

# Body image dissatisfaction in patients with inflammatory bowel disease

Beese, Sophie; Harris, Isobel; Dretzke, Janine; Moore, David

DOI:

[10.1136/bmjgast-2018-000255](https://doi.org/10.1136/bmjgast-2018-000255)

License:

None: All rights reserved

*Document Version*

Peer reviewed version

*Citation for published version (Harvard):*

Beese, S, Harris, I, Dretzke, J & Moore, D 2019, 'Body image dissatisfaction in patients with inflammatory bowel disease: a systematic review', *BMJ Open Gastroenterology*, vol. 6, no. 1, e000255.  
<https://doi.org/10.1136/bmjgast-2018-000255>

[Link to publication on Research at Birmingham portal](#)

**Publisher Rights Statement:**

Checked for eligibility 06/02/2019

This is an author-produced, peer-reviewed version of an article forthcoming in *BMJ Open Gastroenterology*.  
<https://bmjopengastro.bmj.com/>

**General rights**

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

**Take down policy**

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact [UBIRA@lists.bham.ac.uk](mailto:UBIRA@lists.bham.ac.uk) providing details and we will remove access to the work immediately and investigate.

## BMJ Open Gastroenterology

### Body Image Dissatisfaction in Patients with Inflammatory Bowel Disease: A Systematic Review

Journal:	<i>BMJ Open Gastroenterology</i>
Manuscript ID	bmjgast-2018-000255.R1
Article Type:	Systematic review
Date Submitted by the Author:	19-Nov-2018
Complete List of Authors:	Beese, Sophie; University of Birmingham, Institute of Applied Health Research Harris, Isobel; University of Birmingham, Institute of Applied Health Research Dretzke, Janine; University of Birmingham, Institute of Applied Health Research Moore, David; University of Birmingham, Institute of Applied Health Research
Keywords:	INFLAMMATORY BOWEL DISEASE, QUALITY OF LIFE, ULCERATIVE COLITIS, CROHN'S DISEASE
Abstract:	<p>Background and Aims: Little is known about the relationship between inflammatory bowel disease and body image. The aim of this systematic review was to summarise the evidence on body image dissatisfaction in inflammatory bowel disease patients across four areas: body image tools (i), prevalence (ii), factors associated with body image dissatisfaction in inflammatory bowel disease (iii) and association between inflammatory bowel disease and quality of life (iv).</p> <p>Methods: Two reviewers screened, selected, quality assessed and extracted data from studies in duplicate. EMBASE, MEDLINE, PsycINFO and Cochrane CENTRAL were searched to April 2018. Study design specific critical appraisal tools were used to assess risk of bias. Narrative analysis was undertaken due to heterogeneity.</p> <p>Results: Fifty-seven studies using a body image tool were included; 31 for prevalence and 16 and 8 for associated factors and association with quality of life respectively. Studies reported mainly mean or median scores. Evidence suggested female gender, age, fatigue, disease activity, and steroid use were associated with increased body image dissatisfaction, which was also associated with decreased quality of life.</p> <p>Conclusion: This is the first systematic review on body image in inflammatory bowel disease patients. The evidence suggests that body image dissatisfaction can negatively impact patients, and certain factors are associated with increased body image dissatisfaction. Greater body image dissatisfaction was also associated with poorer quality of life.</p> <p>However, the methodological and reporting quality of studies was in some cases poor with considerable heterogeneity. Future IBD research should incorporate measurement of body image dissatisfaction using validated tools.</p>

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



SCHOLARONE™  
Manuscripts

1  
2  
3  
4 1 **Body Image Dissatisfaction in Patients with Inflammatory Bowel Disease:**  
5  
6 2 **A Systematic Review**  
7  
8  
9  
10 3

11  
12  
13 4  
14  
15  
16 5 **Sophie Elizabeth Beese<sup>1</sup>, MPH, Isobel Marion Harris<sup>1</sup>, MPH, Janine**  
17  
18 6 **Dretzke<sup>1</sup>, MSc, David Moore<sup>1</sup>, PhD.**  
19

20  
21 7  
22  
23 8 *<sup>1</sup>Institute of Applied Health Research, Public Health Building, University of*  
24  
25 9 *Birmingham, B15 2TT. 0121 415 9107.*  
26

27  
28 10 **Corresponding author: Sophie Beese, s.beese@bham.ac.uk**  
29

30  
31 11 **Word Count: 3694**  
32  
33  
34  
35 12  
36  
37  
38 13  
39  
40  
41 14  
42  
43  
44 15  
45  
46  
47 16  
48  
49  
50 17  
51  
52  
53 18  
54  
55  
56 19  
57  
58  
59  
60

1  
2  
3  
4 20 **ABSTRACT**  
5  
6

7 21 **Background and Aims:** Little is known about the relationship between  
8  
9  
10 22 inflammatory bowel disease and body image. The aim of this systematic review  
11  
12 23 was to summarise the evidence on body image dissatisfaction in inflammatory  
13  
14 24 bowel disease patients across four areas: body image tools (i), prevalence (ii),  
15  
16 25 factors associated with body image dissatisfaction in inflammatory bowel  
17  
18 26 disease (iii) and association between inflammatory bowel disease and quality of  
19  
20 27 life (iv).  
21  
22

23  
24 28 **Methods:** Two reviewers screened, selected, quality assessed and extracted  
25  
26 29 data from studies in duplicate. EMBASE, MEDLINE, PsycINFO and Cochrane  
27  
28 30 CENTRAL were searched to April 2018. Study design specific critical appraisal  
29  
30 31 tools were used to assess risk of bias. Narrative analysis was undertaken due  
31  
32 32 to heterogeneity.  
33  
34

35  
36 33 **Results:** Fifty-seven studies using a body image tool were included; 31 for  
37  
38 34 prevalence and 16 and 8 for associated factors and association with quality of  
39  
40 35 life respectively. Studies reported mainly mean or median scores. Evidence  
41  
42 36 suggested female gender, age, fatigue, disease activity, and steroid use were  
43  
44 37 associated with increased body image dissatisfaction, which was also  
45  
46 38 associated with decreased quality of life.  
47  
48

49  
50  
51 39 **Conclusion:** This is the first systematic review on body image in inflammatory  
52  
53 40 bowel disease patients. The evidence suggests that body image dissatisfaction  
54  
55 41 can negatively impact patients, and certain factors are associated with  
56  
57 42 increased body image dissatisfaction. Greater body image dissatisfaction was  
58  
59  
60

1  
2  
3  
4 43 also associated with poorer quality of life. However, the methodological and  
5  
6 44 reporting quality of studies was in some cases poor with considerable  
7  
8 45 heterogeneity. Future IBD research should incorporate measurement of body  
9  
10 46 image dissatisfaction using validated tools.  
11  
12  
13  
14  
15  
16

17 48 **Keywords:** Systematic review – inflammatory bowel disease – body image – quality of  
18  
19 49 life  
20  
21  
22  
23  
24  
25

#### 26 51 **What is already known about this subject?**

27  
28  
29 52 Body image in inflammatory bowel disease (IBD) patients is relatively  
30  
31 53 unexplored. However, it may potentially be an issue as symptoms and other  
32  
33 54 factors associated with IBD could lead to body image dissatisfaction. Both of  
34  
35 55 these conditions may lead to an increased risk of developing mental health  
36  
37 56 disorders such as depression and self-harm, warranting research into the area.  
38  
39  
40  
41

#### 42 57 **What are the new findings?**

43  
44  
45 58 This review highlights associations between certain factors in IBD and body  
46  
47 59 image dissatisfaction, as well as suggesting that increased body image  
48  
49 60 dissatisfaction is related to reduced quality of life. The review also highlights the  
50  
51 61 need for a validated, reliable tool to measure body image in IBD patients as well  
52  
53 62 as clearer reporting of studies.  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

64 **How might it impact on clinical practice in the foreseeable future?**

65 Body image can be considered when making clinical decisions regarding IBD  
66 patients with the potential for interventions to improve body image in patients at  
67 risk.

Confidential: For Review Only

68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80

## 81 INTRODUCTION

82

83 Inflammatory bowel disease (IBD) is associated with a range of debilitating  
84 symptoms<sup>(1)</sup> and affects around 300,000 people in the UK<sup>(2)</sup>, over 1 million in  
85 the USA and 2.5 million across Europe<sup>(3)</sup>. A potentially overlooked issue for IBD  
86 patients is body image dissatisfaction (BID). Body image (BI) is how an  
87 individual perceives themselves physically<sup>(4)</sup> and sufferers have a distorted and  
88 negative view of themselves, feeling anxious and uncomfortable about their  
89 body. Additionally, negative BI can have a serious impact on health and well-  
90 being<sup>(5)</sup>.

91 Social media and celebrity attention contribute to pressure to adhere to an  
92 “ideal” body and an obsession with appearance<sup>(6, 7)</sup>. Discontentment with  
93 aspects such as body weight, shape, appearance and skin may contribute  
94 toward an individual having BID<sup>(8)</sup>. Studies have shown patients with negative  
95 BI are more likely to suffer with depression, anxiety and feel suicidal and BID  
96 can impact negatively upon relationships<sup>(9)</sup> and quality of life (QoL)<sup>(10)</sup>.

97 Various tools have been utilised in healthcare to measure BI including the Body  
98 Image Ideals Questionnaire, the Body Image Scale and the Cash Body Image  
99 Disturbance Questionnaire (BIDQ)<sup>(11)</sup>. There are also condition-specific BI tools  
100 such as the Body Image Scale (BIS) for IBD<sup>(12)</sup>.

101 Both condition-specific symptoms and treatments may contribute to BID in IBD  
102 patients, particularly during periods of active disease rather than remission.

103 Symptoms can include urgent bowel movements, bloating, excess wind, fatigue,



1  
2  
3  
4 104 skin problems and ulcers. Treatment with steroids can be associated with  
5  
6 105 weight gain, acne and mood swings<sup>(13)</sup>. Surgeries may also impact upon BI due  
7  
8  
9 106 to scarring and implementation of a stoma<sup>(14)</sup> <sup>(15)</sup>. Those suffering with IBD or  
10  
11 107 BID are at an increased risk of mental health issues<sup>(16, 17)</sup> ; this could be worse  
12  
13 108 for patients living with both conditions. Furthermore, most IBD patients are  
14  
15 109 diagnosed at adolescence<sup>(18)</sup>, when BI is important. Body image is currently not  
16  
17  
18 110 routinely considered in the management of IBD.

21 111 No existing or ongoing systematic reviews on BI in IBD have been identified.  
22  
23 112 However multiple primary studies, mainly cross-sectional in nature assess BI as  
24  
25 113 an outcome in IBD patients, with disparate results. A systematic review is  
26  
27  
28 114 therefore warranted to synthesise and clarify the evidence base.

31 115

34 116 The following four questions will be addressed:

37 117

40 118 **1.** What tools are used to measure body image in IBD patients and what are  
41  
42  
43 119 their components?

46 120 **2.** What is the prevalence and severity of body image dissatisfaction in IBD  
47  
48 121 patients?

51 122 **3.** What factors are associated with body image dissatisfaction in IBD patients?

54 123 **4.** Is there an association between body image dissatisfaction in IBD patients  
55  
56  
57 124 and quality of life?

## 125 **METHODS**

126 This systematic review has been reported according to the Preferred Reporting  
127 Items of Systematic Reviews and Meta-Analysis (PRISMA) guidelines<sup>(19)</sup>. A  
128 protocol was previously registered (PROSPERO (CRD42018060999)) and  
129 submitted for publication and is currently in process<sup>(20)</sup>. A summary of the  
130 methods is reported below. Selection, data extraction and quality assessment  
131 were carried out by two independent reviewers with disagreements resolved  
132 through discussion or third reviewer.

