# Extending the Common Sense Model to Explore the Impact of Visceral Sensitivity on Quality of Life in Inflammatory Bowel Disease

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## ABSTRACT

**Background:** *Inflammatory bowel disease is associated with poor quality of life. The aim of the cross-sectional study was to extend the common sense model to explore the impact of inflammatory bowel disease activity on quality of life and the potential mediating roles of illness perceptions, visceral sensitivity, coping styles, acceptance, and psychological distress.*

**Methods:** *A total of 141 inflammatory bowel disease patients (86 with Crohn's disease and 55 with ulcerative colitis; 74 males, 65 females, and 2 gender non-specific, mean age 40.43 years) from 2 metropolitan hospital inflammatory bowel disease outpatient clinics participated. Measures included disease activity (Crohn's Disease Activity Index, Simple Clinical Colitis Activity Index), illness perceptions (Brief Illness Perceptions Questionnaire), visceral sensitivity (Visceral Sensitivity Index), coping styles (Brief Coping Operations Preference Enquiry), acceptance (Acceptance and Action Questionnaire-II), psychological distress (Depression, Anxiety, and Stress Scale), and European Health Interview Survey-Quality of Life (EUROHIS-QoL).*

**Results:** *A structural equation model of the extended common sense model was found to have a good fit ($\chi^2(10) = 10.07$, $P = .43$, root mean square error of approximation = 0.01, standardized root mean residual = 0.04, comparative index fit = 1.00, Tucker–Lewis index = 1.00, goodness-of-fit = 0.98). After controlling for irritable bowel syndrome diagnosis, the impact of disease activity on quality of life was statistically mediated by illness perceptions, maladaptive coping styles, and psychological distress. In addition, visceral sensitivity bordered on influencing the impact of disease activity and illness perceptions on quality of life through psychological distress.*

**Conclusions:** *This study demonstrates that together with illness perceptions and coping styles, visceral sensitivity plays an important role in an individual's adaption to living with inflammatory bowel disease.*

**Keywords:** *Common sense model, illness perceptions, inflammatory bowel disease, psychological distress, quality of life, visceral sensitivity*

## INTRODUCTION

Individuals living with inflammatory bowel disease (IBD) frequently report psychological distress (i.e., up to 66%)[1] and poor quality of life (QoL),[2] especially during times of active disease.[1] In turn, IBD-related psychological distress is associated with poorer QoL.[3] Given the chronic nature of IBD and its significant impact on illness adjustment, such as psychological distress and QoL, identification of modifiable psychosocial processes that can be targeted in psychological interventions is essential.

The common sense model (CSM)[4] has been applied across multiple chronic illnesses demonstrating strong evidence for its utility in identifying and evaluating the role of modifiable psychosocial processes,[5] with illness perceptions (e.g., beliefs about control, consequences) and individual coping styles (e.g., cognitive and behavioral strategies undertaken to manage stress) being key components. Research applying the CSM in cohorts with IBD has found that illness perceptions mediate the relationships between IBD activity/symptoms and psychological distress and QoL and also directly influence individual coping styles.[3] In turn, coping styles, with maladaptive coping styles (e.g., behavioral disengagement) being the most predominant, mediate the relationships between illness perceptions and psychological distress, and QoL.[3]

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A recent review of the CSM research involving IBD cohorts[3] recommended extending the CSM in IBD cohorts by including acceptance (i.e., a preparedness to connect with negative private experiences)[6] and gastrointestinal-specific modifiable psychosocial variables, such as visceral sensitivity (i.e., gastrointestinal-focused anxiety).[7,8] Given that IBD and irritable bowel syndrome (IBS) share some clinically relevant features (e.g., symptoms such as diarrhea, constipation, and abdominal pain), it is reasonable to expect that psychosocial processes acknowledged as influencing outcomes in IBS cohorts, such as visceral sensitivity[7,8] and acceptance,[7] may also be relevant to IBD. However, the number of IBD studies exploring visceral sensitivity is limited in number and scope to physiology.[9] Only 3 studies have explored psychological distress and/or QoL, with all 3 reporting that visceral sensitivity had a detrimental impact on these IBD outcomes.[10-12] As identified by Ceuleers et al.[13] a physiological process that may facilitate visceral sensitivity in IBD cohorts is nerve inflammation. With regards to acceptance, no studies involving IBD cohorts have evaluated acceptance in relation to psychological distress, and only one has examined QoL, which found a significant positive association with acceptance.[6]

