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I am a total failure: associations between beliefs and anxiety and depression in patients with inflammatory bowel disease with poor mental quality of life

Floor Bennebroek Evertsz^{1*}, Mirjam A.G. Sprangers¹, Laura M. de Vries², Robbert Sanderman³, Pieter C.F. Stokkers⁴, Mathilde G.E. Verdam^{1,5}, Huibert Burger⁶ and Claudi L.H. Bockting⁷

¹Department of Medical Psychology, Amsterdam University of Medical Centres, University of Amsterdam, Meibergdreef 15, 1105 AZ Amsterdam, The Netherlands, ²Department of Medical Psychology, Amsterdam University of Medical Centres, Vrije University of Amsterdam, De Boelelaan 1118, 1081 HZ, Amsterdam, The Netherlands, ³Department of Health Psychology, University Medical Centre Groningen, University of Groningen, Antonius Deusinglaan 1, 9713 AV, Groningen, The Netherlands, ⁴Department of Gastroenterology, Sint Lucas Andreas Hospital, Jan Tooropstraat 164, 1061 AE, Amsterdam, The Netherlands, ⁵Research Institute of Child Development and Education, University of Amsterdam, Amsterdam, The Netherlands, ⁶Department of General Practice, University Medical Centre, University of Groningen, Antonius Deusinglaan 1, 9713 AV Groningen, The Netherlands and ⁷Department of Psychiatry, Amsterdam University of Medical Centres, University of Amsterdam, Meibergdreef 15, 1105 AZ Amsterdam, The Netherlands

*Corresponding author. Email: f.bennebroek@amsterdamumc.nl

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Abstract

Background: According to cognitive behavioural theory, cognitive factors (i.e. underlying *general* dysfunctional beliefs and (situation) *specific* illness beliefs) are theorized to lead to outcomes like anxiety and depression. In clinical practice, *general* dysfunctional beliefs are generally not tackled directly in short-term-therapy.

Aims: The goal of the present study was to investigate the associations of *general* versus *specific* illness beliefs on anxiety and depressive symptoms and psychiatric disorders among a subgroup of patients with inflammatory bowel disease (IBD) with poor mental quality of life (QoL).

Method: This study concerns cross-sectional data, collected at baseline from a randomized clinical trial. One hundred and eighteen patients, recruited at four Dutch hospitals, with poor QoL (score ≤ 23 on the mental health subscale of the Short-Form 36-item Health-Survey; SF-36) were included. *General* dysfunctional beliefs were measured by the Dysfunctional Attitude Scale (DAS), *specific* illness beliefs by the Illness Perceptions Questionnaire-Revised (IPQ-R), anxiety and depressive symptoms by the Hospital Anxiety and Depression Scale (HADS), and psychiatric disorders by the Structured Clinical Interview for DSM-IV Axis-I Disorders (SCID-I).

Results: Univariate analyses showed associations between the level of anxiety and/or depression and *general* dysfunctional beliefs and four *specific* illness beliefs (consequences, personal control, emotional representations and treatment control). Among patients with IBD with psychiatric disorders, only the DAS was significantly associated with anxiety and depression (DAS added to IPQ-R and IPQ-R added to DAS).

Conclusions: Psychological interventions may have to target *general* dysfunctional beliefs of patients with IBD with co-morbid psychiatric disorders to be effective. These patients with IBD are especially in need of psychological treatment.

Keywords: anxiety; depression; dysfunctional beliefs; illness beliefs; inflammatory bowel disease; psychiatric disorders

Introduction

Inflammatory bowel disease (IBD) consists of the gastrointestinal diseases Crohn's disease and ulcerative colitis (Mittermaier *et al.*, 2004). Crohn's disease is an inflammatory illness of the intestinal tract from the mouth to the anus. Ulcerative colitis is limited to inflammation of the colon. Physical complaints patients with IBD may experience include bowel pains, diarrhoea, weight loss, fatigue, fever attacks, (perianal) fistulas, joint pain and mucus and blood in faeces (Graff *et al.*, 2006; Greenley *et al.*, 2010). The onset of the disease is usually between 15 and 30 years of age. Exacerbations of IBD can be intense and unpredictable and are often accompanied by the aforementioned symptoms (Husain and Triadafilopoulos, 2004). Currently, the exact causal nature of IBD is unknown. Multiple factors (i.e. genetics, microbiota, environment and immune response) have a contribution to the aetiology of IBD (Zhang and Li, 2014).