133

### 134 **Search Strategy**

135 Bibliographic databases (EMBASE, MEDLINE, PsycINFO, Cochrane  
136 CENTRAL) were searched to April 2018 using combinations of index and text  
137 terms for IBD and BI (see Supplementary table 1 for MEDLINE strategy)  
138 Strategies were adapted for each database and run without date or language  
139 restrictions. Trial registries (Clinicaltrials.gov, EU Clinical Trial Register) were  
140 searched for ongoing trials and reference lists of included studies were  
141 checked.

142

### 143 **Screening and Selection Criteria**

144 Study eligibility was based on the following criteria:

145 Study design: Any primary study reporting quantitative data.

1  
2  
3  
4 146 Population: Patients of any age diagnosed with IBD. At least 50% of population  
5  
6 147 must have IBD unless results are reported separately for sub-groups of  
7  
8  
9 148 individuals with IBD.

10  
11  
12 149 Tools: Any tool measuring any aspect of BI (including QoL tools that had at  
13  
14 150 least one BI related domain or question).

15  
16  
17 151 Studies were also eligible (for question 2-4) where they reported: any measure  
18  
19 152 of prevalence/frequency and severity of BID in IBD patients; data on  
20  
21 153 associations between any factor in IBD patients and BID; or any association  
22  
23 154 between BI and QoL measures in IBD patients, including associations between  
24  
25 155 two separate domain measures of the same tool.

26  
27  
28  
29 156 Exclusion criteria: Case reports, qualitative research and conference abstracts  
30  
31 157 published three years before the date of the searches.

32  
33  
34  
35 158 Reasons for exclusion were recorded.

36  
37  
38 159

39  
40  
41 160 **Data Extraction**

42  
43  
44 161 A piloted data extraction form was used. Examples of the type of data extracted  
45  
46 162 are shown below:

47  
48  
49 163 Study characteristics:

50  
51  
52  
53 164 Study design, aim and setting, inclusion/exclusion criteria, recruitment methods,  
54  
55 165 follow-up period.

56  
57  
58 166 Participant characteristics:

59  
60

1  
2  
3  
4 167 Number of patients, age, gender, type of IBD, disease severity and activity,  
5  
6 168 BMI, comorbidities, therapy/surgery.  
7  
8

9  
10 169 Data for synthesis/analysis:  
11

12  
13 170 BI measurement tool, components of tools/scales, data on BID (e.g. body image  
14  
15 171 scores, prevalence, thresholds for determining BID), factors associated with BI  
16  
17 172 dissatisfaction and strength of association, QoL measures, strength of  
18  
19 173 association between BID and QoL.  
20  
21

22  
23 174  
24  
25

## 26 175 **Quality Assessment**

27  
28  
29 176 Quality assessment was based on critical appraisal checklists for both  
30  
31 177 prevalence and cross-sectional analytical studies from the Joanna Briggs  
32  
33 178 Institute<sup>(21)</sup>. Studies solely included for question one were not quality assessed  
34  
35 179 as the objective of this question was to compile a list of body image tools.  
36  
37

38  
39 180 Important quality items included sample selection, response rate during  
40  
41 181 enrolment in the study, clear inclusion criteria and measurement of outcomes in  
42  
43 182 a valid and reliable way.  
44  
45

46  
47 183  
48  
49

## 50 184 **Analysis**

51  
52  
53 185 A narrative synthesis was carried out separately for each question, with key  
54  
55 186 findings tabulated. Substantial heterogeneity relating to populations, tools and  
56  
57 187 settings was apparent in the included studies meaning that meta-analysis was  
58  
59  
60

1  
2  
3  
4 188 not appropriate. Consistencies and discrepancies in findings between studies  
5  
6 189 were noted and discussed in the context of any likely sources of heterogeneity.  
7  
8  
9 190 Quality assessment findings were used when considering the strength of  
10  
11 191 evidence for the latter three questions.  
12  
13  
14 192  
15  
16  
17 193  
18  
19  
20 194  
21  
22  
23 195  
24  
25  
26 196  
27  
28  
29 197  
30  
31  
32 198  
33  
34  
35 199  
36  
37  
38 200  
39  
40  
41 201  
42  
43  
44 202  
45  
46  
47 203  
48  
49  
50 204  
51  
52  
53 205  
54  
55  
56 206  
57  
58  
59  
60

Confidential: For Review Only

1  
2  
3  
4 207 **RESULTS**  
5  
6

7 208 Database searches identified 587 records and 57<sup>(14, 22-77)</sup> studies were included,  
8  
9 209 with some studies eligible for multiple questions (see Figure 1 for selection  
10  
11 process and reasons for exclusion). All 57 papers reported using BI tools, 31<sup>(14,  
12  
13 22-26, 30, 31, 33-39, 42, 47, 50, 51, 53, 54, 59, 61, 62, 64-66, 68, 70, 72, 73)</sup> reported prevalence or  
14  
15 211 mean/median BI scores, 16<sup>(14, 23, 24, 30, 34-36, 47, 54, 59, 61, 62, 64, 66, 68, 72)</sup> studies  
16  
17 212 presented factors associated with BID and 8<sup>(14, 22-24, 34, 62, 66, 72)</sup> studies reported  
18  
19 213 correlations between QoL and body image.  
20  
21 214  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4 227 **Question 1: What tools are used to measure body image and what are**  
5  
6 228 **their components?**  
7  
8

9  
10 229 Of the 57 studies measuring BI, 51 were cross-sectional whilst the others varied  
11  
12 230 (case-control<sup>(25)</sup>, prospective cohort<sup>(51, 66)</sup>, case series<sup>(39)</sup>, randomised controlled  
13  
14 231 trial<sup>(65)</sup> and non-randomised intervention study<sup>(42)</sup>). Study populations included  
15  
16 232 adults and children in settings including outpatients, pre/post-surgery, summer  
17  
18 233 camps and online registries, from countries across the world. Twenty studies  
19  
20 234 focused on BI as one of the main outcomes but only six of these studies were  
21  
22  
23 235 non-surgery based.

24  
25  
26 236 Fifteen tools were identified (Table 1). Seven tools were specifically for BI and  
27  
28 237 eight were QoL tools which included a BI domain or question(s). The most  
29  
30 238 frequently applied tool specific to BI was the Body Image Questionnaire (BIQ)  
31  
32 239 which was used in 14 studies. The Body Image Scale (BIS) was used in 5  
33  
34 240 studies and is the only tool validated in an IBD population. IMPACT-III (or earlier  
35  
36 241 IMPACT-II) is a validated QoL questionnaire aimed at adolescents and children  
37  
38 242 with IBD and includes a BI domain. It was used across 18 studies. The  
39  
40 243 remaining 12 tools were used in only 1-3 studies respectively.

41  
42  
43 244 None of the tools included had a clear cut-off point for defining BID but offered  
44  
45 245 an indication of increasing or decreasing likelihood of dissatisfaction. In some  
46  
47 246 tools, a higher score indicated better BI (BIQ, EORTC, DUX-25). In others, a  
48  
49 247 higher score indicated increased BID (IMPACT, BIS, RFIPC, IBDSI, Body  
50  
51 248 Image Self-Consciousness during Intimacy Scale, BIDQ and ASWAP).  
52  
53  
54  
55  
56  
57  
58  
59  
60

249 Tools where items had similar themes were grouped to show general focus of  
 250 BI questions and are shown in Table 2.  
 251

**Table 1.** Tools identified and used across included studies

Measurement Tool	Type of Tool	Intended target population	Is tool Validated?	Scoring	No. of Studies Tool Used In
<b>Body Image Tools</b>					
<b>ASWAP</b>	Body image	Initially used in scleroderma patients	Yes but not in IBD patients	15 items rated on 7-point scale. Questions corresponding to items 4–11 were reverse scored such that higher scores reflect greater dissatisfaction	1
<b>Askevold's Body Image Test</b>	Body image	Unclear	Unclear	Unclear	2
<b>Body Image and Self-Consciousness During Intimacy Scale</b>	Body image and sexual self-consciousness	Women	No	0-75, higher scores poorer body image	1
<b>BIA/BIA-P</b>	Body image	Adults, no specific clinical population	Unclear	Based on body image silhouettes ranging in size. Score=difference between current body size and ideal body size.	1
<b>BIQ</b>	Body image	Originally caesarean or appendectomy patients, now IBD	No	5-20, higher score better body image	14



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

		patients			
<b>BIS</b>	Body image	Cancer patients	Yes	0-30, lower score better	5
				body image	
<b>Cash Body Image Disturbance Questionnaire</b>	Body image	Range of clinical groups	Yes but not in IBD patients	7-35, higher score poorer body image	2
<b>Quality of Life Tools with a Body Image Component</b>					
<b>BUX-25</b>	Quality of daily functioning. (1 of 4 domains relate to body image)	School age children	No	Higher scores, better QoL	1
<b>EORTC-QLQ-CR38</b>	Quality of Life questionnaire. (3 of 38 items relate to body image)	Cancer patients	Yes but not in IBD patients	38 items with 4 category responses. Functional scales: higher score higher functioning. Symptoms scales: higher score higher level of symptoms.	1
<b>EORTC-QLQ-CR29</b>	Quality of Life questionnaire. (3 of 29 items relate to body image)	Cancer patients	Yes but not in IBD patients	29 items with 4 category responses. Functional scales: higher score higher functioning. Symptoms scales: higher score higher level of symptoms.	1
<b>IMPACT-III or IMPACT II</b>	Health-related quality of life. (3 of 35 items relate to body image)	Children and adolescents with IBD	Yes	35-175, higher scores better QoL	18
<b>Inflammatory Bowel Disease Stress Index</b>	Assessing the extent to which IBD has caused alterations in lifestyle. (1 of 10 items relate to body image)	IBD patients	Unclear	8 scales with a score of 0-3 (no impact-a great deal of impact).	1

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

	image)				
<b>RFIPC</b>	Quality of life questionnaire. (1 item of 25 relate to body image)	IBD patients	Yes	0-100, higher score poorer QoL	3
<b>Stoma Quality of Life Scale</b>	Stoma-related. (5 items of 19 relate to body image and sexuality).	Stoma patients	Yes (in ostomy patients)	5 scales, 19 questions. Each scored 1-5 (Never-always). Average scores for each scale calculated.	3
<b>The Karolinska Psychodynamic Profile</b>	Assessment of stable modes of mental functioning and character traits (1 subscale and 3 of 18 items relate to body image.)	No specific clinical population	Yes	Each subscale is graded from 1-3 (Most normal-least normal).	2

**Abbreviations:** ASWAP: Adapted Satisfaction with Appearance scale; BI/BIA-P: Body Image Assessment/Body Image Assessment-Preadolescent; BIQ: Body Image Questionnaire; BIS: Body Image Scale; DUX-25: Dutch Children's AZL/TNO Quality of Life Questionnaire; EORT-QLQ-CR38/EORT-QLQ-CR29: European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life questionnaire for Colorectal Cancer; IMPACT-II/IMPACT-III: A measure of health-related quality of life in paediatric inflammatory bowel disease; RFIPC: Rating Form of IBD Patient Concerns.

252  
253  
254  
255  
256  
257  
258

**Table 2.** Body image tools with similar questions grouped into overarching themes

Body Image Tool	Components								
	Satisfaction with appearance	Attractiveness	Socialising/Work	Avoidance of people or tasks	Feeling feminine/masculine	Effect of disease on body	Scar satisfaction	Satisfaction with body both naked and dressed	Distressing thoughts
<b>BIS</b>	✓	✓	✓		✓	✓		✓	
<b>BIQ</b>	✓	✓			✓	✓	✓	✓	
<b>CBIDQ</b>	✓	✓	✓	✓					✓
<b>ASWAP</b>	✓	✓	✓	✓				✓	

**N.B.** Similar components of tools were grouped into themes shown above. **BIS**=Body Image Scale. **BIQ**=Body Image Questionnaire.