The current literature provides strong evidence of associations between disease activity, illness perceptions, coping styles, psychological distress, and QoL in IBD. Similarly, visceral sensitivity and acceptance have been acknowledged as significantly influencing outcomes in individuals living with IBS. Despite the research demonstrating these relationships and the high prevalence of comorbidity of IBS in IBD (up to 39%),[14] no study to date has evaluated these psychosocial variables together in an IBD cohort. Therefore, using structural equation modeling (SEM), the aim of the study was to extend the CSM to explore the potential relationships between disease activity, illness perceptions, visceral sensitivity, coping styles, acceptance, psychological distress, and QoL in an IBD cohort. It was hypothesized that increased disease activity, illness perceptions, visceral sensitivity, maladaptive coping styles, psychological distress, and decreased acceptance and adaptive coping would be associated with poorer QoL. Consistent with the CSM, it was also hypothesized that the relationship between disease activity and QoL would be statistically mediated by illness perceptions, visceral sensitivity, coping styles, acceptance, and psychological distress.

### Main Points

- *The common sense model (CSM) is a well-validated framework which proposes that the impact of illness stimuli (e.g., inflammatory bowel disease [IBD] activity) on patient-reported outcomes (e.g., psychological distress and quality of life) is influenced by modifiable psychosocial processes including perceptions that individuals have relating to their illness (illness perceptions) and how they cope (coping styles).*
- *Consistent with past research, this study demonstrated that illness perceptions and coping styles influenced the impact of IBD activity on quality of life. That is, poorer illness perceptions (e.g., perceived inability to manage IBD) and maladaptive coping (e.g., behavioral disengagement) were associated with increased psychological distress and poorer quality of life.*
- *Extending past research, this study provided evidence that greater gastrointestinal-focused anxiety (visceral sensitivity) was also associated with increased psychological distress and poorer quality of life.*
- *Interventions should target modifiable psychological processes, especially poor illness perceptions, visceral sensitivity, and maladaptive coping styles, to improve the quality of life for those living with IBD.*

## MATERIALS AND METHODS

This was a cross-sectional study to evaluate the disease activity, illness perceptions, visceral sensitivity, acceptance, coping styles, psychological distress, and QoL in patients attending the hospital IBD outpatient clinics. The study was conducted between October 30, 2019, and December 18, 2019. Gastroenterologists provided information relating to patients' IBD diagnosis, disease activity, and current medications. Irritable bowel syndrome diagnosis was determined by the presence or absence of symptoms compatible with Rome IV-defined IBS[15] with a fecal calprotectin <250 µg/g (where available) and/or the gastroenterologist's clinical assessment (based upon clinical information available such as inflammatory markers, ultrasound, colonoscopy, and sigmoidoscopy). Patients could complete the questionnaire in the clinic or at a time and place convenient to them and were asked to return the questionnaire using a prepaid envelope.

### Participants

A total of 141 participants (74 males, 65 females, and 2 gender non-specific) with IBD (86 Crohn's disease and 55 ulcerative colitis) from 2 metropolitan hospital IBD outpatient clinics were included in the study. Mean age was 40.43 years (standard deviation (SD) = 13.51 years). Of the 141 participants, 56 (40%) were married, 50 (36%) were single, 24 (17%) were de facto, and 9 (7%) were either separated, widowed, or divorced. The mean duration of diagnosed IBD was 114 (range 1-436) months. Forty-six

patients (32%) had active disease, 19 (14%) were diagnosed with comorbid IBS (as defined by the Rome IV criteria),[15] and 53 (37%) reported a history of at least 1 surgery. Current medications taken were aminosalicylates (n = 38, 27%), immunomodulators (n = 68, 48%), corticosteroids (n = 10, 7%), biologics (n = 73, 51%), and antibiotics (n = 3, 2%).

Inclusion criteria were age over 18 years, a diagnosis of IBD, and an ability to give informed consent. Exclusion criteria were an inability to understand written English, a diagnosis of IBD unclassified, and individuals with an end ileostomy or colostomy. Ethical approval to conduct this research was obtained from the Hospital (SERP Approval Certificate 51207) and university (Ref: 20190363-288) Research Ethics Committees. Written informed consent was obtained from all individual participants included in the study.