General dysfunctional beliefs about the world, others, and self (e.g. 'I am a total failure') make one vulnerable for depression and anxiety disorders, particularly when confronted with life stressors (Beck, 1987; Beck *et al.*, 1979). In line with this view, previous research has indicated *general* dysfunctional beliefs to be a risk factor for the onset of episodes of depression and anxiety disorders in a group of primary care attendees (Weich *et al.*, 2003). Whereas research has been conducted on the association between *general* dysfunctional beliefs and psychiatric disorders (i.e. anxiety, depression, bipolar disorder) among the *general* population (Alatiq *et al.*, 2010; Otto *et al.*, 2007; Teasdale, 1988), research into *general* dysfunctional beliefs among specific somatic disease groups is scarce. To the best of our knowledge, there is only one study investigating the assessment of *general* dysfunctional beliefs in IBD and irritable bowel syndrome (IBS) (Kovacs and Kovacs, 2007). The results indicate that patients with IBS report more *general* dysfunctional beliefs compared with both IBD and healthy subjects, while IBD and healthy subjects did not differ with respect to these *general* dysfunctional beliefs.

Several studies investigated the role of *specific* illness beliefs (e.g. 'My illness has major consequences for my life') and their applicability to mental health behaviour in patients with medical conditions (e.g. myocardial infarction, type II diabetes) (Hagger *et al.*, 2016; Petrie *et al.*, 2007). Other studies among various chronic disease groups (i.e. atrial fibrillation, coronary artery disease, type II diabetes mellitus, multiple sclerosis) found associations between *specific* illness beliefs and psychological distress (Jopson and Moss-Morris, 2003; McCabe and Barnason, 2012; Skinner *et al.*, 2014; Stafford *et al.*, 2009). Additionally, associations have been reported between *specific* patients' illness beliefs about their psychiatric disorders (e.g. depression, eating disorders and schizophrenia) and the level of depressive and anxiety symptomatology (Baines and Wittkowski, 2013). Other studies have investigated the effect of *specific* illness beliefs on patients with IBD specifically (Dorrian *et al.*, 2009; Han *et al.*, 2005; Kiebles *et al.*, 2010; Knowles *et al.*, 2011; Rochelle and Fidler, 2013; van der Have *et al.*, 2013). Generally, studies focusing on IBD found that *specific* (illness) beliefs had a significant direct influence on the level of depression and anxiety patients experienced (Dorrian *et al.*, 2009; Knowles *et al.*, 2011; Rochelle and Fidler, 2013).

Specific illness beliefs were shown to have a significant direct influence on the level of depression and anxiety in patients with Crohn's disease (Knowles *et al.*, 2011). Three other studies focused on both Crohn's disease and ulcerative colitis (Dorrian *et al.*, 2009; Kiebles *et al.*, 2010; Rochelle and Fidler, 2013) and used the Revised-Illness-Perception-Questionnaire (IPQ-R) (Moss-Morris *et al.*, 2002) to measure the influence of *specific* illness beliefs on psychological distress. Two studies found that *specific* illness beliefs are associated with adjustment to IBD (Dorrian *et al.*, 2009; Kiebles *et al.*, 2010). The third study found that negative *specific* illness beliefs were related to higher levels of anxiety and depression in patients with IBD (Rochelle and Fidler, 2013).

According to Beck's Cognitive Behavioral Theory cognitive factors (both situation *specific* beliefs, such as *specific* illness beliefs and underlying *general* dysfunctional beliefs, described by

other authors as core beliefs or schemata) are theorized to lead to outcomes such as anxiety and depression (Clark and Beck, 2010). Our hypothesis is that, in line with the theory of Beck, *general* dysfunctional beliefs are just as, if not more, important as *specific* illness beliefs in targeting anxiety and depression in patients with a somatic illness.

