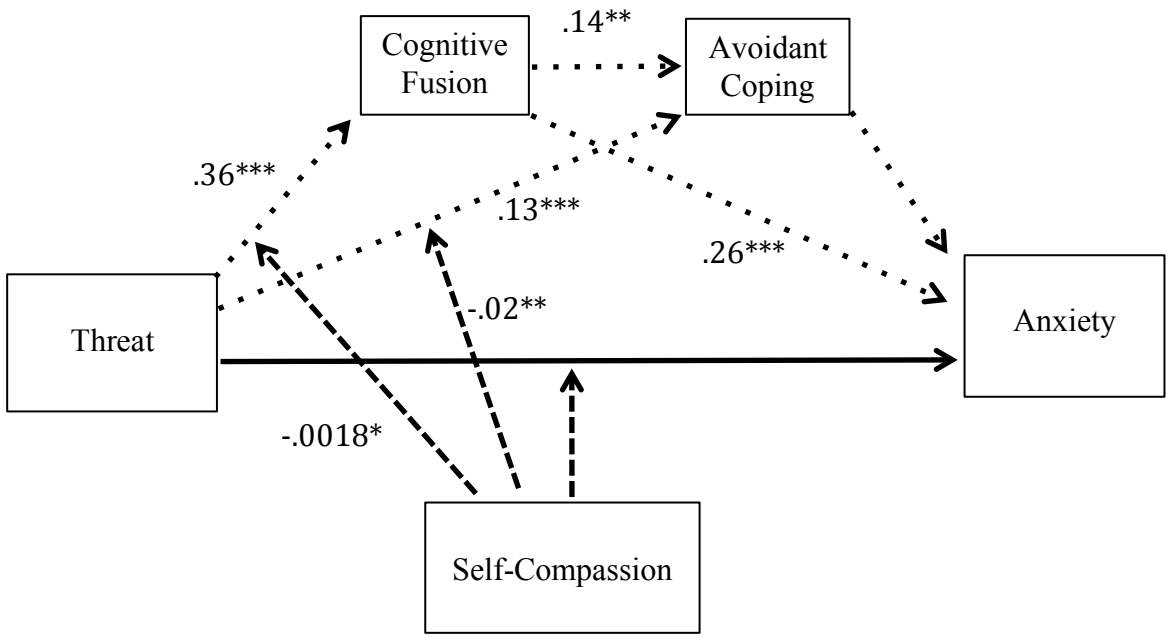
Insert Figure 3 here

Solid lines represent direct effects, dotted lines represent indirect effects and dashed lines represent moderating effects. Numbers on the lines represent standardised *β coefficients.* Only significant paths are shown in order to avoid the figures becoming cluttered. Each figure contains a table showing the results of the conditional process analysis. Numbers in each row are bootstrapped confidence intervals (BCI) of 10,000 resamples. If these confidence intervals do not contain zero, the effect of that path is considered to be significant at a *p* value of less than .05. The overall variance explained by each model is also shown.

For the model predicting anxiety, the overall model explained 53% of the variance in anxiety. Surprisingly, threat appraisals do not directly influence anxiety. Threat appraisals exert an effect on anxiety indirectly via cognitive fusion. In addition, this path was also moderated by self-compassion (index of mediated moderation point estimate = -.0018, 95%CI = -.022, -.002). Higher self-compassion buffers the impact of threat appraisals and cognitive fusion, leading to reduced anxiety. Threat appraisals also lead to avoidant coping, though this in turn does not influence anxiety. The path from threat appraisals to avoidance is also moderated by self compassion. Consistent with theory: for those higher in self-compassion, threat appraisals do not predict avoidant coping as strongly.