## *DISEASE ASSESSMENT AND MEASURES*

### *Gastroenterologist-Completed Questionnaires*

#### Crohn's disease activity

The Crohn's Disease Activity Index (CDAI)[16] is an 8-item questionnaire evaluating the activity of Crohn's disease that is completed by the clinician and includes medical and patient-reported information. The CDAI assesses disease symptoms from the previous week and includes measurement of pain, diarrhea, and general well-being, the presence of extra-intestinal symptoms such as arthralgia, skin, or ocular manifestations, and fever, and concurrent use of antidiarrheal medication. The patients' weight, hematocrit, and presence of abdominal masses are also included. The total CDAI score is the sum of subscores from the 8 items, with a total CDAI score <150 representing clinical remission.

#### Ulcerative colitis activity

The Simple Clinical Colitis Activity Index (SCCAI)[17] is a 6-item questionnaire evaluating disease activity in ulcerative colitis that is completed by the clinician and includes medical and patient-reported information. The questionnaire assesses disease symptoms from the previous week. It is composed of 6 domains: bowel frequency scores (during the day) ranging from 0 to 3, bowel frequency (during the night) scores ranging from 0 to 2, urgency of defecation ranging from none (0) to incontinence (3), blood in stool ranging from none (0) to usually frank (3), general well-being ranging from very well (0) to terrible (4), and a number of defined extracolonic features of ulcerative colitis (e.g., arthritis). The total SCCAI score (range 0-19) is the sum of sub-scores from the 6 items, with a total SCCAI score <5 representing clinical remission.

#### Standardized disease activity

To allow comparison across Crohn's disease and ulcerative colitis disease activity, a standardized continuous score based on transforming an individual's CDAI or SCCAI score was created, and this will be referred to as "disease activity."

### *Participant-Completed Questionnaires*

#### Illness perceptions

The Brief Illness Perceptions Questionnaire (BIPQ)[18] is an 8-item questionnaire evaluating perceptions of illness across 8 dimensions: consequences, timeline, personal control, treatment control, identity, concern, comprehensibility, and emotional response. Each item is assessed on an 11-point Likert-type scale with subscale ranging from 0 (not at all) to 10 (severely affects my life). Based on an exploratory factor analysis using the principal axis factoring method with an Oblimin rotation and Cronbach's α with item-if-deleted analyses, the BIPQ identified a 5-item factor solution. The 5 items composed of: "How much does your illness affect your life," "How much control do you feel you have over your illness," "How much do you experience symptoms from your illness," "How concerned are you about your illness," and "How much does your illness affect you emotionally" had shown good internal consistency (0.79). The brief illness perceptions score is the average of the 5 items, with higher scores reflecting poorer illness perceptions.

#### Visceral sensitivity

The Visceral Sensitivity Index (VSI)[19] is a 15-item questionnaire evaluating anxiety related to gastrointestinal sensations, symptoms, or the contexts in which these may occur. The VSI is designed to measure gastrointestinal-specific anxiety across 5 dimensions: worry, fear, vigilance, sensitivity, and avoidance. For example, "I often worry about problems in my belly" is assessed on a 6-point Likert-type scale: 0 (strongly agree) to 5 (strongly disagree), reversed and summed to give a VSI total (range 0-75), with higher scores indicating more gastrointestinal-specific anxiety. The VSI demonstrated strong internal consistency (0.95).

#### Acceptance

The Acceptance and Action Questionnaire-II (AAQ-II)[20] is a 7-item questionnaire evaluating acceptance/psychological

inflexibility. Participants reflect on experiences and feelings and indicate how true each of the 7 statements is for them. For example, "I'm afraid of my feelings" is assessed on a 7-point Likert-type scale with subscale ranging from 1 (never true) to 7 (always true). The AAQ-II total is the sum of the 7 items (range 7-49), with higher scores representing less acceptance/psychological flexibility. The AAQ-II demonstrated strong internal consistency (0.95).

**Coping styles**

The Brief Coping Operations Preference Enquiry[21] is a 28-item questionnaire evaluating 14 conceptually different coping styles. Each item is measured with a 4-point Likert-type scale ranging from 1 (not at all) to 4 (a lot or all of the time). Consistent with the scale authors,[21] and based on an exploratory factor analysis using the principal axis factoring method with an Oblimin rotation, and Cronbach's α with item-if-deleted analyses, 2 coping styles were found, namely maladaptive and adaptive coping styles.