Until now, no studies have investigated the comparison between *general* dysfunctional beliefs and/or *specific* illness beliefs and their association with anxiety and depressive symptomatology in patients with IBD. This study will focus on a subgroup of patients with IBD with a low level of mental quality of life (QoL) who participated in a randomized clinical trial investigating the effect of individual cognitive behavioral therapy on QoL, anxiety and depression, the so-called QL!C study (Bennebroek Evertsz' *et al.*, 2012; Bennebroek Evertsz' *et al.*, 2017).

The aim of this study is to examine the unique contributions of *general* dysfunctional beliefs and *specific* illness beliefs (explanatory variables) to the explained variance of anxiety and depressive symptomatology (outcome variable) among patients with IBD with poor mental QoL, measured using the mental health subscale of the Medical Outcomes Study 36-item Short Form Health Survey (SF-36) (Bennebroek Evertsz' *et al.*, 2012; Bennebroek Evertsz' *et al.*, 2017). We will specifically examine this objective in a patient subgroup with depressive disorder, anxiety disorders and/or adjustment disorders with anxiety and/or depressive symptomatology. We decided to add patients with an adjustment disorder to this group as within the group of patients with IBD many patients with adjustment disorders also have anxiety and/or depressive symptomatology. These patients seriously suffer from their somatic disease and treatment might be helpful, although adjustment disorders are differentiated from other mental disorders because of presumed differences in severity and consequences of the condition. Moreover, there are also studies indicating that in adjustment disorders the consequences can be severe (such as suicide), if not treated (Appart *et al.*, 2017).

Method

Participants and recruitment procedure

IBD patients were consecutively recruited from the Academic Medical Centre (AMC), Vrije Universiteit Medical Centre (VUmc), the Slotervaart and the Flevo hospitals for participation in the QL!C study (Bennebroek Evertsz' *et al.*, 2012; Bennebroek Evertsz' *et al.*, 2017). This is a cross-sectional observational design, i.e. baseline data were used of a randomized clinical trial. IBD was diagnosed and assessed by gastroenterologists at least 3–6 months before study entry. At the gastroenterology departments from the four participating medical centres, all patients with IBD were asked to complete the SF-36 (Ware and Sherbourne, 1992) as part of standard medical care. A three-step recruitment procedure was used. Firstly, patients with IBD were pre-selected with a score of ≤ 23 on the mental health subscale of the SF-36, indicative of poor mental QoL. The mental health subscale of the SF-36 consists of five items that require a response on a 6-point scale (range 5–30). The cut-off score of 23 is chosen, as scores of 23 or lower were found to be indicative of depression and anxiety in primary care patients, with a high level of sensitivity, but a rather low level of specificity (Means-Christensen *et al.*, 2005; van den Beukel *et al.*, 2012). Secondly, these patients were contacted by telephone to check if they were in need of psychological care and wanted to participate in the QL!C study and if so, a telephone-version of the semi-structured Structural Clinical Interview for DSM-IV Axis-I Disorders (SCID-I) interview (van Groenestijn *et al.*, 1999) was administered. Finally, patients completed a set of online or printed questionnaires at baseline before randomization.

Inclusion and exclusion criteria

Eligible patients had to meet the following inclusion criteria: (1) diagnosis of Crohn's disease or ulcerative colitis; (2) age above 18 years; (3) score of ≤ 23 on the mental health subscale of the

SF-36; (4) physically and mentally able to attend eight weekly sessions; and (5) sufficient command of Dutch. Exclusion criteria were: (1) current psychotherapy; and (2) severe other psychiatric disorders (i.e. substance abuse, bipolar disorder, or psychosis) as assessed with the SCID-I (van Groenestijn *et al.*, 1999).

Structural Clinical Interview for DSM-IV Disorders-I (SCID-I)

The SCID-I assesses Axis I psychiatric diagnoses (e.g. anxiety and depression disorders) and is a semi-structured clinical interview (van Groenestijn *et al.*, 1999). The duration of administration can be up to two hours. The SCID-I was administered by telephone, by experienced psychologists who received a specific training by a clinical psychologist. These structural interviews were audiotaped and verified by a clinical psychologist.