1  
2  
3  
4 **CBDIQ=Cash Body Image Disturbance Questionnaire. ASWAP=Adapted Satisfaction with Appearance Scale. Askevold's Body Image Test**  
5 **(no information in paper or online), Body Image and Self-consciousness during Intimacy Scale (too specific) and the Body Image**  
6 **Assessment (based on figural drawing scales) were not included.**  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46

---

Confidential: For Review Only

1  
2  
3  
4 **260 What is the prevalence of body image dissatisfaction in IBD patients?**

5  
6  
7 261 Thirty-one studies including a total of 3,634 patients reported on prevalence or  
8  
9 262 severity of BID (see Table 3 for study characteristics). Seventeen studies<sup>(14, 22,</sup>  
10  
11 263 23, 25, 30, 31, 38, 42, 53, 54, 59, 61, 62, 66, 70, 72, 73) included both ulcerative colitis (UC) and  
12  
13 264 Crohn's disease (CD) patients. Ages ranged from 2-71 and eighteen studies<sup>(22,</sup>  
14  
15 265 30, 38, 40-42, 51-53, 58, 60-63, 70, 71, 73, 76) included only children/adolescents. Fourteen  
16  
17 266 studies<sup>(24-26, 33-37, 39, 47, 50, 64, 65, 68)</sup> included surgery patients and one study  
18  
19 267 included only females<sup>(72)</sup>.

20  
21  
22  
23  
24 268 Only three studies reported prevalence. Brown (2015)<sup>(26)</sup> found that 21-34% UC  
25  
26 269 patients reported negative impacts on BI using BIQ. McDermott (2015)<sup>(14)</sup> found  
27  
28 270 that 87% patients reported some form of concern about an aspect of their BI  
29  
30 271 using the Cash Body Image Disturbance Questionnaire. Muller (2010)<sup>(59)</sup>  
31  
32 272 reported that 66.8% IBD patients stated they had impaired BI based on a  
33  
34 273 researcher devised questionnaire. The other 28 studies reported mean/median  
35  
36 274 BI scores based on a range of tools.

37  
38  
39  
40  
41 275 In studies with populations undergoing surgery it was found that there was no  
42  
43 276 significant difference in BI scores (using the BIQ) after laparoscopic or  
44  
45 277 open/conventional surgery in IBD patients<sup>(33-35, 64, 78)</sup>. Only one study found BI  
46  
47 278 scores to be significantly improved after laparoscopic surgery compared to  
48  
49 279 conventional surgery in CD<sup>(36)</sup>.

50  
51  
52  
53 280 BI was included as an outcome across 31 studies. All but one study compared  
54  
55 281 results within the included IBD population e.g. UC vs CD, surgery vs no surgery,  
56  
57 282 males vs females. Bel (2015) found that women with IBD with disease in

1  
2  
3  
4 283 remission scored comparably to women in a healthy population. One  
5  
6 284 longitudinal study by Saha (2015)<sup>(66)</sup> measured scores over two years and  
7  
8  
9 285 found that BI did not change despite improvements in symptoms.  
10  
11  
12 286  
13  
14  
15 287  
16  
17  
18 288  
19  
20  
21 289  
22  
23  
24 290  
25  
26  
27 291  
28  
29  
30 292  
31  
32  
33 293  
34  
35  
36 294  
37  
38  
39 295  
40  
41  
42 296  
43  
44  
45 297  
46  
47  
48 298  
49  
50  
51 299  
52  
53  
54 300  
55  
56  
57 301  
58  
59  
60

Confidential: For Review Only

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>Beld et al (2010)</b>	Cross sectional	UC or FAP undergone restorative proctocolectomy IPAA Jan 92 to Oct 08	Netherlands	26	UC (16) FAP (10)	BIQ	Mean body image scores (SD)	Males 16.3 (3.1) Females 13.5 (4.1)
<b>Brown et al (2015)</b>	Cross sectional	Patients with UC who had colectomy within the past 10 years, data collected from Nov 2010 to July 2011.	Canada, Australia, UK	351	All UC	BIQ	Median body image scores (IQR) Prevalence of “quite a bit” or “extreme” negative impacts on body image as a result of colectomy.	Males 8 (IQR 6-11) Females 11 (IQR 8-14) Age group >50 years 8 (IQR 6-11) Age group <50 years 10 (IQR 7-13). 21-34% reported negative impacts on body image.
<b>Dunker et al (1998)</b>	Cross sectional	CD patients undergoing open or laparoscopic resection at Leiden university medical centre	Netherlands	34	All CD	BIQ	Mean body image scores	Open 16.4 (10-20) Laparoscopic 18 (13-20) (SD not reported)

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>Dunker et al (2001)</b>	Cross sectional matched comparison	UC patients who underwent laparoscopic assisted IPAA and matched conventional IPAA patients.	Netherlands	32	UC (28) FAP (4)	BIQ	Mean body image scores (SD)	Laparoscopic 19 (1.3) Conventional 17.9 (SD not reported)
<b>Eshuis et al (2008)</b>	Repeated cross sectional	Patients who underwent ileocolic resection for Crohn's disease from 1995 until 1998 two centres.	Netherlands	71 <i>(medical file analysis)</i> 61 <i>(returned questionnaires)</i>	All CD	BIQ	Mean body image scores (range)	Open 15.63 (6-20) Laparoscopic 16.3 (7-20) (SD not reported)
<b>Eshuis et al (2010)</b>	Repeated cross sectional	CD patients who had ileocolic resections between September 1999 and November 2003.	Netherlands	55	All CD	BIQ	Median body image scores (IQR)	Open 18.0 (IQR 16-19) Laparoscopic 19.0 (IQR 17-20)



**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>Giudici et al (2017)</b>	Case series (Abstract only)	December 2014-December 2015. Consecutive patients undergoing laparoscopic proctectomy for ulcerative colitis.	Italy	10	All UC	Self-designed body image questionnaire	Mean body image score	59 (SD not reported)
<b>Kjaer et al (2014)</b>	Cross sectional	Adult patients treated with laparoscopy-assisted or open IPAA at Odense University Hospital during the period between October 2008 and March 2012.	Denmark	50	UC (44) FAP (4) Other (2)	BIQ	Median body image scores (range)	Laparoscopic 8 (5-18) Open 9.5 (5-20)
<b>Polle et al (2007)</b>	Repeated cross sectional	Patients eligible for an elective proctocolectomy with IPAA for UC or FAP were included in a randomized trial	Netherlands	53	UC (34) FAP (19)	BIQ	Mean body image scores (limited data)	Women open group: 15 Laparoscopic group: 18 (SD not reported)

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>Ponsioen et al (2017)</b>	Randomised controlled trial	Eligible patients aged 18–80 years, had active Crohn's disease of the terminal ileum, and had not responded to at least 3 months of conventional therapy with glucocorticosteroids, thiopurines, or methotrexate. Patients with diseased terminal ileum longer than 40 cm or abdominal abscesses were excluded.	Netherlands and UK	70 patients Infliximab group 73 Laparoscopic ileocaecaelectomy resection	All CD	BIQ	Mean body image scores (only given for resection group)	Resection group: Baseline 16. Endpoint 17.8. (SD not reported)
<b>Scarpa et al (2009)</b>	Prospective case series	Patients admitted for intestinal surgery for CD May 06 - July 08	Italy	47	All CD	BIQ	Median body image score (IQR)	5 (5-8)
<b>Voermans et al (2010)</b>	Prospective case series	A consecutive series of patients who had an indication for a laparoscopic ileocolic resection were invited to participate. CD patients.	Netherlands	10	All CD	BIQ	Median body image scores	Before surgery 17.0 After surgery 19.0
<b>Bengtsson et al (2011)</b>	Case-control	Patients with preoperative diagnosis of UC or CD who underwent IPAA	Sweden	101 (72 controls, 29 study group)	Controls; UC (60) CD (0) Study group;	BIS	Median body image scores.	Study group: Males 6.5 Females 10. Control group Males

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
				29 study group)	UC (25) CD (4)			1 Females 3
<b>Trindade et al (2017)</b>	Cross sectional	Female participants with ages between 18 and 40 years old who had not undergone IBD-related surgery	Portugal	96	UC (58) CD (38)	BIS	Mean body image score (SD)	10.10 (7.73) (SD not reported)
<b>Vlahou et al (2008)</b>	Cross sectional	Adolescents with IBD who attended clinics at two separate hospitals and a camp for children with IBD	USA	44	Breakdown not reported	BSQ (modified version of BIQ) and BIA-P	Mean body image scores (SD)	BSQ: Males 36.45 (4.88) Females 33.52 (7.77). BIA-P: Males 0.41 (0.85) Females 0.77 (0.92)
<b>Grootenhuis (2009)</b>	Non-randomised controlled	Adolescents with IBD who were under medical care at Emma Children's Hospital AMC and members of Crohn's and colitis association Netherlands	Netherla nds	18 controls; 22 interventi	Controls CD (11) UC (4) IBDU (3). Intervention	DUX-25	Mean body image domain scores (SD)	Intervention: baseline 55.4 (18.6) post intervention 68.9 (17.7) Control:

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
	study			on	CD (17) UC (5) IBDU (0)			baseline 60.0 (17.4) post intervention 59.0 (20.1)
<b>Bel et al (2015)</b>	Cross sectional with controls	18-70 UC or CD	Netherlands	287 (197 healthy controls)	UC (132) CD (155)	EORTC-QLQ-CR38	Mean body image domain scores (SD)	Active: Males 5.61 (2.31) Females 6.2 (2.78). Remission: Males 3.82 (1.33) Females 4.58 (1.68)
<b>Shepanksi (2009)</b>	Before and after study	Children attending Camp Guts and Glory in Pennsylvania	USA	61	CD:UC (2:1)	IMPACT II	Mean body image domain scores (SD, for before and after camp)	By age; Age 9-10: pre 14.6 (4.1). Post 16.4 (3.7). Age 11-12: Pre 11.4 (4.9). Post 13.2 (5.0). Age 13-14: Pre 12.9 (5.2). Post 13.8 (5.9). Age 15-16: Pre 12.3

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
								(5.0). Post 11.2 (5.4)
<b>Abdovic et al (2013)</b>	Cross sectional validation study	Children aged nine years or older with confirmed diagnosis of IBD for more than six months from inpatient and outpatient clinics at particular centres.	Croatia	104	UC (30) CD (74)	IMPACT III	Mean body image domain score (SD).	12.03 (1.96)
<b>Chouliaras et al (2017)</b>	Cross sectional	UC and CD patients hospitalized or followed in outpatient clinic in Athens	Greece	99	UC (37) CD (62)	IMPACT III	Mean body image domain scores (SD)	Overall 71.5 (17.9) UC 67.3 (22.4) CD 72.6 (19.3) No significant relationship between body image and assessed disease characteristics or

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
								prescribed medications.
<b>Gallo et al (2014)</b>	Cross sectional	Children between the ages of 8 and 18 years, who had been diagnosed with IBD at least 6 months before, and were being followed at the Pediatric Gastroenterology Service of the Hospital Italiano de Buenos Aires, Argentina, or at the private office of one of the co-authors (M.O.) and one of their parents.	Argentina	27	UC (17) CD (9)	IMPACT III	Mean body image domain score (SD)	76.54 (16.06)
<b>Lee et al (2015)</b>	Prospective observational study	Children and young adults less than 22 years of age started on EN or anti-TNF therapy for active CD at Hospital for Sick Children Toronto and Children's Hospital Philadelphia.	Canada and USA	90	All CD	IMPACT III	Median body image domain scores (range)	Baseline PEN 71 (54-75) EEN 58 (58-75) TNf 67 (50-83)