Maladaptive coping styles had 4 items composed of: "I've been giving up trying to deal with it," "I've been giving up the attempt to cope," "I've been criticizing myself," and "I've been blaming myself for things that happened," with a good internal consistency of 0.78. Adaptive coping styles had 11 items composed of: "I've been turning to work or other activities to take my mind off things," "I've been getting emotional support from others," "I've been taking action to try to make the situation better," "I've been getting help and advice from other people," "I've been trying to see it in a different light, to make it seem more positive," "I've been trying to come up with a strategy about what to do," "I've been getting comfort and understanding from someone," "I've been looking for something good in what is happening," "I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping," "I've been trying to get advice or help from other people about what to do," and "I've been thinking hard about what steps to take" with a strong internal consistency of 0.89. Each of the subscale scores was obtained by averaging the items, with higher scores indicating a greater engagement in maladaptive or adaptive coping.

**Psychological distress**

The Depression, Anxiety, and Stress Scale (DASS-21)[22] is a 21-item questionnaire with 7 items from 3 subscales evaluating stress, anxiety, and depression. Participants reflect on experiences and feelings and indicate how much each of the 21 statements applied to them over the past week. For example, "I found it hard to wind down" is assessed on a 4-point Likert-type scale with subscale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Items were summed and multiplied by 2 to attain a total measure of psychological distress (range 0-126), with higher scores reflecting higher levels of psychological. The DASS-21 demonstrated strong internal consistency (0.95).

**Quality of life**

The EUROHIS-QOL[23] is an 8-item index evaluating general well-being in the context of goals, expectations, concerns, and societal systems. Participants address 8 questions and indicate how they feel about their QoL over the past 2 weeks. For example, "How satisfied are you with your health?" is assessed on a 5-point Likert-type scale with subscale ranging from 1 (very dissatisfied) to 5 (very satisfied). The EUROHIS-QoL total is the sum of the 8 items (range 8-40), with higher scores representing better QoL. The EUROHIS-QoL demonstrated strong internal consistency (0.91).

### *Statistical Analyses*

All analyses were performed with Statistical Package for Social Sciences for Windows (SPSS Inc.; Chicago, Ill, USA) and Analysis of Moment Structures (SPSS Inc.). Data were screened, and assumptions were tested preceding analyses. Correlational analysis was conducted to test the first hypothesis, while an SEM was developed to evaluate the second. Prior to the SEM being derived, the correlations were utilized with a multivariate analysis of variance (MANOVA) to evaluate the impact of demographic (e.g., age, gender, and education level) and clinical factors (e.g., IBS diagnosis) on the study variables. To ensure the convergent and divergent validity[24] of the study variables, a measurement model was also tested prior to an SEM being developed. Based on inspection of standardized residuals, modification indices, and guided by past research, the final model was derived by an iterative process of adding pathways and removal of variables until the criteria recommended by Hu and Bentler[25] was met ($\chi^2$, $P > .05$; $\chi^2/N$ = 1-3, root mean square error of approximation [RMSEA] < .07, standardized root mean residual [SRMR] < .10, comparative index fit [CFI] > .95, goodness-of-fit [GFI] > .95).

## *RESULTS*

The results supported the first hypothesis, in that increased disease activity, illness perceptions, visceral sensitivity, maladaptive coping styles, psychological

**Table 1.** Pearson's Correlations and Descriptive Values of the Study Variables

| | DA | IPs | VS | Acc | AC | MC | PD | Mean (SD) |
|---|---|---|---|---|---|---|---|---|
| Disease activity (DA) | - | | | | | | | 0.0 (1.00) |
| Illness perceptions (IPs) | 0.30** | - | | | | | | 4.62 (2.32) |
| Visceral sensitivity (VS) | 0.24** | 0.72** | - | | | | | 30.55 (17.72) |
| Acceptance (Acc) | −0.16 | −0.59** | −0.55** | - | | | | 36.01 (10.71) |
| Adaptive coping (AC) | 0.06 | 0.09 | 0.17* | −0.13 | - | | | 2.14 (0.65) |
| Maladaptive coping (MC) | 0.21* | 0.43** | 0.33** | −0.60** | 0.17* | - | | 1.54 (0.66) |
| Psychological distress | 0.13 | 0.53** | 0.48** | −0.82** | 0.18* | 0.58** | - | 28.67 (26.28) |
| Quality of life | −0.20* | −0.60** | −0.56** | 0.70** | −0.03 | −0.53** | −0.75** | 29.54 (6.65) |

DA, disease activity (a standardized measure combining the Crohn's Disease Activity Index and Simple Clinical Colitis Index); IPs, illness perceptions; VS, visceral sensitivity; Acc, acceptance; AC, adaptive coping; MC, maladaptive coping; PD, psychological distress; SD, standard deviation.
*$P$ < .05, **$P$ < .01, ***$P$ < .001.

distress, and decreased acceptance were associated with poorer QoL (Table 1). However, contrary to expectation, increased adaptive coping styles was associated with poorer QoL. These results suggest that as an individual's disease activity, negative perceptions, visceral sensitivity, non-acceptance, engagement in adaptive and maladaptive coping, and psychological distress increases, their QoL became poorer.