General dysfunctional beliefs

General dysfunctional beliefs (attitudes) are measured by the Dysfunctional Attitude Scale (DAS) (Riskind *et al.*, 1983), a measure of depression-related beliefs. It consists of 40 items, for example 'If a person asks for help, it is a sign of weakness', 'What other people think about me is very important' and 'My value as a person depends greatly on what others think of me'. Each item can be answered on a 7-point scale ranging from -3 (strongly disagree) to 3 (strongly agree). Higher scores indicate higher levels of *general* dysfunctional beliefs. The DAS demonstrates good reliability and convergent construct validity (de Graaf *et al.*, 2009; Riskind *et al.*, 1983).

Specific illness beliefs

Specific illness-related beliefs (cognitions) are measured by the Revised Illness Perception Questionnaire (IPQ-R) (Moss-Morris *et al.*, 2002). This questionnaire consists of seven subscales. The consequences subscale (6 items) describes the effect of the disease on physical ('My illness is a serious condition'), psychological ('My illness has major consequences on my life') and social functioning ('My illness causes difficulties for those who are close to me'). The personal and treatment control subscales (both 6 items) contain questions about whether the illness or its effects can be modified by personal interference ('What I do can determine whether my illness gets better or worse') or treatment interference ('My treatment can control my illness'), respectively. The emotional representation subscale (6 items) expresses the experienced negative emotions caused by the illness. The illness coherence subscale (5 items) measures the patient's understanding of his or her illness. The timeline acute/chronic subscale (6 items) incorporates questions on the extent to which the illness is regarded as being chronic or acute and the subscale timeline cyclic (4 items) represents the perceived changeability of the illness symptoms.

Each item can be answered on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Low scores on the two subscales personal control and treatment control indicate *dysfunctional* illness-related beliefs, and low scores on the other subscales indicate functional illness-related beliefs. The IPQ-R is considered a valid measure of illness perceptions in mental health in patients with several somatic diseases (Baines and Wittkowski, 2013).

Anxiety and depressive symptomatology

Anxiety and depressive symptoms combined were assessed as the total score on the standardized and validated Hospital Anxiety and Depression Scale (HADS) (Spinhoven *et al.*, 1997). The HADS-total consists of 14 items, divided into two 7-item subscales for anxiety and depression, which range from 0 (no complaints) to 21 (maximum complaints). Scores are derived by summing responses for each of the two subscales or for the scale as a whole. Higher scores indicate greater

levels of anxiety or depressive symptomatology (Spinhoven *et al.*, 1997). The HADS yields good levels of reliability and validity in assessing anxiety disorders and depression in patients and in the general population (Bjelland *et al.*, 2002; Spinhoven *et al.*, 1997).

Statistical analysis

In case of missing data, we used multiple imputation as this is the preferred approach leading to less bias and more statistical power compared with complete case analyses (Rubin, 1987). We used a set of ten imputations for each missing data point, and analyses of the resulting ten datasets were subsequently pooled using the established Rubin's rules (Rubin, 1987). Ten data sets are generally considered amply sufficient to account for missing data uncertainty (de Graaf *et al.*, 2010). The imputation model included all variables used in the analyses as recommended (de Graaf *et al.*, 2010). We imputed under the assumption that the missingness mechanism was missing at random (MAR) or missing completely at random (MCAR).

Bivariate Pearson's correlations between the DAS total score and the IPQR subscales were calculated to examine the degree of overlap between the two questionnaires.

To examine the non-unique (univariable) and unique (multivariable) contribution of *general* dysfunctional beliefs and *specific* illness beliefs to the explained variance of anxiety and depressive symptomatology, a series of linear regression analyses were performed. In each of these analyses, the DAS total score and the IPQR subscale scores served as independent variables and the HADS-total score as the dependent variable. First, the associations between the DAS total score and the IPQR subscale scores with the HADS-total score were analysed separately using univariate regression models. Second, we used a multivariable regression model to investigate the unique association of the DAS total score and all seven IPQR scores with the HADS-total score. In subsequent analyses, we studied the extent to which the *specific* illness beliefs had added predictive value over and above the *general* dysfunctional beliefs by evaluating whether the model improved when the total set of IPQR variables were added to the DAS. Improvement in predictive power was assessed in terms of R^2 change and its statistical significance using the *F*-test. The same procedure was followed to evaluate the reverse, i.e. the added value of DAS total to IPQR subscales. In addition, we repeated the analyses while adjusting for the potential confounders (i.e. gender, being in a relationship (yes/no), level of education (low or high), being employed (yes/no), and number of operations (as a proxy for IBD severity)) by adding them as independent variables in the regression equations.