For the model predicting depression, the overall model explained 37% of the variance in depression. Threat appraisals did not directly influence depression, though they do exert influence via the indirect effect of avoidant coping. The path from threat appraisal to

Figure 1: Conditional Process Analysis – Anxiety



Key:

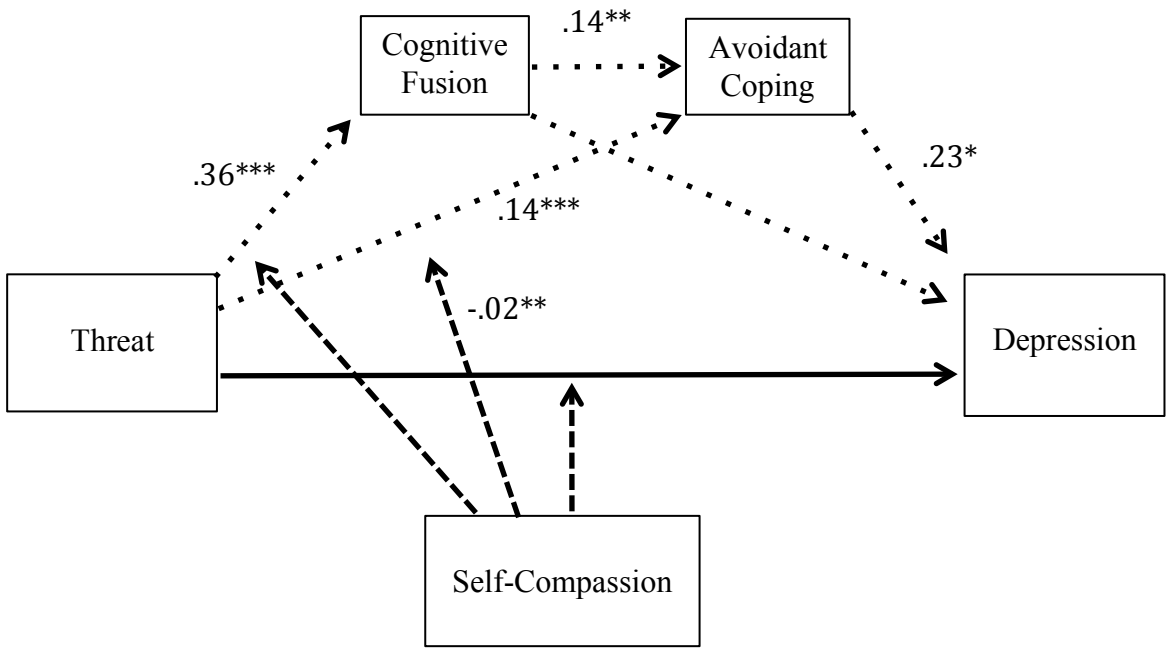
Direct path Indirect path Moderator

Numbers on the paths represent standardised β coefficients * p<.05 **p<.01 ***P<.001

Path	BCI		IMM	
	LL	UL	LL	UL
Direct effect threat to anxiety	-.022	.1134	-.017	.016
Total indirect effect	.079	.179		
Threat to fusion to anxiety	.045	.156	-.022	-.002
Threat to avoidant coping to anxiety	-.011	.059	-.010	.002
Threat to fusion to avoidant coping to anxiety	-.004	.026	-.003	.001
Total model: R^2 = .53, p<.0001, f^2 = 1.1				

BCI = Bootstrapped confidence interval; LL = Lower Limit; UL = Upper Limit; IMM = Index of Moderated Mediation (not available for the total indirect effect)

Figure 2: Conditional Process Analysis – Depression



Key:

Direct path Indirect path Moderator

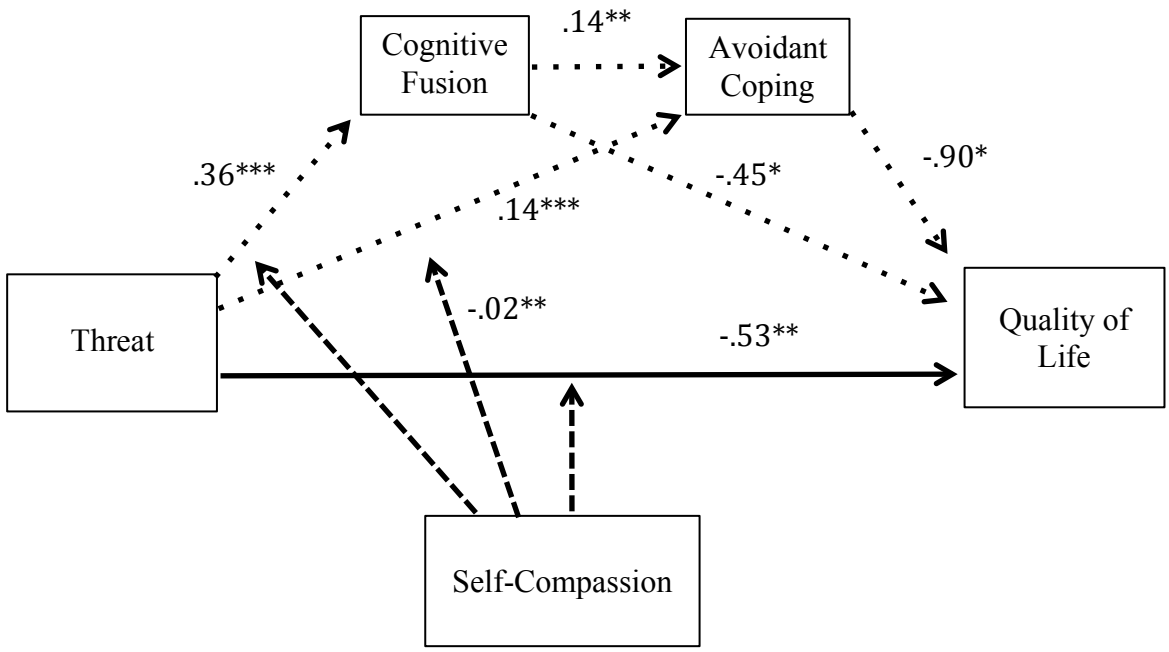
Numbers on the paths represent standardised β coefficients * p<.05 **p<.01 ***P<.001

Path	BCI		IMM	
	LL	UL	LL	UL
Direct effect threat to depression	-.004	.153	-.017	.016
Total indirect effect	.002	.109		
Threat to fusion to depression	-.043	.059	-.007	.005
Threat to avoidant coping to depression	.001	.075	-.011	.001
Threat to fusion to avoidant coping to depression	-.001	.031	-.004	.001

Total model: R^2 = .37, p<.0001, f^2 = .59

BCI = Bootstrapped confidence interval; LL = Lower Limit; UL = Upper Limit; IMM = Index of Moderated Mediation (i.e. self-compassion moderating the indirect effect) (IMM not available for the total indirect effect)

Figure 3: Conditional Process Analysis – Quality of Life



Key:

Direct path Indirect path Moderator

Numbers on the paths represent standardised β coefficients * p<.05 **p<.01 ***P<.001

Path	BCI		IMM	
	LL	UL	LL	UL
Direct effect threat to quality of life	-.861	-.192	-.092	.048
Total indirect effect	-.607	-.092		
Threat to fusion to quality of life	-.365	.026	-.002	.047
Threat to avoidant coping to quality of life	-.291	.006	-.005	.047
Threat to fusion to avoidant coping to quality of life	-.123	.005	-.001	.016

Total model: R^2 = .46, p<.0001, f^2 = .85

BCI = Bootstrapped confidence interval; LL = Lower Limit; UL = Upper Limit; IMM = Index of Moderated Mediation (i.e. self-compassion moderating the indirect effect) (IMM not available for the total indirect effect)

avoidant coping was significantly moderated by self compassion, but the overall indirect effect associated with this path (threat to avoidance to depression) was not mediated by self compassion. The model suggests a less prominent role for cognitive fusion in depressive symptoms, compared to its importance in anxiety symptoms. By contrast, avoidant coping appears more influential on mood disturbance.

For the model predicting quality of life, the direct path from threat appraisals is significant. In addition, the total indirect path is also significant, meaning that the influence of threat, via the combined mediators of fusion and avoidant coping is also significant, though none of the paths is significant alone. In the path model the direct influence of fusion alone is β=-.45, p<.05, and avoidance alone is β=-.90, p<.05. Self-compassion does not moderate any of the paths in the model, though does moderate the relationship between threat appraisal, and avoidant coping. The test of moderation of the relationship between threat appraisal and cognitive fusion by self-compassion approaches significance (β=-.03, p = .058, *ns*). Self-compassion does not moderate the direct influence of threat appraisal on quality of life and does not directly influence quality of life either (β=.10, p = .83, *ns*).

DISCUSSION

This study explored cancer related cognition, avoidance coping, self-compassion and cognitive fusion as predictors of distress and quality of life after cancer. Correlational analysis showed significant associations in predicted directions between aspects of mental adjustment / illness appraisal and anxiety, depression and quality of life. Specifically, threat related cognitions were associated with all of the outcomes. Also in line with previous findings, avoidant coping was associated with all three outcomes. The newer constructs of cognitive fusion and self-compassion were strongly associated with all three outcomes too.