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>Mason et al (2015)</b>	Prospective observational study	Adolescents >10 years old with confirmed diagnosis of IBD attending gastroenterology clinic at Royal Hospital for Sick Children, Glasgow	Scotland	63	UC/IBDU (18) CD (45)	IMPACT III	Mean body image domain score	7 (SD not reported)
<b>Ogden et al (2011)</b>	Cross sectional validation study	Unclear - children with IBD	UK	97	UC (12) CD (64) IBDU (21)	IMPACT III	Mean body image domain score	63.5 (95% CI 56.5 - 70.6) (SD not reported)
<b>Perrin et al (2008)</b>	Cross sectional	Children aged 8-17 years diagnosed with UC or CD 6 mnths before the study followed at 1 of 6 paediatric gastroenterology centres. No other chronic conditions.	USA	220	UC (59) CD (161)	IMPACT III	Mean body image domain scores (SD)	68.1 (19.6) UC 68.6 (20.8) CD 67.9 (19.2)

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>McDermot et al (2015)</b>	Cross sectional	Patients with histologically confirmed IBD attending ambulatory clinics in 1 of 2 medical centres between July 2011 and November 2012	Ireland	330	UC (145) CD (194)	Modified BIS and Cash Body Image Scale (qualitative only)	Median body image score (range) Prevalence	6 (0-27) 13% patients reported no concerns about any aspect of body image
<b>Saha et al (2015)</b>	Prospective observational study	Patients with UC, CD or IBDU aged 18 and above enrolled in the Ocean State Crohn's and Colitis Area Registry (OSCCAR) with a minimum of 2 years of follow-up	USA	274	CD (145) UC/IBDU (129)	ASWAP	Mean body image scores (SD)	Baseline: Females 30.1 (14.4) Males 21.2 (8.4) Year 1: Females 28.2 (14.1) Males 24.5 (12.5) Year 2: Females 28.8 (13.2) Males 24.1 (13.5)



**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
<b>Muller et al (2010)</b>	Cross sectional	IBD patients aged 18-50 from a database of patients maintained by the Southern Adelaide IBD Service	Australia	217	UC (85) CD (127) IBDU (5)	No specific tool – range of questions regarding body image and impact of IBD on this	Prevalence (%) of body image dissatisfaction	66.8% of patients reported impaired body image
<b>de Rooy et al (2001)</b>	Cross sectional	Outpatients of the Inflammatory Bowel Disease Center, Mount Sinai Hospital. Subjects were a convenience sample waiting for a regularly scheduled physician appointment.	USA	241	UC (121) CD (120)	RFIPC	“Feelings about body” question mean score (SD)	42.84 (33.97)
<b>Maunder et al (1999)</b>	Retrospective analysis	Patients with IBD who had completed the RFIPC and a survey of demographic and disease-related variables in one of three previous studies	Unclear	343	UC (186) CD (157)	RFIPC	“Feelings about body” question mean scores	Female 52.13 (34.8) Male 38.16 (33.83)
<b>Kuruvilla et al</b>	Cross-sectional	Consecutive patients who had undergone IPAA or a permanent ileostomy for ulcerative colitis by a	USA	59	All UC. IPAA (35); TPC (24).	Stoma Quality of Life Scale	Mean (SD) and median (range) body	IPAA; Mean 93.1 (9.7). Median 100.

**Table 3.** Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
(2012)	(Abstract only)	single surgeon, presenting for their annual follow-up visit from July through September 2011, were offered participation in the study. A randomly chosen group of subjects who did not have scheduled appointments during the study period were sent a letter inviting them to participate in the study.					image/sexuality domain scores.	(65-100). TPC: Mean 76.4 (14.6) Median 80 (50-100).
<p><b>Abbreviations:</b> UC: Ulcerative Colitis; CD: Crohn's disease; IBD: Inflammatory bowel disease; IBDU: Inflammatory bowel disease unclassified; FAP: Familial adenomatous polyposis; IPAA: ileal pouch-anal anastomosis; TPC: Total proctocolectomy; PEN: Partial Enteral Nutrition; EEN: Exclusive Enteral Nutrition; TNF; Tumour Necrosis Factor; TNF: Tumour necrosis factor; IQR: Interquartile range; SD; Standard deviation; ASWAP: Adapted Satisfaction with Appearance scale; BI/BIA-P: Body Image Assessment/Body Image Assessment-Preadolescent; BIQ: Body Image Questionnaire; BIS: Body Image Scale; DUX-25: Dutch Children's AZL/TNO Quality of Life Questionnaire; EORT-QLQ-CR38/EORT-QLQ-CR29: European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life questionnaire for Colorectal Cancer; IMPACT-II/IMPACT-III: A measure of health-related quality of life in paediatric inflammatory bowel disease; RFIPC: Rating Form of IBD Patient Concerns; BSQ: Body Satisfaction Questionnaire.</p>								

302

303

304

1  
2  
3  
4 305 **What factors are associated with body image dissatisfaction in IBD**  
5  
6 306 **patients?**  
7  
8  
9

10 307 Sixteen studies<sup>(14, 23, 24, 30, 34-36, 47, 54, 59, 61, 62, 64, 66, 68, 72)</sup> totalling 2333 IBD patients  
11 reported the association between various factors and BID (see Table 4).  
12

13 309 Factors included those related to demographics as well as disease and  
14 treatment-related characteristics. Ten studies<sup>(14, 24, 34-36, 47, 64, 66, 68, 72)</sup> utilised a  
15 specific BI tool and six<sup>(34-36, 47, 64, 68)</sup> focused on comparative surgery techniques.  
16 310  
17 311 Three studies<sup>(30, 61, 62)</sup> included a paediatric population; the remaining studies  
18 included adults. BI was one of the main outcomes in most of these studies and  
19 the study by Saha (2015)<sup>(66)</sup> was the first longitudinal follow up of BID in IBD  
20 according to the authors.  
21 312  
22 313  
23 314  
24 315

25 316 In 6/10 studies<sup>(14, 23, 54, 59, 64, 66)</sup> female gender was found to be significantly  
26 associated with increased BID. One study<sup>(59)</sup> reported the odds of BID was over  
27 3 times more in females than males ( $p=0.001$ ), with strong associations  
28 reported in the other five studies. Increased disease activity was found to have  
29 a significant but moderate positive association in 7/9 studies<sup>(14, 23, 34, 62, 66, 68, 72)</sup>  
30 320

31 321 Other factors found to be significantly associated with increased BID included  
32 steroid use<sup>(14, 61, 66, 72)</sup>, age<sup>(14, 23)</sup>, increased BMI<sup>(14, 72)</sup>, smoking<sup>(14)</sup> and  
33 322 fatigue<sup>(23)</sup>(Table 4). Saha (2015)<sup>(66)</sup> also found a significant association between  
34 323 extraintestinal manifestations (EIM) and increased BID, but were the only study  
35 324 to assess this. Laparoscopic surgery was found to be associated with improved  
36 325 body image in 2/6 studies<sup>(36, 68)</sup>. Ileal pouch-anal anastomosis (IPAA) seemed to  
37 326 result in patients being satisfied with their body image in two studies<sup>(24, 26)</sup> but  
38 327  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4 328 they lacked a comparative surgery group. One study<sup>(50)</sup> compared IPAA and  
5  
6 329 ileostomy and found better body image scores in the IPAA group. No significant  
7  
8  
9 330 associations were found between disease sub-type and increased BID.

11  
12 331 **Is there an association between body image dissatisfaction and quality of**  
13  
14 332 **life in IBD patients?**

15  
16  
17 333 Eight studies<sup>(14, 22-24, 34, 62, 66, 72)</sup> explored a potential association between BID  
18  
19 334 and QoL across a total of 1371 patients, with seven presenting a significant  
20  
21  
22 335 association. Three studies<sup>(22, 24, 62)</sup> (Table 4) focused on younger populations  
23  
24 336 with the rest including adults only. The majority of studies included populations  
25  
26  
27 337 with both UC and CD whilst two<sup>(24, 34)</sup> included only one subtype.

28  
29  
30 338 Statistically significant weak to moderately strong correlations were present in  
31  
32 339 five studies<sup>(22, 23, 34, 62, 72)</sup> ranging from  $r = 0.34$  to  $r = 0.67$ . Furthermore,  
33  
34 340 McDermott(2015)<sup>(14)</sup> found that when using the BI scale there was a significant  
35  
36 341 difference in scores between those with good or poor QoL. Trindade(2017)<sup>(72)</sup>  
37  
38 342 found that BI was positively correlated with psychological and physical QoL.  
39  
40  
41 343 Saha(2015)<sup>(66)</sup> found that a one unit increase in the total ASWAP score  
42  
43 344 (indicating poorer body image) was associated with a 0.62 decrease in QoL  
44  
45 345 score ( $p < 0.0001$ ).

46  
47  
48  
49 346 Various QoL tools (See Table 1) were used across studies with some using  
50  
51 347 more than one. Four of these questionnaires used (IMPACT II and III, GIQLI  
52  
53 348 and WHOQOL-BREF) contain a question or domain on BI, potentially making  
54  
55  
56 349 them more likely to correlate with BI questionnaires.

57  
58 350  
59  
60

1  
2  
3  
4 351  
5  
6  
7 352  
8  
9 353  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Confidential: For Review Only

**Table 4.** Most common factors found to be significantly associated with impaired body image in IBD as reported in each study, including associations between reduced body image and reduced QoL.

	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	Dunker 1998	Eshuis 2008	Eshuis 2010	Kjaer 2014	Maurder 1999	McDermott 2015	Muller 2010	Ogden	Perrin	Polle 2007	Saha 2015	Scarpa 2009	Trindade 2017
<b>Female gender</b>	r= -0.18*	Difference in means p=0.08	Difference in means p>0.10	Difference in scores p=0.18	No significant association			Female	Significantly worse scores in open surgery group p=0.004*	p<0.001*	Difference in proportions p=0.007			Significantly worse scores in open surgery group p=0.004*	p<0.0001*		

Factor	Study																
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	Dunker 1998	Eshuis 2008	Eshuis 2010	Kjaer 2014	Mauder 1999	McDermott 2015	Muller 2010	Ogden 2000	Perrin 2000	Polle 2007	Sana 2015	Scarpa 2009	Trindade 2017
<b>Higher disease/symptom activity</b>		r=0.38*		No significant association	r=0.5*				p<0.001*			p=0.50	p=0.003*		In UC p=0.006*	Multiple regression β=0.426 p=0.006*	Active disease r=0.18 Symptoms r=0.40*
<b>Fatigue</b>		r=0.55*															

Factor	Study																					
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker	2008	Eshuis 2010	Eshuis	Kjaer 2014	1999	Maurder 2015	McDermott 2010	Muller	Ogden	Perrin	Polle 2007	Sana 2015	2009	Scarpa	2017	Trindade
<b>Disease Subtype</b>				No significant association								p=0.63	Difference in proportions p=0.094		p=0.05		No association found					
<b>Age</b>		r = -0.18*			No significant association							Younger age p<0.001*										r = -0.06
<b>Steroids</b>				No significant association		No significant association						p=0.03*			p=0.005*			p=0.02*				r=0.22*



Factor	Study																			
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker 2008	Eshuis 2010	Eshuis 2010	Kjaer 2014	Maurder 1999	McDermott 2015	2010	Muller	Ogden	Perrin	Polle 2007	Saha 2015	Scarpa 2009	2017	Trindade
<b>Smoking</b>											p=0.001*									
<b>Open/conventional surgical</b>				Difference in scores p=0.2	Difference in means p=0.51	Difference in median p=0.03*	Difference in median p=0.17								No significant differences			Multiple regression (for laparoscopic approach) $\beta=0.331$ p=0.036*		