The analyses of model improvement were repeated within a subsample of patients with IBD who have a depressive disorder and/or anxiety disorder, and/or an adjustment disorder with anxiety and/or depressive symptomatology. As pooled results for analyses of model improvement were unavailable, results of unimputed data were reported. For reasons of statistical power, we refrained from adjustment for potential confounders in these subsample analyses. Furthermore, the results of these subgroup analyses must be considered exploratory as we did not formally assess the statistical significance of the interaction between the presence of one of these disorders on the one hand and the *general* dysfunctional beliefs and *specific* illness belief items on the other, due to lack of statistical power.

The level of statistical significance was set at 0.05, two-sided. In addition to *p*-values, we report unstandardized regression coefficients (B) with confidence intervals to indicate their range of likely values. In addition, we report standardized regression coefficients (β) to evaluate the size of effects, where values of .1, .3 and .5 can be interpreted as indicating small, medium and large effects, respectively (Cohen, 1988). The adjusted R^2 is used to evaluate the explained variance of the HADS-total score. All analyses were performed using IBM SPSS Statistics version 20.0.

Table 1. Demographic and clinical baseline characteristics of the subgroup of patients with IBD and poor mental QoL

<i>n</i> = 118		%
Gender		
Female	75	(63.6)
In a relationship	64	(54.2)
Level of education		
Low (primary or secondary)	64	(54.2)
High (college or university)	54	(45.8)
Employment		
Employed or studying	72	(61.0)
Unemployed	46	(39.0)
Sick leave	24	(20.3)
Hospital type		
Academic	79	(67.0)
Diagnosis		
Ulcerative colitis	50	(42.4)
Crohn's disease	68	(57.6)
Disease duration in years	11.2 (0.3–46.0)	
Number of operations		
None	73	(61.9)
≥1	45	(38.1)
Stoma	6	(5.1)
Medication		
Prednisone	28	(23.7)
Anti-depressant	6	(5.1)
Family member(s) with IBD	30	(25.4)

Values are means (*SD*) unless stated otherwise.

Results

Demographic and clinical characteristics

Demographic and clinical characteristics of the participants with IBD and poor mental QoL of the QL!C study (*n* = 118) are summarized in Table 1. Nearly two-thirds (63.6%) of the IBD sample was female, and the mean age was 39.0 years (range 19.4–76.5).

Association of general dysfunctional beliefs and specific illness beliefs with the level of anxiety and depressive symptomatology

Missing values for HADS were 5%, for DAS 7%, and for IPQR 14%. These missing data were replaced using multiple imputation. The correlations between the subscales of the IPQ-R and the DAS were close to zero (all < .1) and not significant, indicating that the two questionnaires provide distinct information.

Univariate analyses showed significant associations between the level of anxiety and/or depression (HADS) and *general* dysfunctional beliefs as measured by the DAS total and four IPQR subscales (respectively: consequences, personal control, emotional representations and treatment control; see Table 2).

Unique association of general dysfunctional beliefs or specific illness beliefs with anxiety and depression symptomatology

General dysfunctional beliefs and *specific* illness beliefs explained 14.9 and 25% of the variance of HADS-total, respectively.

In the multivariate regression analysis (see Table 3), both the *general* dysfunctional beliefs (DAS total) and the IPQR subscale emotional representations showed a significant unique association (i.e. remained statistically significant) with depression and anxiety (HADS-total).

Table 2. Univariate analysis: association of *general* dysfunctional beliefs (DAS-total) and *specific* illness beliefs (IPQ-R) with anxiety and depressive symptomatology (HADS-total)

Independent variables	B ***	β^{**}	<i>p</i>	CI (95%) for	
				Lower	Upper
<i>DAS</i>					
DAS total score	.123	.339	.000*	.061	.185
<i>IPQR</i>					
Consequences	.802	.454	.000*	.474	1.130
Treatment control	-.716	-.335	.001*	-1.147	-.286
Emotional representations	.774	.452	.000*	.476	1.072
Illness coherence	-.388	-.144	.151	-.919	.143
Personal control	-.516	-.281	.008*	-.898	-.133
Timeline cyclical	.418	.143	.109	-.093	.929
Timeline acute/chronic	.269	.149	.189	-.133	.670

Dependent variable: HADS-total. CI (95%) = 95% confidence interval.