Prior to the SEM being derived, correlational analysis and a MANOVA indicated that of all the demographic and clinical factors, only IBS diagnosis resulted in significant differences across the study variables (specifically illness perceptions, visceral sensitivity, and QoL). Due to this, IBS diagnosis was added in the final model to control its influence on the study variables. A measurement model indicated that acceptance failed to discriminate from psychological distress, and therefore, it was not included in further model development. After adaptive coping was removed, the final model had a good fit ($\chi^2(10) = 10.07$, $P = .43$, RMSEA = 0.04, SRMR = 0.04, CFI = 1.00, Tucker–Lewis index = 1.00, GFI = 0.98; Figure 1). The total amount

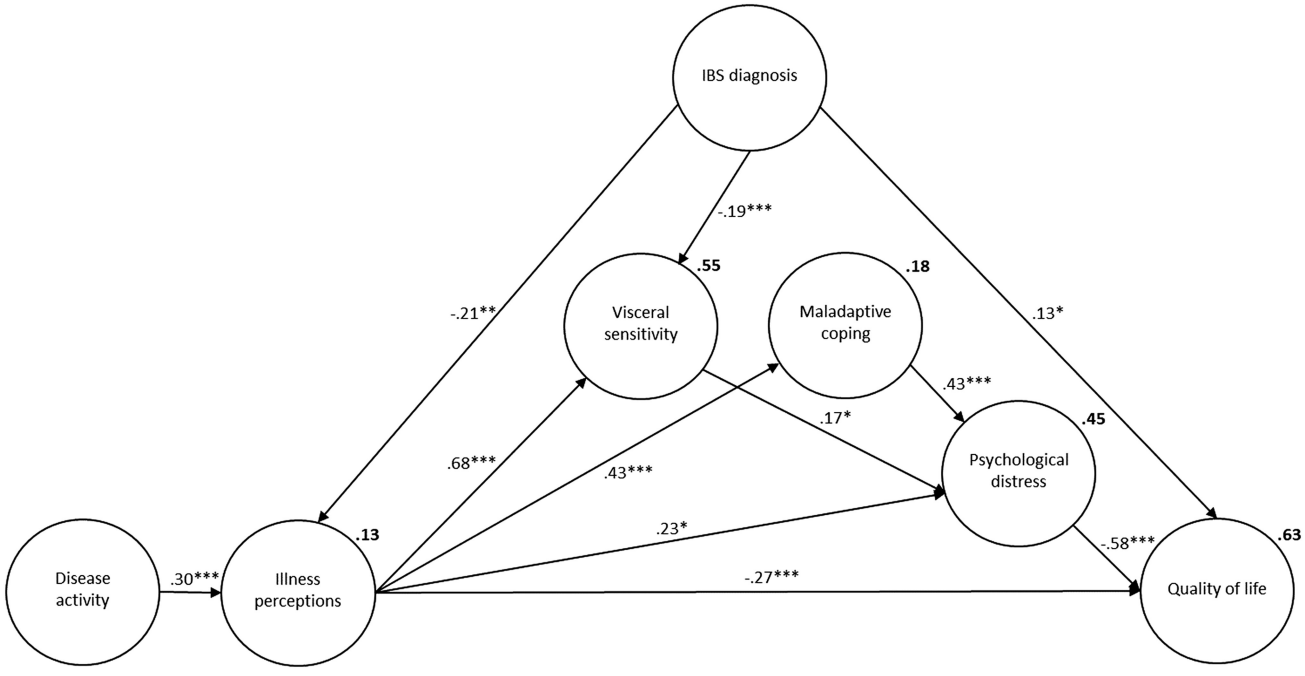


**Figure 1.** Final extended CSM (study variables presented with error terms removed; *$P$ < .05, **$P$ < .01, ***$P$ < .001). CSM, common sense model.

of variance accounted for in each of the variables was 13% of illness perceptions, 55% of visceral sensitivity, 18% of maladaptive coping styles, 45% of psychological distress, and 63% of QoL.