Factor	Study																																														
Increase d BMI	<table border="1"> <tr> <td data-bbox="1108 451 1153 798">Abdovic</td> <td data-bbox="1153 451 1198 798">Bel 2015</td> <td data-bbox="1198 451 1243 798">Beld 2010</td> <td data-bbox="1243 451 1288 798">Chouliaras 2017</td> <td data-bbox="1288 451 1332 798">1998</td> <td data-bbox="1332 451 1377 798">Dunker</td> <td data-bbox="1377 451 1422 798">2008</td> <td data-bbox="1422 451 1467 798">Eshuis 2010</td> <td data-bbox="1467 451 1512 798">Eshuis 2010</td> <td data-bbox="1512 451 1556 798">Kjaer 2014</td> <td data-bbox="1556 451 1601 798">1999</td> <td data-bbox="1601 451 1646 798">Maurder</td> <td data-bbox="1646 451 1691 798">McDermott 2015</td> <td data-bbox="1691 451 1736 798">2010</td> <td data-bbox="1736 451 1780 798">Muller</td> <td data-bbox="1780 451 1825 798">Ogden</td> <td data-bbox="1825 451 1870 798">Perrin</td> <td data-bbox="1870 451 1915 798">Polle 2007</td> <td data-bbox="1915 451 1960 798">Sana 2015</td> <td data-bbox="1960 451 2004 798">2009</td> <td data-bbox="2004 451 2049 798">Scarpa</td> <td data-bbox="2049 451 2094 798">2017</td> <td data-bbox="2094 451 2139 798">Trindade</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Females only</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>No significant association</td> <td></td> <td></td> <td></td> <td>r= 0.25*</td> </tr> </table>	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker	2008	Eshuis 2010	Eshuis 2010	Kjaer 2014	1999	Maurder	McDermott 2015	2010	Muller	Ogden	Perrin	Polle 2007	Sana 2015	2009	Scarpa	2017	Trindade													Females only						No significant association				r= 0.25*
Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker	2008	Eshuis 2010	Eshuis 2010	Kjaer 2014	1999	Maurder	McDermott 2015	2010	Muller	Ogden	Perrin	Polle 2007	Sana 2015	2009	Scarpa	2017	Trindade																									
												Females only						No significant association				r= 0.25*																									

Confidential: For Review Only

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46

Factor	Study																	
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker 2008	Eshuis 2010	Eshuis	Kjaer 2014	Maurer 1999	McDermott 2015	Muller 2010	Ogden	Perrin	Polle 2007	Sana 2015	Scarpa 2009	Trindade 2017
Impaired QoL	r=0.52*	r=0.67*	r<0.41		r=0.5*						p<0.001*			r=0.51*		One unit increase in ASWAP score associated with a 0.62 decrease in IBDQ (p<0.001)*		Psychological QoL r=0.56*
*Significant association found.																		

Factor	Study
Abdovic	Kjaer 2014
Bel 2015	Maunder 1999
Beld 2010	McDermott 2010
Chouliaras 2017	Muller
1998	Ogden
Dunker	Perrin
2008	Polle 2007
Eshuis 2010	Sana 2015
Eshuis 2010	Scarpa 2009
Kjaer 2014	Trindade 2017

***N.B: With some tools, higher scores indicate better body image/QoL and in others higher scores indicate worse body image/QoL. This may result in both positive and negative correlation coefficients. Where applicable, signs have been flipped for ease of interpretation to clearly show the positive correlation between body image and quality of life.***

Pre-proof  
Manuscript: For Review Only

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46

## 356 Risk of Bias

357 The 31 studies relevant for questions 2-4 were assessed using criteria from the  
358 Joanna Briggs Institute critical appraisal tools for analytical cross-sectional and  
359 prevalence designs (Supplementary Table 2). Only cross-sectional data was  
360 relevant for the review. Poor reporting of quality criteria in many studies made  
361 quality assessment difficult. Where criteria were reported, the overall quality  
362 was variable. Most studies had some areas of low and higher quality. Only one  
363 study, McDermott (2015)<sup>(14)</sup>, was able to demonstrate adequate response rates,  
364 validated outcome measurement tools and adjustment for confounders.  
365 However, Chouliaras (2017)<sup>(30)</sup>, Trindade (2017)<sup>(72)</sup>, Lee (2015)<sup>(51)</sup> and Bel  
366 (2015)<sup>(23)</sup> adjusted for confounders and used validated outcome measurement  
367 tools but lacked adequate response rates.

368 Twenty studies (64.5%) used an appropriate sample frame with acquisition of  
369 patients from outpatient settings, IBD registries or healthcare records. Eighteen  
370 studies (58.1%) clearly reported inclusion criteria applied when recruiting  
371 participants. Only twelve studies (38.7%) had response rates >75%. Fifteen  
372 studies (48.4%) used a tool which had been validated using factor analysis and  
373 internal consistency analysis to measure BI. The others used non-validated  
374 tools. Twelve studies<sup>(14, 35, 50, 51, 59, 65, 66, 73)</sup> adjusted for potential confounders  
375 such as age, gender, BMI and previous surgery often using multiple regression  
376 models. Several studies reported limited demographic data. It should also be  
377 noted that sample sizes of many of the studies were small and confidence  
378 intervals were mostly not presented.

1  
2  
3  
4 379 **DISCUSSION**  
5  
6

7 380  
8  
9

10 381 **Summary of Findings**  
11  
12

13 382 Overall, fifteen different tools were used across 57 studies to measure BI in IBD  
14  
15 383 patients. These included QoL tools incorporating BI questions or domains, BI  
16  
17 384 tools and other adapted questionnaires. None offer a defining threshold for  
18  
19 385 presence or absence of BID, which is not commonly considered as a specific  
20  
21 386 psychological disorder unlike body dysmorphia.  
22  
23  
24  
25

26 387 It remains unclear whether IBD patients suffer with BID more so than the  
27  
28 388 general population as most studies reported mean values with no reference to  
29  
30 389 healthy population values. Three studies estimated a prevalence of a negative  
31  
32 390 BI based on one question and this varied between 21 and 81%. This wide  
33  
34 391 variation likely reflects the differences in tools and study characteristics. All  
35  
36 392 three studies were based on self-report questionnaires with a wide age range  
37  
38 393 and registry or hospital-based population.  
39  
40  
41  
42

43 394 Certain factors including female gender, disease activity and steroid use were  
44  
45 395 consistently found to be significantly associated with increased BID in IBD  
46  
47 396 patients. There was also a significant association between increasing BID and  
48  
49 397 decreasing QoL reported in eight studies. These findings are consistent with a  
50  
51 398 previous narrative review<sup>(79)</sup> assessing BID and sexual functioning in IBD  
52  
53 399 patients.  
54  
55  
56

57 400  
58  
59  
60

## 401 **Strengths and Weaknesses of the Review**

402 This is the first systematic review assessing BID in an IBD population, and a  
403 robust methodology was employed to ensure that bias and errors were  
404 minimised. A sensitive search strategy means that it is unlikely that relevant  
405 studies were missed and over 50 studies have contributed to the evidence base  
406 in an area previously unexplored by a systematic review.

407 The review has some limitations. Some of the extracted data is based on  
408 abstracts only where full texts could not be obtained from the authors. This will  
409 have resulted in some missing information.

410 Furthermore, qualitative studies were not included as this was considered  
411 beyond the scope of this review. It's likely that there are qualitative studies  
412 which could offer a deeper insight into perception of BI in IBD patients.

## 414 **Strengths and Weaknesses of the Evidence**

415 There are some weaknesses within the included evidence. All studies had some  
416 areas of high risk of bias or had poorly reported methodological criteria thus  
417 hampering quality assessment. Some studies had very low response rates  
418 leading to possible under-representation of certain groups. Few studies  
419 adjusted for confounders which could have resulted in overestimates of  
420 associations.

421 A further issue is the lack of healthy control groups. Although it appears that  
422 IBD patients are concerned about BI, it is difficult to determine whether they are

1  
2  
3  
4 423 affected more than the general population. However, it has been found that  
5  
6 424 children and adolescents with chronic illnesses such as asthma, cystic fibrosis  
7  
8  
9 425 and diabetes do have increased BID compared to healthy peers<sup>(80)</sup>.

10  
11  
12 426 Non-validated tools were often used for measuring BI and the reliability and  
13  
14 427 validity of findings based on these is therefore unknown. There is also still little  
15  
16 428 known about potential changes in BI perception over time.

17  
18  
19  
20 429

### 21 22 23 430 **Findings in Context**

24  
25  
26 431 This review is consistent with findings from the narrative review by Jedel  
27  
28 432 (2015)<sup>(79)</sup> which found that BI could potentially be a problem in IBD patients.

29  
30 433 Whilst surgery has been found to be an important contributing factor in BID in  
31  
32  
33 434 other research <sup>(81)</sup>, it is unclear how it impacts upon IBD patients. An association  
34  
35 435 between BID and poorer QoL has been highlighted in both.

36  
37  
38 436 Females and adolescents are more likely to be concerned with BI and to suffer  
39  
40 437 with BID compared with males and older people<sup>(82-87)</sup>. Whilst we found  
41  
42  
43 438 inconsistent results surrounding age, IBD is often diagnosed in adolescence  
44  
45 439 when BID could be more of a concern.

46  
47  
48 440 In oncology, BI is more widely researched. One study suggested gynaecologic  
49  
50 441 cancer patients suffered with BID which predicted emotional well-being<sup>(88)</sup>.

51  
52  
53 442 Another study with advanced cancer patients suggested BID was associated  
54  
55 443 with depression, anxiety and fatigue<sup>(89)</sup>. Qualitative research in pregnancy<sup>(90)</sup>  
56  
57 444 and systematic lupus<sup>(91)</sup> suggests BI can affect medication compliance and that



1  
2  
3  
4 445 patients would like more support around dealing with BI issues. This could also  
5  
6 446 be true for IBD patients.  
7  
8  
9

10 447 Finally, a previous systematic review found that children with chronic conditions  
11  
12 448 were more likely to be dissatisfied with their body than healthy peers<sup>(92)</sup>.  
13

14 449 Although IBD patients were not included, patients with similar chronic diseases  
15  
16 450 like diabetes, cancer, asthma and scoliosis were, suggesting IBD patients could  
17  
18 451 be similarly affected.  
19  
20  
21

22 452

### 25 453 **Implications**

26  
27  
28 454 This evidence identified in this review suggests an association between BID and  
29  
30 455 poorer QoL as well as finding factors influencing BI in IBD patients. There were  
31  
32 456 however limitations to the evidence in terms of methodological quality and/or  
33  
34 457 reporting. Also, results were difficult to compare across studies. More  
35  
36 458 promisingly, BI is becoming an increasingly assessed outcome, highlighting the  
37  
38 459 need for continued research in this area.  
39  
40  
41

42  
43 460 Current research suggests that age, gender, medication and disease activity in  
44  
45 461 IBD may impact upon BI. These could be taken into account by clinicians and  
46  
47 462 patients by altering therapy or targeting comorbidities which could have a  
48  
49 463 beneficial effect on BID. Interventions to improve BI could be incorporated into  
50  
51 464 treatment strategies, which may in turn help to improve QoL. A recent  
52  
53 465 systematic review<sup>(93)</sup> found that stress-management, mindfulness and talking  
54  
55 466 therapies may offer small to moderate improvements in BI however there is a  
56  
57 467 lack of evidence from good randomised controlled trials.  
58  
59  
60

## 468 **Future Research**

469 Future research should focus on developing a consensus around which  
470 validated tool or tools are best suited to measuring BID in an IBD population.  
471 Whilst we describe validity of tools such as the Body Image Scale, we have not  
472 independently verified this, therefore we could not recommend a particular tool.  
473 Defining thresholds may allow estimation of the prevalence of BID in this  
474 population. Establishing reference values in a healthy population would allow for  
475 more meaningful interpretation of BID scores across different chronic diseases.  
476 Enrolling patients from diagnosis and following them over time would be useful  
477 to measure how BI changes with duration, activity of disease and treatment.  
478 Whilst more severe IBD symptoms or invasive treatment options may  
479 exacerbate BID, BID itself and any associated anxiety or depressive symptoms  
480 may in turn exacerbate IBD symptoms<sup>(94, 95)</sup>, and future research should also  
481 address this association. If BID is recognised and treated early it may contribute  
482 to preventing worsening disease course. It may also be useful to encourage the  
483 use of BI as a patient reported outcome in future IBD studies. This would  
484 increase data on BID and lead to a greater understanding of the condition.