***B is the unstandardized regression coefficient, where 1 point increase in the predictor variable (e.g. DAS total score) is associated with B point(s) increase in the dependent variable (i.e. HADS total score).

** β is the standardized regression coefficient, where 1 standard deviation increase in the predictor variable (e.g. DAS total score) is associated with β point(s) increase in the dependent variable (i.e. HADS total score). Standardized β s were based on the original unimputed data.

*Bold values are significant ($p < .05$).

Table 3. Multivariable analysis: independent contributions of *specific* illness beliefs (IPQR) and *general* dysfunctional beliefs (DAS-total) in the prediction of anxiety and depression symptomatology (HADS-total)

Independent variables	B ***	β^{**}	<i>p</i>	CI (95%) for BB	
				Lower	Upper
<i>DAS</i>					
DAS total score	.102	.263	.001*	.043	.160
<i>IPQR</i>					
Consequences	.324	.201	.102	-.065	.713
Treatment control	-.266	-.129	.320	-.795	.262
Emotional Representations	.506	.277	.003*	.175	.837
Illness coherence	.186	.075	.499	-.359	.732
Personal control	-.195	-.107	.281	-.550	.160
Timeline cyclical	.168	.057	.453	-.273	.609
Timeline acute/chronic	-.020	-.019	.922	-.414	.374

CI (95%) = 95% confidence interval

***B is the unstandardized regression coefficient, where 1 point increase in the predictor variable (e.g. DAS total score) is associated with B point(s) increase in the dependent variable (i.e. HADS total score)

** β is the standardized regression coefficient, where 1 standard deviation increase in the predictor variable (e.g. DAS total score) is associated with β point(s) increase in the dependent variable (i.e. HADS total score). Standardized β s were based on the original unimputed data.

*Bold values are significant ($p < .05$)

The added value of the DAS relative to IPQR was investigated. The results indicate that the DAS provides a unique contribution over and above the IPQR subscales in their association with the level of anxiety and depression (HADS-total) (IPQ-R added to DAS: R^2 change = 0.264, $F_{\text{change}} = 5.38$, $p < 0.001$ and DAS added to IPQR: R^2 change = 0.066, $F_{\text{change}} = 9.41$, $p = 0.003$).

Adjustment for potential confounders in both the univariable and multivariable analyses did not change the conclusions. The pattern of statistical significance remained unaltered while unstandardized regression coefficients decreased less than 25% upon adjustment.

The prevalence rates of *DSM-IV psychiatric disorders* among the patients with IBD are summarized in Table 4. Among 78 patients with IBD and psychiatric disorders (i.e. depressive

Table 4. Prevalence of psychiatric disorders among patients with IBD and poor mental QoL

<i>n</i> = 118		%
Current psychiatric disorder	83	70.3
Psychiatric disorder with co-morbidity	41	34.7
Mood disorder (current and past)	54	45.8
Current depressive episode	23	19.5
Past depressive episode	42	35.6
Current manic episode	0	—
Past manic episode	2	1.7
Current dysthymic disorder	3	2.5
Current hypomanic episode	0	—
Past hypomanic episode	0	—
Mood disorder with co-morbidity	38	32.2
Anxiety disorder (current)	37	31.4
Panic disorder	7	5.9
Panic disorder with agoraphobia	4	3.4
Agoraphobia without history of panic disorder	2	1.7
Social phobia	5	4.2
Specific phobia	11	9.3
Obsessive compulsive disorder	1	0.8
Post-traumatic stress disorder	8	6.7
Generalized anxiety disorder	8	6.7
Anxiety due to a somatic disorder	0	—
Anxiety due to substance use	0	—
Anxiety disorder with co-morbidity	27	22.9
Somatiform disorder (current)	1	.8
Somatization disorder	0	—
Pain disorder	0	—
Undifferentiated somatoform disorder	1	.8
Hypochondriasis	0	—
Body dysmorphic disorder	0	—
Somatiform disorder with co-morbidity	0	—
Eating disorder (current)	6	5.1
Anorexia nervosa	3	2.5
Bulimia nervosa	2	1.7
Eating disorder not otherwise specified	1	.8
Eating disorder with comorbidity	6	5.1
Adjustment disorder (current)	36	30.5
Adjustment disorder with depressed mood	21	17.8
Adjustment disorder with anxiety	6	5.1
Adjustment disorder with mixed anxiety and depressed mood	6	5.1
Adjustment disorder with disturbance of conduct	0	—
Adjustment disorder with mixed disturbance of emotions and conduct	0	—
Adjustment disorder (unspecified)	3	2.5
Adjustment disorder with co-morbidity	9	7.6
Alcohol related disorder (current)	2	1.7
Alcohol abuse	1	.8
Alcohol dependence	1	0.8
Alcohol-related disorder with co-morbidity	2	1.7
Disorder related to substance abuse (current)	0	—
Sedative-related disorders	0	—
Cannabis-related disorders	0	—
Stimulant-related disorders	0	—
Opioid-related disorders	0	—
Cocaine-related disorders	0	—
Hallucinogen-related disorders	0	—
Polysubstance-related disorders	0	—
Other substance-related disorders	0	—
Disorder related to substance abuse with co-morbidity	0	—
Psychotic disorder (current)	0	—