Simultaneous linear regression compares the ability of each construct to predict the outcome, whilst controlling for the presence of the other predictors, giving a metric of each

construct's unique explanatory variance. The regression equations for all three outcomes were highly significant, with large proportions of variance explained. In addition, cognitive fusion was the strongest predictor of anxiety, illness cognitions and avoidance coping were the strongest predictors of depression and quality of life, when controlling for the presence of the other predictors. Previous studies have found avoidance coping to be a strong predictor of poorer adjustment in cancer populations (McCaul et al., 1999) and the current study supports these findings.

Self-compassion was associated with lower distress and increased quality of life in correlational analysis, but not after controlling for known predictors. This is in contrast to earlier studies (Pinto-Gouveia, Duarte, Matos & Fráguas, 2014; Wren et al., 2012). Although the results for the self-compassion were unexpected, previous studies have included fewer predictors. The current study examined self-compassion in comparison to other known and postulated predictors, resulting in a more stringent test for the newer constructs.

The CFQ demonstrated strong correlations with distress and quality of life consistent with previous studies (Gillanders et al., 2014), however it was not found to be a significant predictor of quality of life in the regression analysis. This is consistent with previous research in multiple sclerosis patients (Ferenbach, unpublished manuscript).

The conditional process analysis tested a theoretically driven model, in which having threatening thoughts about cancer would influence distress and quality of life both directly and indirectly via fusion and avoidance (consistent with the ACT model). In addition, predictions from ACT (and other therapies, such as compassion focussed therapy, Gilbert, 2010) suggest that self-compassion ought to moderate these relationships, buffering the negative effects of illness threat, fusion and avoidance.

This model was particularly successful in modelling anxiety symptoms as an outcome, with significant overall variance explained, significant direct and indirect effects and evidence of moderated mediation. This means that holding threatening appraisals of cancer, combined with higher levels of cognitive fusion, predicts anxiety. This path is moderated or buffered by higher levels of self-compassion (i.e. the direct and indirect effects are attenuated when self-compassion is higher).

The model predicting depression was also successful. Depression was more influenced by avoidant coping strategies than by fusion, in contrast to the anxiety model. Contrary to hypotheses, this model was not moderated by self-compassion, though the path between threat cognitions and avoidance was.

In terms of quality of life, the direct effect of illness threat was significant as was the total indirect path, but individual paths on their own were not significant. Self-compassion also did not moderate these paths. There were however, direct influences from cognitive fusion and avoidance to quality of life, and illness threat did also influence these variables. Despite this, the formal test of mediation showed that these constructs (fusion and avoidance) are unlikely to mediate the relationship between threat cognition and quality of life. They do however remain important treatment targets in their own right, due to their significant relationships with this outcome.

Theoretical Implications

The contribution of this study is two fold: firstly it provides a first step in comparing the relative predictive power of constructs derived from different theoretical models; secondly it tests the explanatory power of a theoretical model in which these constructs exert mutual influence in arriving at important outcomes such as distress and quality of life. The findings of the conditional process analysis suggest that constructs that are closely targeted in ACT (cognitive fusion and avoidance behaviour) represent more potent treatment targets in terms of their relationships with anxiety and depression, than for example distressing cognitions about cancer. This might suggest that changing how we relate to appraisals and reducing the behavioural regulatory impact of appraisals could be more effective than attempts to change the content of appraisal, supporting the ACT model more clearly than the cognitive model.

The analysis predicting quality of life however, contained significant direct effects from illness cognitions, suggesting cognitive content as an important theoretical factor. Such an analysis would be supportive of a cognitive approach to theoretical development. In addition, though fusion and avoidance do not mediate the influence of threat appraisal on quality of life, they continue to directly influence it in theoretically predicted directions.

This analysis demonstrates the importance of each of these constructs in understanding psychological adjustment following cancer, and suggests overlapping and interdependent processes influencing quality of life following cancer. Given these empirical findings, it would seem important to continue to theorise how threatening illness appraisals exert their influence over these outcomes, from *within* a contextual behavioural science framework. Further theorising on the synergy between cognitive content, cognitive fusion and overt behavioural strategies could build useful bridges between areas of psychology.