485

## 486 **CONCLUSION**

487 In conclusion, the evidence suggests a detrimental effect of IBD on BI, but  
488 uncertainty remains due a lack of comparison data from healthy populations.  
489 Associations of BID with disease-related factors such as steroid treatment,  
490 fatigue, disease activity and surgery are apparent and findings suggest a

1  
2  
3  
4 491 correlation between impaired BI and poorer QoL. These results should be  
5  
6 492 cautiously interpreted due to risk of bias and/or poor reporting of methodological  
7  
8 493 criteria amongst included studies, and the wide variation between populations,  
9  
10 494 BI tools, and scoring systems. Future studies should make use of validated  
11  
12 495 measurement tools and include BI as a main outcome where appropriate.  
13  
14  
15  
16  
17 496

### 19 497 **Specific Author Contributions**

21  
22  
23 498 SB identified the topic, undertook scoping, defined the question, developed the  
24  
25 499 protocol and wrote the draft of the manuscript. IH contributed to the methods  
26  
27 500 development and carried out second reviewer tasks as well as helping to draft,  
28  
29 501 comment on and approve the final version of this paper. DM provided  
30  
31 502 substantial methodological input to aid protocol development and assisted with  
32  
33 503 drafting and reading, commenting on approving the final version. JD provided  
34  
35 504 methodological input and read, commented on and edited the draft and  
36  
37 505 approved the final version.  
38  
39  
40  
41

### 42 506 **Financial Support**

43  
44  
45 507 During this research Isobel Harris was funded by a National Institute for Health  
46  
47 508 Research (NIHR) Research Methods - Systematic Review Fellowship and Sophie Beese  
48  
49 509 was a locally funded trainee in systematic reviews at the University of Birmingham  
50  
51 510 with agreement from the NIHR. This article presents independent research funded by  
52  
53 511 the NIHR. The views expressed are those of the authors and not necessarily those of  
54  
55 512 the NHS, the NIHR or the Department of Health.  
56  
57  
58  
59  
60

1  
2  
3  
4 513  
5  
6  
7

8 514 **Acknowledgements**  
9

10 515 Not applicable.  
11  
12

13  
14 516 **Conflicts of Interest**  
15

16  
17 517 The authors have nothing to disclose.  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

518 **REFERENCES**

519

- 520 1. Centers for Disease Control and Prevention. What is inflammatory bowel disease  
521 (IBD)? 2014 [cited 2017 30/01/2017]. Available from: [https://www.cdc.gov/ibd/what-is-](https://www.cdc.gov/ibd/what-is-ibd.htm)  
522 [ibd.htm](https://www.cdc.gov/ibd/what-is-ibd.htm).
- 523 2. Crohn's and Colitis UK. About Inflammatory Bowel Disease [cited 2017 18/02/2017].  
524 Available from: <https://www.crohnsandcolitis.org.uk/about-inflammatory-bowel-disease>.
- 525 3. Kaplan GG. The global burden of IBD: from 2015 to 2025. *Nature Reviews*  
526 *Gastroenterology & Hepatology*. 2015;12:720-7.
- 527 4. National Eating Disorders Association. What is body image? [cited 2017 17/02/2017].  
528 Available from: <https://www.nationaleatingdisorders.org/what-body-image>.
- 529 5. Griffiths S, Hay P, Mitchison D, Mond JM, McLean SA, Rodgers B, et al. Sex differences  
530 in the relationships between body dissatisfaction, quality of life and psychological distress.  
531 *Aust N Z J Public Health*. 2016;40:518-22.
- 532 6. Brown Z, Tiggemann M. Attractive celebrity and peer images on Instagram: Effect on  
533 women's mood and body image. *Body image*. 2016;19:37-43.
- 534 7. Cohen R, Blaszczynski A. Comparative effects of Facebook and conventional media on  
535 body image dissatisfaction. *Journal of eating disorders*. 2015;3:23.
- 536 8. Holland G, Tiggemann M. A systematic review of the impact of the use of social  
537 networking sites on body image and disordered eating outcomes. *Body image*. 2016;17:100-  
538 10.
- 539 9. Dyl J, Kittler J, Phillips KA, Hunt JI. Body Dysmorphic Disorder and Other Clinically  
540 Significant Body Image Concerns in Adolescent Psychiatric Inpatients: Prevalence and Clinical  
541 Characteristics. *Child Psychiatry and Human Development*. 2006;36:369-82.
- 542 10. Kim JS, Kang S. A Study on Body Image, Sexual Quality of Life, Depression, and Quality  
543 of Life in Middle-aged Adults. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2015;9:96-103.
- 544 11. Thomas F. Cash. Body Image Assessments [cited 2017 17/02/2017]. Available from:  
545 <http://www.body-images.com/assessments/>.
- 546 12. McDermott E, Moloney J, Rafter N, Keegan D, Byrne K, Doherty GA, et al. The body  
547 image scale: a simple and valid tool for assessing body image dissatisfaction in inflammatory  
548 bowel disease. *Inflamm Bowel Dis*. 2014;20:286-90.
- 549 13. NHS Choices. Corticosteroids - Side effects 2015 [updated 12/03/2015; cited 2017  
550 19/02/2017]. Available from: [http://www.nhs.uk/Conditions/Corticosteroid-](http://www.nhs.uk/Conditions/Corticosteroid-(drugs)/Pages/Sideeffects.aspx)  
551 [\(drugs\)/Pages/Sideeffects.aspx](http://www.nhs.uk/Conditions/Corticosteroid-(drugs)/Pages/Sideeffects.aspx).
- 552 14. McDermott E, Mullen G, Moloney J, Keegan D, Byrne K, Doherty GA, et al. Body image  
553 dissatisfaction: Clinical features, and psychosocial disability in inflammatory bowel disease.  
554 *Inflamm Bowel Dis*. 2015;21:353-60.
- 555 15. Zaghiyan K, Ghantiwala V, Le Q, Murrell Z, Fleshner P. Is body image and cosmesis  
556 better after double-port laparoscopic or open ileal pouch-anal anastomosis (IPAA)?  
557 2011;54:e119.
- 558 16. Michaela MB, Dianne N-S. Body dissatisfaction: an overlooked public health concern.  
559 *Journal of Public Mental Health*. 2014;13:64-9.
- 560 17. Bernstein CN, Hitchon CA, Walld R, Bolton JM, Sareen J, Walker JR, et al. Increased  
561 Burden of Psychiatric Disorders in Inflammatory Bowel Disease. *Inflamm Bowel Dis*. 2018.

- 1  
2  
3  
4 562 18. NHS Choices. Inflammatory Bowel Disease 2015 [updated 20/03/2015; cited 2017  
5 563 17/02/2017]. Available from: [http://www.nhs.uk/conditions/Inflammatory-bowel-](http://www.nhs.uk/conditions/Inflammatory-bowel-disease/Pages/Introduction.aspx)  
6 564 [disease/Pages/Introduction.aspx](http://www.nhs.uk/conditions/Inflammatory-bowel-disease/Pages/Introduction.aspx).  
7  
8 565 19. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred Reporting Items for Systematic  
9 566 Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med*. 2009;6.  
10 567 20. Beese S, Harris I, Dretzke J, Moore D. Body Image Dissatisfaction in Patients with  
11 568 Inflammatory Bowel Disease: A Systematic Review Protocol *BMC Systematic Reviews*. 2018.  
12 569 21. The Joanna Briggs Institute. Joanna Briggs Institute Reviewers' Manual: 2016 edition. .  
13 570 2016.  
14 571 22. Abdovic S, Mocic Pavic A, Milosevic M, Persic M, Senecic-Cala I, Kolacek S. The  
15 572 IMPACT-III (HR) Questionnaire: A valid measure of health-related quality of life in Croatian  
16 573 children with inflammatory bowel disease. *Journal of Crohn's and Colitis*. 2013;7:908-15.  
17 574 23. Bel LGJ, Vollebregt AM, Van der Meulen-de Jong AE, Fidder HH, Ten Hove WR, Vliet-  
18 575 Vlieland CW, et al. Sexual Dysfunctions in Men and Women with Inflammatory Bowel Disease:  
19 576 The Influence of IBD-Related Clinical Factors and Depression on Sexual Function. *J Sex Med*.  
20 577 2015;12:1557-67.  
21 578 24. Beld M, Van Balkom K, Visschers R, Van Gemert W, Breukink S. Long term results after  
22 579 restorative proctocolectomy with ileal pouch-anal anastomosis at young age. *Colorectal Dis*.  
23 580 2010;12:16.  
24 581 25. Bengtsson J, Lindholm E, Nordgren S, Berndtsson I, Oresland T, Borjesson L. Sexual  
25 582 function after failed ileal pouch-anal anastomosis. *Journal of Crohn's and Colitis*. 2011;5:407-  
26 583 14.  
27 584 26. Brown C, Gibson PR, Hart A, Kaplan GG, Kachroo S, Ding Q, et al. Long-term outcomes  
28 585 of colectomy surgery among patients with ulcerative colitis. *Springerplus*. 2015;4:573.  
29 586 27. Cabras PL, Giardinelli L, la Malfa GP, Galassi F. Variations in body image during  
30 587 autogenic training in patients with psychosomatic gastrointestinal disorders. *Giunti*  
31 588 *Organizzazioni Speciali*. 1986;178:27-33.  
32 589 28. Camilleri-Brennan J, Munro A, Steele RJ. Does an ileoanal pouch offer a better quality  
33 590 of life than a permanent ileostomy for patients with ulcerative colitis? *J Gastrointest Surg*.  
34 591 2003;7:814-9.  
35 592 29. Carlsen K, Jakobsen C, Hansen LF, Paerregaard A, Kallemose T, Riis LB, et al. Quality of  
36 593 life in paediatric inflammatory bowel disease patients in a self-administered telemedicine  
37 594 randomised clinical study. *Journal of Crohn's and Colitis*. 2016;10:S421-S2.  
38 595 30. Chouliaras G, Margoni D, Dimakou K, Fessatou S, Panayiotou I, Roma-Giannikou E.  
39 596 Disease impact on the quality of life of children with inflammatory bowel disease. *World J*  
40 597 *Gastroenterol*. 2017;23:1067-75.  
41 598 31. de Rooy EC, Toner BB, Maunder RG, Greenberg GR, Baron D, Steinhart AH, et al.  
42 599 Concerns of patients with inflammatory bowel disease: results from a clinical population. *Am J*  
43 600 *Gastroenterol*. 2001;96:1816-21.  
44 601 32. Drossman DA, Patrick DL, Mitchell CM, Zagami EA, Appelbaum MI. Health-related  
45 602 quality of life in inflammatory bowel disease. Functional status and patient worries and  
46 603 concerns. *Dig Dis Sci*. 1989;34:1379-86.  
47 604 33. Dunker MS, Bemelman WA, Slors JF, van Duijvendijk P, Gouma DJ. Functional outcome,  
48 605 quality of life, body image, and cosmesis in patients after laparoscopic-assisted and  
49 606 conventional restorative proctocolectomy: a comparative study. *Dis Colon Rectum*.  
50 607 2001;44:1800-7.  
51 608 34. Dunker MS, Stiggelbout AM, van Hogezaand RA, Ringers J, Griffioen G, Bemelman WA.  
52 609 Cosmesis and body image after laparoscopic-assisted and open ileocolic resection for Crohn's  
53 610 disease. *Surg Endosc*. 1998;12:1334-40.