Psychiatric disorders are not mutually exclusive, patients could have more than one psychiatric disorder.

disorder and/or anxiety disorders and/or an adjustment disorder with anxiety and/or depressive symptomatology), the DAS had statistically significantly added predictive value for anxiety and depression, not vice versa (DAS added to the IPQ-R: R^2 change = 0.074, $F_{\text{change}} = 5.316$, $p = 0.025$ and IPQ-R added to DAS: R^2 change = 0.187, $F_{\text{change}} = 1.926$, $p = 0.083$). Analyses were based on 63 patients with complete baselines.

Discussion

Our study shows that *general* dysfunctional beliefs of patients with IBD are associated with the level of anxiety and depression. *Specific* illness beliefs in the domains of illness consequences, personal-, and treatment control and emotional representations of the illness are, according to the univariate analysis, also associated with anxiety and depression in the total patient group. The *specific* illness beliefs combined were superior in explaining unique variance in depressive and anxious symptoms compared with the *general* dysfunctional beliefs.

Our findings regarding *specific* illness beliefs indicate that patients with IBD who believe that their illness has serious consequences and patients who have negative emotions related to their illness are more likely to have a higher level of anxiety and depression. Moreover, patients with a low sense of illness control (due to treatment or their own behaviour) report more anxiety and depressive symptoms. Similar results are found in previous studies, investigating the association between perceived serious consequences of patients' illness and psychological distress in various chronic disease groups (i.e. atrial fibrillation, rheumatoid arthritis, multiple sclerosis, coronary artery disease, cardiovascular disease and type 2 diabetes mellitus) (Grace *et al.*, 2005; Groarke *et al.*, 2004; Jopson and Moss-Morris, 2003; McCabe and Barnason, 2012; Skinner *et al.*, 2014; Stafford *et al.*, 2009). Prior research on the influence of personal or treatment control on psychological distress showed mixed results for various disease groups (Grace *et al.*, 2005; Groarke *et al.*, 2004; Jopson and Moss-Morris, 2003; McCabe and Barnason, 2012; Skinner *et al.*, 2014; Stafford *et al.*, 2009). The association found for negative emotions is in agreement with the findings of an earlier study among patients with IBD (Dorrian *et al.*, 2009).

General dysfunctional beliefs (but not *specific* illness beliefs) provided a unique contribution to the association with anxiety and depressive symptomatology in the subsample of patients with IBD with depressive disorder, anxiety disorders and/or adjustment disorders. Therefore psychological interventions in patients with IBD with a co-morbid depressive disorder, anxiety disorders, and adjustment disorders might have to specifically target *general* dysfunctional beliefs especially instead of *specific* illness beliefs. A common psychological treatment to treat depression and anxiety is cognitive behavioural therapy, based on Beck's cognitive model (Beck, 1987; Beck *et al.*, 1979). Cognitive therapists teach patients to identify and challenge their enduring *general* dysfunctional beliefs as well as automatic negative thoughts (such as *specific* illness beliefs). Moreover, several studies (Ellis, 2000) suggested changing both *general* dysfunctional beliefs and *specific* illness beliefs to make patients more resilient to a broader range of future life events. Future studies are needed to investigate the added value of addressing *specific* illness beliefs above *general* dysfunctional beliefs on therapy outcomes.