Whilst self compassion was an important moderator of a number of paths, it was surprising that it was not more influential, this was contrary to hypotheses. It must be acknowledged however that this is a cross sectional sample of people following cancer, who have a 'natural' level of self compassion. The normative data in Table 2 suggests they are similar to other normative populations, but the current models are only picking up relationships between natural variations in these constructs. Providing an intervention that increases self compassion (or that reduces defusion, avoidance, or even illness threat) may yet lead this construct to have greater importance in influencing these paths. A replication of this study in populations who had successfully undertaken compassion based or mindfulness interventions would allow a test of this hypothesis.

Clinical implications

Although more evidence is needed in order to identify the most effective psychological treatments for cancer patients, this study suggests avoidant coping, cognitive fusion and self-compassion to be important treatment targets, particularly when patients report prominent anxiety symptoms and perceive illness threat to be high. In patient presentations that are characterised by low mood and other depressive symptoms, the current results suggest that a focus on more active and less avoidant coping is warranted. The data lend some support for increasing self-compassion as a way to moderate the impact of cognition on avoidance. This suggests a focus on self-compassionate engagement in difficult and demanding situations will be likely to be of help. Finally, the total indirect path was significant in predicting quality of life; suggesting that a combined focus on reducing fusion, reducing avoidance and increasing self-compassion would be likely to be of benefit. In addition, directly targeting illness threats and modifying these perceptions

would also appear to be a viable treatment target, in circumstances where this may be possible.

In clinical practice, many of these constructs are evoked and manipulated simultaneously and so the lack of specificity in model 3 is not considered to be a particular problem from a contextual behavioural science perspective. By contrast the specificity of model 1 does suggest that cultivating a defused and compassionate stance towards one's experience is likely to lead to reduced distress, even in the presence of threatening cognitions. In some cancer situations changing appraisal may not be clinically warranted (due to the accurate nature of these beliefs) and the current data suggest alternative treatment routes under such circumstances.

Limitations of the Study

There are a number of limitations. The use of self-report measures may introduce subjective bias and the cross-sectional study design prevents causal inference. Similarly, the data cannot explore the dynamic interaction between these constructs over time. The sample was heterogeneous, with respect to cancer diagnosis and time since diagnosis. Data on disease stage and socio economic status was not gathered. The sample was also predominantly white British. These factors limit the generalizability of the findings.

It was interesting that the covariate analysis showed few relationships between variables that we would have expected to be important predictors of psychological processes and outcomes in this population. In particular, cancer survivorship, length of time since diagnosis and whether they are currently receiving treatment or not were expected to be influential and were not. This may simply be because the numbers of people in the sample classified as survivors or not survivors leads to difference tests that are low in power to detect differences between the other variables. Future studies should continue to carefully evaluate the impact of these clinical features on psychosocial adjustment.

Finally, the ordering of variables in the conditional process analysis requires sensitive interpretation. The order was based on the first steps of the empirical analysis (correlation and regression) and a theoretically driven model. Whilst this shed light on some of the interactions between these variables, the method is still limited to a somewhat linear analysis with one predictor and criterion at a time. Similar studies with larger samples

(>200) could further test how these constructs are related using structural equation modelling. Such methods can handle multiple predictors and multiple outcomes, as well as multiple mediators and moderators, though require far larger sample sizes to use them. Longitudinal studies could also determine the impact of psychological variables at time of diagnosis on later adjustment, and the unfolding of these processes over a period of naturalistic adjustment. Finally, the constructs observed in this study were static to one point in time, prior to any psychological intervention. It is likely that interventions to increase self-compassion, reduce fusion, reduce avoidance and promote engagement will lead to alterations in these variables and the patterns of relating among them.

Conclusion

The findings suggest that interventions targeting cognitive fusion and emotional avoidance, such as ACT, may be an effective treatment in addressing distress and adjustment difficulties in cancer patients. There is also likely to be a role for compassion based interventions and possibly even a role for direct cognitive change strategies where plausible (though these may be less ACT consistent). In this regard, further theorising on how to conceptualise cognitive change endeavours as *part of* contextual behavioural science could lead to practical guidance for targeting the influential relationships described in these data, whilst still remaining theoretically consistent.

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