- 1  
2  
3  
4 611 35. Eshuis EJ, Polle SW, Slors JF, Hommes DW, Sprangers MA, Gouma DJ, et al. Long-term  
5 612 surgical recurrence, morbidity, quality of life, and body image of laparoscopic-assisted vs. open  
6 613 ileocolic resection for Crohn's disease: a comparative study. *Dis Colon Rectum*. 2008;51:858-  
7 614 67.
- 8 615 36. Eshuis EJ, Slors JFM, Stokkers PCF, Sprangers MAG, Ubbink DT, Cuesta MA, et al. Long-  
9 616 term outcomes following laparoscopically assisted versus open ileocolic resection for Crohn's  
10 617 disease. *Br J Surg*. 2010;97:563-8.
- 11 618 37. Eshuis EJ, Voermans RP, Stokkers PCF, Van Berge Henegouwen MI, Fockens P,  
12 619 Bemelman WA. Laparoscopic resection with transcolonic specimen extraction for ileocaecal  
13 620 Crohn's disease. *Br J Surg*. 2010;97:569-74.
- 14 621 38. Gallo J, Grant A, Otley AR, Orsi M, Macintyre B, Gauvry S, et al. Do parents and children  
15 622 agree? Quality-of-life assessment of children with inflammatory bowel disease and their  
16 623 parents. *J Pediatr Gastroenterol Nutr*. 2014;58:481-5.
- 17 624 39. Giudici F, Scaringi S, Di Martino C, Ficari F, Bechi P. Rationalisation of the surgical  
18 625 technique for minimally invasive laparoscopic ileal pouch-anal anastomosis after previous total  
19 626 colectomy for ulcerative colitis. *J Minim Access Surg*. 2017;13:188-91.
- 20 627 40. Grant A, Kappelman M, Martin C, Otley A. A new domain structure for the impact-III, a  
21 628 pediatric inflammatory bowel disease (IBD) health reported quality of life (HRQOL) tool.  
22 629 *Inflamm Bowel Dis*. 2016;22:S7-S8.
- 23 630 41. Grant A, Otley A, Escher J, Hyams JS, Maa JF, Alperovich G, et al. Assessment of  
24 631 IMPACT III emotional and social functioning domain scores in adalimumab-treated paediatric  
25 632 patients with Crohn's disease. *Journal of Crohn's and Colitis*. 2016;10:S424-S5.
- 26 633 42. Grootenhuis MA, Maurice-Stam H, Derkx BH, Last BF. Evaluation of a  
27 634 psychoeducational intervention for adolescents with inflammatory bowel disease. *Eur J*  
28 635 *Gastroenterol Hepatol*. 2009;21:340-5.
- 29 636 43. Gudlaugsdottir K, Valsdottir EB, Stefansson TB. [Quality of Life after colectomy due to  
30 637 ulcerative colitis]. *Laeknabladid*. 2016;102:482-9.
- 31 638 44. Hagan M, Jambaulikar G, Osche-Gauvin K, Schwartz D, Higginbotham T, Cross R. Sexual  
32 639 function in patients with inflammatory bowel disease: Results of a web-based health survey.  
33 640 *Am J Gastroenterol*. 2014;109:S516.
- 34 641 45. Joachim G, Milne B. Inflammatory bowel disease: effects on lifestyle. *J Adv Nurs*.  
35 642 1987;12:483-7.
- 36 643 46. Juan L, Ricardo DLV, Mayte V, Esther T. Gender differences in stoma-related quality of  
37 644 life in Puerto Ricans with IBD. *Am J Gastroenterol*. 2018;113 (Supplement 1):S14.
- 38 645 47. Kjaer MD, Laursen SB, Qvist N, Kjeldsen J, Poornorozy PH. Sexual function and body  
39 646 image are similar after laparoscopy-assisted and open ileal pouch-anal anastomosis. *World J*  
40 647 *Surg*. 2014;38:2460-5.
- 41 648 48. Knowles SR, Gass C, Macrae F. Illness perceptions in IBD influence psychological status,  
42 649 sexual health and satisfaction, body image and relational functioning: A preliminary  
43 650 exploration using Structural Equation Modeling. *Journal of Crohn's and Colitis*. 2013;7:e344-  
44 651 e50.
- 45 652 49. Knowles SR, Wilson J, Wilkinson A, Connell W, Salzberg M, Castle D, et al. Psychological  
46 653 well-being and quality of life in Crohn's disease patients with an ostomy: a preliminary  
47 654 investigation. *Journal of Wound, Ostomy, & Continence Nursing*. 2013;40:623-9.
- 48 655 50. Kuruvilla K, Osler T, Hyman NH. A comparison of the quality of life of ulcerative colitis  
49 656 patients after IPAA vs ileostomy. *Dis Colon Rectum*. 2012;55:1131-7.
- 50 657 51. Lee D, Baldassano RN, Otley AR, Albenberg L, Griffiths AM, Compher C, et al.  
51 658 Comparative effectiveness of nutritional and biological therapy in North American children  
52 659 with active Crohn's disease. *Inflamm Bowel Dis*. 2015;21:1786-93.
- 53  
54  
55  
56  
57  
58  
59  
60



- 1  
2  
3  
4 660 52. Liwanag MJ, Liu JX, Tan LN, Huang JG, Quak SH, Aw MM. Health related quality of life  
5 661 in paediatric inflammatory bowel disease in a Southeast Asian population. *Journal of Crohn's*  
6 662 *and Colitis*. 2014;8:S409.
- 7 663 53. Mason A, Malik S, McMillan M, McNeilly JD, Bishop J, McGrogan P, et al. A prospective  
8 664 longitudinal study of growth and pubertal progress in adolescents with inflammatory bowel  
9 665 disease. *Horm Res Paediatr*. 2015;83:45-54.
- 10 666 54. Maunder R, Toner B, De Rooy E, Moskovitz D. Influence of sex and disease on illness-  
11 667 related concerns in inflammatory bowel disease. *Can J Gastroenterol*. 1999;13:728-32.
- 12 668 55. Mazzoccone A, et al. A study of body image in patients with chronic colon and liver  
13 669 diseases. *Giunti Organizzazioni Speciali*. 1980;155-156:105-13.
- 14 670 56. McDermott E, Moloney J, Rafter N, Keegan D, Byrne K, Doherty GA, et al. The body  
15 671 image scale: A simple and valid tool for assessing body image dissatisfaction in inflammatory  
16 672 bowel disease. *Inflamm Bowel Dis*. 2014;20:286-90.
- 17 673 57. Mountifield R, Bampton P, Prosser R, Muller K, Andrews JM. Fear and fertility in  
18 674 inflammatory bowel disease: A mismatch of perception and reality affects family planning  
19 675 decisions. *Inflamm Bowel Dis*. 2009;15:720-5.
- 20 676 58. Mukhopadhyay A, Probert S, Smith C, Maville C, Renji E, Bunn S, et al. IMPACT III-  
21 677 disease-specific health-related quality of life (HRQOL) for children with Crohn's disease (CD) on  
22 678 infliximab-a single centre experience. *J Pediatr Gastroenterol Nutr*. 2017;64 (Supplement  
23 679 1):519-20.
- 24 680 59. Muller KR, Prosser R, Bampton P, Mountifield R, Andrews JM. Female gender and  
25 681 surgery impair relationships, body image, and sexuality in inflammatory bowel disease: Patient  
26 682 perceptions. *Inflamm Bowel Dis*. 2010;16:657-63.
- 27 683 60. Navas-Lopez VM, Martin-De-Carpi J, Grant A, Walters TD, Ruemmele F, Mack D, et al.  
28 684 Quality of life in paediatric Crohn's disease: Data from the Imagekids study. *Journal of Crohn's*  
29 685 *and Colitis*. 2016;10:S145-S6.
- 30 686 61. Ogden CA, Akobeng AK, Abbott J, Aggett P, Sood MR, Thomas AG. Validation of an  
31 687 instrument to measure quality of life in British children with inflammatory bowel disease. *J*  
32 688 *Pediatr Gastroenterol Nutr*. 2011;53:280-6.
- 33 689 62. Perrin JM, Kuhlthau K, Chughtai A, Romm D, Kirschner BS, Ferry GD, et al. Measuring  
34 690 quality of life in pediatric patients with inflammatory bowel disease: Psychometric and clinical  
35 691 characteristics. *J Pediatr Gastroenterol Nutr*. 2008;46:164-71.
- 36 692 63. Plevinsky JM, Greenley RN. Exploring health-related quality of life and social  
37 693 functioning in adolescents with inflammatory bowel diseases after attending camp oasis and  
38 694 participating in a facebook group. *Inflamm Bowel Dis*. 2014;20:1611-7.
- 39 695 64. Polle SW, Dunker MS, Slors JF, Sprangers MA, Cuesta MA, Gouma DJ, et al. Body  
40 696 image, cosmesis, quality of life, and functional outcome of hand-assisted laparoscopic versus  
41 697 open restorative proctocolectomy: long-term results of a randomized trial. *Surg Endosc*.  
42 698 2007;21:1301-7.
- 43 699 65. Ponsioen CY, de Groof EJ, Eshuis EJ, Gardenbroek TJ, Bossuyt PMM, Hart A, et al.  
44 700 Laparoscopic ileocaecal resection versus infliximab for terminal ileitis in Crohn's disease: a  
45 701 randomised controlled, open-label, multicentre trial. *The Lancet Gastroenterology &*  
46 702 *Hepatology*. 2017;2:785-92.
- 47 703 66. Saha S, Zhao YQ, Shah SA, Esposti SD, Lidofsky S, Bright R, et al. Body image  
48 704 dissatisfaction in patients with inflammatory bowel disease. *Inflamm Bowel Dis*. 2015;21:345-  
49 705 52.
- 50 706 67. Savarino JR, Venkatesh RD, Israel EJ, Kaplan JL. Health-related quality of life in pediatric  
51 707 inflammatory bowel disease patients receiving infliximab: A pilot study using the impact-III  
52 708 questionnaire. *J Pediatr Gastroenterol Nutr*. 2016;63:S362-S3.