Overall, no association was found between the level of anxiety and depression on the remaining patient's *specific* illness beliefs, i.e. understanding their illness, the extent to which the illness is perceived as being chronic or acute and the perceived changeability of the illness. This finding is not totally surprising as earlier studies on IBD (Dorrian *et al.*, 2009; Kiebles *et al.*, 2010) and atrial fibrillation (McCabe and Barnason, 2012) showed inconsistent results with regard to the relationship between patient's understanding of their illness and psychological distress. In two studies a better understanding was found to correlate with lower levels of psychological distress (Dorrian *et al.*, 2009; McCabe and Barnason, 2012) whereas another study also did not find an

association (Kiebles *et al.*, 2010). This inconsistent relationship might depend on factors such as coping styles, personal characteristics, and the severity of the illness.

With respect to the perceived chronicity or the acuteness of the disease (subscale 'timeline' of the IPQ-R), our findings are in line with previous research. Other studies focusing on IBD (Dorrian *et al.*, 2009; Kiebles *et al.*, 2010) and atrial fibrillation (McCabe and Barnason, 2012) similarly did not find an association with psychological distress. In contrast to our study, perceiving symptoms as cyclic and unpredictable (i.e. the perceived changeability of the illness) was reported to be a risk factor for anxiety (Dorrian *et al.*, 2009; McCabe and Barnason, 2012). We have no explanation for these inconsistent results.

Some limitations of this study merit attention. Because our findings are based on cross-sectional data, we cannot infer a causal relationship between *general* dysfunctional beliefs and/or *specific* illness beliefs and the level of anxiety and depression. Prospective research is needed to examine this causality.

Additionally, we stated that psychological interventions in patients with IBD with a co-morbid depressive disorder, anxiety disorders, and adjustment disorders might have to target *general* dysfunctional beliefs especially instead of *specific* illness beliefs. Further research is suggested as this finding was demonstrated in a limited sample and was therefore considered exploratory.

This study has several strengths. Firstly, recruitment of patients with IBD took place in two academic and two peripheral medical centres. As these centers treat patients with different severity, the results are likely to apply to a wide spectrum of patients with IBD, enhancing the generalizability of this study. Secondly, we selected patients with IBD with a poor level of mental QoL. These patients suffer most and are the ones who are most in need of psychological help. To the best of our knowledge, no study has previously selected patients based on their initial well-being. Lastly, in our study, we used the SCID-I (van Groenestijn *et al.*, 1999) that is regarded as the 'gold standard' when it comes to determining the accuracy of psychiatric diagnoses.

Conclusions

Both *general* dysfunctional beliefs and some *specific* illness beliefs were found to be associated with anxiety and depressive symptomatology. Particularly, psychological interventions may have to target especially *general* dysfunctional beliefs of patients with IBD with co-morbid psychiatric disorders to be effective, as is common in CBT. It should be noted that this only applies to those who have poor mental QoL.

According to our previous research (Bennebroek Evertsz' *et al.*, 2017), prevalence of psychiatric disorders in patients with IBD with poor mental QoL was found to be high. The used screening procedure in which patients are screened on QoL and subsequently on psychiatric disorders appeared to be feasible in the hospital environment. In general, our research findings underline the need for psychological treatment for this group of patients with IBD.

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Ethical statements. Authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the APA. The QL!C study protocol (F. Bennebroek Evertsz' *et al.*, 2012) was approved by the MEC of the AMC Amsterdam and confirmed by the institutional ethics review committees from the participating medical centers (i.e. Flevo Hospital, Slotervaart Hospital, VUmc).

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Authors' contributions. F.B.E., C.B., M.S. and R.S. designed the study. F.B.E. drafted the paper (which was added and modified by all other authors) and was responsible for the supervision of the psychologists who administered the SCID-I by telephone. H.B. and M.G.E.V. contributed to the analytic strategy. All authors read and approved the final manuscript.

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