The results supported the second hypothesis, in that disease activity had a significant direct influence on illness perceptions ($\beta$ = 0.30, $P < .001$), and in turn, illness perceptions had a significant direct influence on maladaptive coping styles ($\beta$ = 0.43, $P < .001$), psychological distress ($\beta$ = 0.23, $P < .05$), and QoL ($\beta$ = –.27, $P < .001$). Also, the analysis indicated several indirect pathways: illness perceptions fully mediated the relationships between disease activity and visceral sensitivity, and maladaptive coping styles, and psychological distress, and QoL; visceral sensitivity bordered on partially mediating the relationship between illness perceptions and psychological distress ($P$ = .057), and partially mediated the relationship between illness perceptions and QoL; and maladaptive coping styles and psychological distress partially mediated the relationship between illness perceptions and QoL.

## DISCUSSION

The aim of the current study was to extend the CSM to explore the potential relationships between disease activity, illness perceptions, visceral sensitivity, acceptance, coping styles, psychological distress, and QoL in an IBD cohort. Consistent with previous IBD research, the results supported the first hypothesis that poorer QoL was associated with increased disease activity,[1] visceral sensitivity,[10,11,26] maladaptive coping styles,[3] non-acceptance,[6] psychological distress,[3] and poorer illness perceptions.[3] Not supporting the first hypothesis and past research[6] was the finding of a non-significant small negative relationship between adaptive coping and QoL.

Supporting the second hypothesis was the finding that illness perceptions, coping styles, and psychological distress mediated the relationship between disease activity and QoL. These findings are consistent with past IBD research,[3] which highlight the important role of illness perceptions, coping styles, and psychological distress in influencing the relationship between disease activity and QoL. Extending past research, the current study also found that gastrointestinal-focused anxiety was associated with psychological distress,[7,8,26] and that psychological distress was subsequently associated with poorer QoL.[3]

Given there is no current cure for IBD, supporting patients' ability to optimally manage their relapsing and remitting condition is essential. The current study findings suggest that modification of unhelpful illness perceptions, hyperactive visceral sensitivity, maladaptive coping styles, and psychological distress through targeted psychological interventions, such as cognitive-behavioral therapy or hypnosis,[27] may help to promote QoL in IBD cohorts.

The current research is not without limitations. It is acknowledged that a sample size of over 200 is generally recommended when using SEM.[28] However, this study was based upon a proven model with strong theoretical underpinnings, and well-published measures with robust psychometric properties were used. Further, as the study is cross-sectional, true causal relationships cannot be established. While all participants came from an IBD outpatient service, therefore allowing the researchers to confirm diagnosis and disease activity, this cohort may not be generalizable to a wider IBD community in terms of disease activity, comorbidities, and prescribed medications.

Future research would benefit by addressing these limitations, including exploring adjustment to illness over repeated time points (e.g., diagnosis to 12 months). Given the positive relationship between adaptive and maladaptive coping styles, and the finding that adaptive coping was not viable in the final model, further research should seek to explore the complex interplay among coping styles and their interaction with other CSM components. Consistent with the growing evidence base for Acceptance and Commitment Therapy in promoting QoL in IBD cohorts,[29] further research should seek to explore the role of acceptance in improving QoL. However, the known bias of acceptance toward psychological distress[30] suggests that the development of an acceptance measure with strong construct validity is needed first. Finally, future research should utilize the CSM to evaluate additional modifiable psychosocial variables identified in the IBD literature as predicting psychological distress and/or QoL, these include pain catastrophizing,[7,10] self-efficacy,[31] and mindfulness.[27]

## CONCLUSION

This study demonstrates that together with illness perceptions, visceral sensitivity and coping styles play important roles in an individual's adaption to living with IBD. Clinically, these findings indicate that greater illness adjustment, such as improved psychological distress and QoL, is likely to occur through targeting modifiable psychological processes, especially poor illness perceptions, visceral sensitivity, and maladaptive coping styles.

***Ethics Committee Approval:*** Ethics approval was obtained from the Alfred Hospital (SERP Approval Certificate 51207) and Swinburne University of Technology (Ref: 20190363-288) Research Ethics Committees.

***Informed Consent:*** Written informed consent was obtained for all individual participants included in the study.

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