- 1  
2  
3  
4 709 68. Scarpa M, Ruffolo C, Bassi D, Boetto R, D'Inca R, Buda A, et al. Intestinal surgery for  
5 710 Crohn's disease: Predictors of recovery, quality of life, and costs. *J Gastrointest Surg.*  
6 711 2009;13:2128-35.
- 7 712 69. Shah S, Urban M, Gracely E, Nandi N. Anonymous self perception survey of sexuality  
8 713 and body image in inflammatory bowel disease. *Am J Gastroenterol.* 2017;112 (Supplement  
9 714 1):S377-S9.
- 10 715 70. Shepanski MA, Hurd LB, Culton K, Markowitz JE, Mamula P, Baldassano RN. Health-  
11 716 related quality of life improves in children and adolescents with inflammatory bowel disease  
12 717 after attending a camp sponsored by the Crohn's and Colitis Foundation of America. *Inflamm*  
13 718 *Bowel Dis.* 2005;11:164-70.
- 14 719 71. Swedish E, Blucker RT, Grunow J, Suorsa K, Jacobs NJ. Severity of illness and quality of  
15 720 life over time in pediatric inflammatory disease patients. *Gastroenterology.* 2015;1):S635.
- 16 721 72. Trindade IA, Ferreira C, Pinto-Gouveia J. The effects of body image impairment on the  
17 722 quality of life of non-operated Portuguese female IBD patients. *Qual Life Res.* 2017;26:429-36.
- 18 723 73. Vlahou CH, Cohen LL, Woods AM, Lewis JD, Gold BD. Age and body satisfaction predict  
19 724 diet adherence in adolescents with inflammatory bowel disease. *J Clin Psychol Med Settings.*  
20 725 2008;15:278-86.
- 21 726 74. Weinryb RM, Gustavsson JP, Barber JP. Personality predictors of dimensions of  
22 727 psychosocial adjustment after surgery. *Psychosom Med.* 1997;59:626-31.
- 23 728 75. Weinryb RM, Gustavsson JP, Barber JP. Personality traits predicting long-term  
24 729 adjustment after surgery for ulcerative colitis. *J Clin Psychol.* 2003;59:1015-29.
- 25 730 76. Werner H, Landolt MA, Buehr P, Koller R, Nydegger A, Spalinger J, et al. Validation of  
26 731 the IMPACT-III quality of life questionnaire in Swiss children with inflammatory bowel disease.  
27 732 *Journal of Crohn's and Colitis.* 2014;8:641-8.
- 28 733 77. Zambonin D, Giudici F, Ficari F, Rogai F, Scaringi S. Short-and long-term outcome of  
29 734 minimally invasive approach for Crohn's disease: Comparison between single incision,  
30 735 roboticassisted and conventional laparoscopy. *Journal of Crohn's and Colitis.* 2018;12  
31 736 (Supplement 1):S411-S2.
- 32 737 78. Kjaer MD, Laursen SB, Poornorozy PH. Sexual function and body image is similar after  
33 738 laparoscopic and open ileal pouch-anal anastomosis. *Gastroenterology.* 2014;1):S-383.
- 34 739 79. Jedel S, Hood MM, Keshavarzian A. Getting personal: a review of sexual functioning,  
35 740 body image, and their impact on quality of life in patients with inflammatory bowel disease.  
36 741 *Inflamm Bowel Dis.* 2015;21:923-38.
- 37 742 80. Piquart M. Body image of children and adolescents with chronic illness: A meta-  
38 743 analytic comparison with healthy peers. *Body Image.* 2013;10:141-8.
- 39 744 81. Allison M, Lindsay J, Gould D, Kelly D. Surgery in young adults with inflammatory bowel  
40 745 disease: a narrative account. *International journal of nursing studies.* 2013;50:1566-75.
- 41 746 82. Rosenblum GD, Lewis M. The relations among body image, physical attractiveness, and  
42 747 body mass in adolescence. *Child development.* 1999;70:50-64.
- 43 748 83. Bearman SK, Martinez E, Stice E, Presnell K. The Skinny on Body Dissatisfaction: A  
44 749 Longitudinal Study of Adolescent Girls and Boys. *Journal of youth and adolescence.*  
45 750 2006;35:217-29.
- 46 751 84. Brennan M, Lalonde C, Bain J. Body Image Perceptions: Do Gender Differences Exist?  
47 752 *Psi Chi J Undergrad Res.* 2010.
- 48 753 85. Miranda VP, Conti MA, de Carvalho PH, Bastos RR, Ferreira ME. Body image in  
49 754 different periods of adolescence. *Rev Paul Pediatr.* 2014;32:63-9.
- 50 755 86. Ando S, Osada H. Age and gender differences in body image over the life span:  
51 756 Relationships between physical appearance, health and functioning 2009. 1-16 p.
- 52 757 87. Pruis TA, Janowsky JS. Assessment of body image in younger and older women. *J Gen*  
53 758 *Psychol.* 2010;137:225-38.
- 54  
55  
56  
57  
58  
59  
60

- 1  
2  
3  
4 759 88. Teo I, Cheung YB, Lim TYK, Namuduri RP, Long V, Tewani K. The relationship between  
5 760 symptom prevalence, body image, and quality of life in Asian gynecologic cancer patients.  
6 761 *Psycho-oncology*. 2017.  
7  
8 762 89. Rhondali W, Chisholm GB, Daneshmand M, Allo J, Kang DH, Filbet M, et al. Association  
9 763 between body image dissatisfaction and weight loss among patients with advanced cancer and  
10 764 their caregivers: a preliminary report. *Journal of pain and symptom management*.  
11 765 2013;45:1039-49.  
12 766 90. Watson B, Broadbent J, Skouteris H, Fuller-Tyszkiewicz M. A qualitative exploration of  
13 767 body image experiences of women progressing through pregnancy. *Women Birth*. 2016;29:72-  
14 768 9.  
15 769 91. Hale ED, Radvanski DC, Hassett AL. The man-in-the-moon face: a qualitative study of  
16 770 body image, self-image and medication use in systemic lupus erythematosus. *Rheumatology*.  
17 771 2015;54:1220-5.  
18 772 92. Pinquart M. Body image of children and adolescents with chronic illness: a meta-  
19 773 analytic comparison with healthy peers. *Body Image*. 2013;10:141-8.  
20 774 93. Alleva JM, Sheeran P, Webb TL, Martijn C, Miles E. A Meta-Analytic Review of Stand-  
21 775 Alone Interventions to Improve Body Image. *PLoS One*. 2015;10:e0139177.  
22 776 94. Mikocka-Walus A, Pittet V, Rossel J-B, von Känel R, Anderegg C, Bauerfeind P, et al.  
23 777 Symptoms of Depression and Anxiety Are Independently Associated With Clinical Recurrence  
24 778 of Inflammatory Bowel Disease. *Clin Gastroenterol Hepatol*. 2016;14:829-35.e1.  
25 779 95. Kochar B, Barnes EL, Long MD, Cushing KC, Galanko J, Martin CF, et al. Depression Is  
26 780 Associated With More Aggressive Inflammatory Bowel Disease. *The American Journal Of*  
27 781 *Gastroenterology*. 2017;113:80.  
28  
29  
30  
31 782  
32  
33  
34 783  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

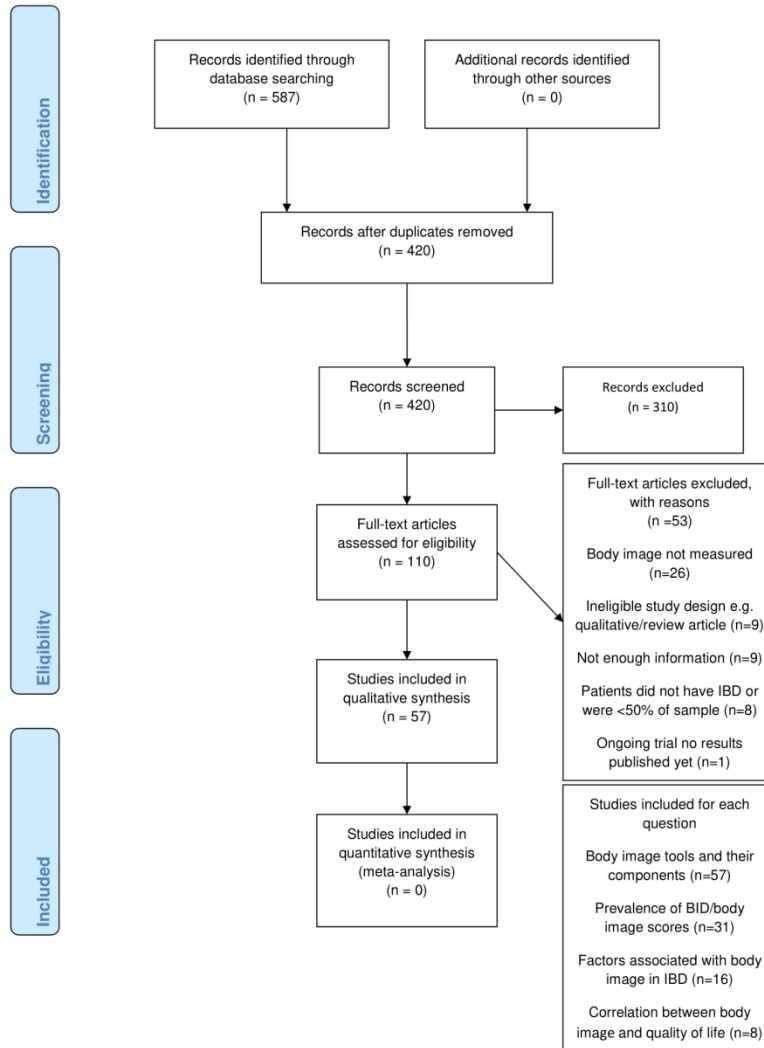
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

784 **Figures**

785 **1.** The selection process of records for inclusion/exclusion detailed in a PRISMA  
786 flowchart.

Confidential: For Review Only

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



437x618mm (96 x 96 DPI)

## Supplementary Data Content - Table 1

MEDLINE Search Strategy – OVID MEDLINE In process & other non-indexed citations and OVID MEDLINE.

Search	Query
#1	exp inflammatory bowel diseases/
#2	inflammatory bowel disease*.mp.
#3	exp Colitis, Ulcerative/
#4	ulcerative colitis.mp.
#5	exp Crohn disease/
#6	Crohn* disease.mp.
#7	Crohn*.mp.
#8	IBD.mp.
#9	CD.mp.
#10	UC.mp.
#11	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10
#12	exp body image/
#13	body image.mp.
#14	body dissatisfaction.mp.
#15	body awareness.mp.
#16	body concern*.mp.
#17	body attitude*.mp.
#18	body preoccupation.mp.

#19	body perception.mp.
#20	body anxiety.mp.
#21	body conscious*.mp.
#22	12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21
#23	11 AND 22

Confidential: For Review Only

1 **Supplementary Data Content - Table 2** Results of risk of bias assessment using Joanna Briggs Institute Tools

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
<b>Abdovic et al (2013)</b>	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes
<b>Bel et al (2015)</b>	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	No
<b>Beld et al (2010)</b>	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
<b>Bengtsson et al (2011)</b>	Yes	No	No	Yes	Yes	Unclear	No	Yes	Yes	No
<b>Brown et al (2015)</b>	Yes	Yes	Yes	Yes	Yes	Unclear	No	No	Yes	No
<b>Chouliaras et al (2017)</b>	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Unclear
<b>de Rooy et al (2001)</b>	Unclear	No	Yes	No	N/A	Yes	Yes	Yes	Yes	Unclear



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Dunker et al (1998)	No	No	Yes	Unclear	Unclear	No	No	No	Yes	Yes
Dunker et al (2001)	Unclear	No	Unclear	Yes	Unclear	Unclear	Unclear	No	Yes	Yes
Eshuis et al (2008)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Eshuis et al	Unclear	Yes	Unclear	Yes	Yes	No	No	No	Yes	Yes

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
<b>(2010)</b>										
<b>Gallo et al</b>	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes
<b>(2014)</b>										
<b>Giudici et al</b>	No	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
<b>(2017)</b>										
<b>Grootenhuis</b>	Yes	Yes	Yes	N/A	Unclear	Yes	Yes	No	Yes	No
<b>(2009)</b>										

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
<b>Kjaer et al (2014)</b>	Unclear	Unclear	Yes	Yes	Unclear	No	No	No	Yes	No
<b>Kuruvilla et al (2012)</b>	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
<b>Lee et al (2015)</b>	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear
<b>Mason et al (2015)</b>	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Unclear

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Maunder et al (1999)	Unclear	Unclear	Yes	Yes	N/A	No	No	Yes	Yes	Unclear
McDermott et al (2015)	Yes	Yes	Unclear	Unclear	N/A	Yes	Yes	Yes	Yes	Yes
Muller et al (2010)	Yes	Yes	Unclear	Unclear	N/A	Yes	Yes	No	Yes	Unclear
Ogden et al	Unclear	Unclear	Unclear	Unclear	N/A	N/A	N/A	Yes	Yes	Yes

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
<b>(2011)</b>										
<b>Perrin et al (2008)</b>	Yes	Yes	Yes	Unclear	N/A	N/A	N/A	Yes	Yes	No
<b>Polle et al (2007)</b>	Unclear	Unclear	Unclear	Yes	Unclear	Yes	No	No	Yes	Yes
<b>Ponsioen et al (2017)</b>	Yes	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes	Unclear	No

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Saha et al (2015)	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Unclear	Yes	No
Scarpa et al (2009)	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	No	Yes	Yes
Shepanksi (2005)	Yes	Unclear	Unclear	Yes	Unclear	Unclear	No	Yes	Yes	No
Trindade et al (2017)	Yes	Yes	Yes	Unclear	N/A	Yes	Yes	Yes	Yes	Unclear

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
-------	--	--	--	--	--	--------------------------------------	--	---	--	---

<b>Vlahou et al (2008)</b>	Yes	Unclear	No	Unclear	N/A	Yes	Yes	No	Yes	Unclear
<b>Voermans et al (2010)</b>	Unclear	Yes	Unclear	Yes	N/A	No	No	No	Yes	Yes

Confidential: For Review Only

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60