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# Positive psychological interventions in chronic conditions: Gratitude and inflammatory bowel disease

**By:**

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## Declaration

I declare that this work has not been submitted for any other degree at the University of Sheffield or any other institution.

| | Word Count |
|---|---|
| **Literature Review** | **7,979** |
| Including references and tables | 13,376 |
| | |
| **Research Report** | **8,997** |
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| | |
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*"In everything give thanks: for this is the will of God in Jesus Christ concerning you" (King James Bible, New Testament: 1st Thessalonians chapter 5, verse 18)*

## Abstract

Positive psychology is the study of happiness, wellbeing, positive traits, and engagement in absorbing activities. Gratitude is a positive psychological construct that has been found to have positive relationships with wellbeing and coping in both non-clinical and clinical populations. Research suggests that practicing gratitude can increase levels of gratitude and positively impact wellbeing. Inflammatory Bowel Disease (IBD) is a chronic condition that mainly affects the digestive system. It is associated with elevated levels of mood disorder and anxiety. However, evidence for the effectiveness of psychological treatments are mixed. It is possible that approaches which focus on increasing positive affect and coping through practices such as gratitude may be beneficial for those living with IBD. This project aimed to extend the current evidence base by first: reviewing the literature on the relationship of positive psychological factors to coping and adjustment in IBD, and second: investigating the effectiveness of a brief gratitude intervention on wellbeing and coping in people with IBD.

Part I describes the results of a systematic review which yielded 17 papers investigating positive psychological factors and their relationship to adjustment and coping in IBD using various measures. The results show that positive psychological factors have a positive relationship with indicators of successful adjustment and coping, and some evidence suggests a negative relationship between positive factors and indicators of poor adjustment and coping.

Part II presents a randomised controlled trial which investigated the effectiveness of a one-week online gratitude intervention on wellbeing and coping in people with IBD. 129 participants were randomised to 2 groups (gratitude intervention and active control), and completed measures of wellbeing before, during, after and at

eight-weeks follow-up. Attrition was relatively high. The study found no differences over time and between groups in levels of gratitude and wellbeing. Secondary analysis suggested immediate improvement in positive emotion regulation post-intervention and delayed improvement in self-efficacy at eight-week follow-up.

These studies extend the current evidence for the role of positive psychological factors in understanding adjustment to disease in IBD. The findings suggest that positive psychological factors play a role in predicting more successful adjustment, and the adoption of 'approach' rather than 'avoid' coping strategies. The findings also suggest that gratitude interventions have the potential to build coping capacities. However, no direct effect for improved wellbeing was observed in the current study.

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# Part I: Literature Review

A systematic review of positive psychological factors associated with adjustment and coping in inflammatory bowel disease

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## Abstract

### Objectives

To systematically explore the relationship between positive psychological factors, coping and adjustment in Inflammatory Bowel Disease (IBD).

### Method

A systematic review of the literature was undertaken. A database search by title, abstract and key term was completed for terms related to positive psychological traits, coping and IBD. The search was conducted in OVID (including Medline and PsychINFO), Pubmed, Scopus, and CINAHL in November 2017. Seven positive psychological factors included were gratitude, positive affect, optimism, resilience, hope, mindfulness and self-compassion.

### Results

A total of 17 papers were included in the final review. All seven factors were found to have been investigated in the literature. Four additional factors were identified: acceptance, religiousness, sense of coherence and thriving. Positive psychological factors were found to have a positive relationship with healthy coping and adjustment variables.

### Conclusions

There is emerging evidence for the importance of positive psychological factors in coping and adjustment to IBD. However further experimental and longitudinal research is required.

### Practitioner points

- Professionals should consider exploration of positive psychological factors during assessment to inform formulation and plans for ongoing support for patients with IBD.

- It may be important to consider interventions, which build strengths that overlap with positive psychological qualities e.g. Compassion Focused Therapy (CFT) and Acceptance and Commitment Therapy (ACT).

**Limitations**

- The conclusions are largely based on cross-sectional studies, presenting correlational data, which makes assertions about causation difficult.
- A wide variation in measurement for coping was used, and use of well-validated positive psychological measurements was mixed, which can make comparisons across studies difficult. Further research which makes use of validated measures of coping and positive psychological traits are needed.

## Introduction

Positive psychological interventions are growing in popularity and research interest. As these interventions continue to spread they increasingly become employed in clinical practice, for instance in work with chronic condition populations. This review aims to investigate the current evidence for the role of positive psychological factors in coping with chronic conditions and, in doing so, contribute to the dialogue surrounding the effectiveness of positive psychological interventions for individuals living with chronic conditions.

### Chronic Health Conditions

Most definitions of chronic conditions maintain that they persist over a sustained period, are without cure, have significant impact on function and wellbeing, require appropriate medical attention, monitoring, and self-management (Rampton & Shanahan, 2006, Taylor et al., 2014). Chronic conditions, when not terminal, are often life-long and therefore unlike briefer acute conditions can be the source of ongoing distress. Effective self-management is associated with reduced symptoms and better quality of life (Conley & Redeker, 2016; Plevinsky, Greenley, & Fishman, 2016; Saibil, Lai, Hayward, Yip, & Gilbert, 2008). Clinical psychology must apply psychological theory and evidence to support people in effective self-management. The Practical systematic RevIew of Self-Management Support for long-term conditions (PRISM) study (Taylor et al., 2014) outlines many factors that are important to consider in the role of self-management in chronic conditions.

IBD is an autoimmune illness that affects the digestive system. It is characterised by periods of exacerbated symptoms (flares) and periods of remission. Symptoms include abdominal pain, diarrhoea, tiredness and fatigue, mouth ulcers, weight loss, and anaemia (Rampton & Shanahan, 2006). If left without appropriate treatment it can worsen, leading to secondary problems affecting internal organs. The

two most common diagnoses, Crohn's disease (CD) and Ulcerative Colitis (UC), are estimated to affect around 300,000 people in the UK and 1,171,000 people in the United States (Kappelman et al., 2007; Molodecky et al., 2012). Due to the relapsing and remitting nature of the illness, the difficulty in managing the associated symptoms, likelihood of surgery, and the stigma attached to having these symptoms, IBD is associated with an increased amount of stress (Targownik et al., 2015), anxiety and depression (Bennebroek Evertsz' et al., 2012).

**Coping and adjustment in chronic conditions**

Being able to live well with the stress associated with chronic conditions is often described using the terms "coping" and "adjustment". Coping can be defined as the helpful or unhelpful behaviours or strategies employed to help manage and adjust to stress (Lopez, 2013). In conceptualising "coping" social scientists have turned to discussion and investigation of adaptive and maladaptive coping strategies (Tan, Teo, Anderson, & Jensen, 2011), and instrumental and emotional coping strategies (Baker & Berenbaum, 2007). Other ideas such as denial and avoidance, often associated with psychodynamic models of understanding human experience, have also been drawn upon and thus contribute to our understanding of healthy and unhealthy coping (Vaillant, 2011). Another model of coping that has been proposed is the common sense model (CSM) of illness (Knowles, Wilson, Connell, & Kamm, 2011; Leventhal, Phillips, & Burns, 2016). This model acknowledges the interaction between disease activity, illness perceptions, coping styles and outcomes with focus on instrumental versus emotional coping strategies.

Early conceptualisations of "adjustment" were based on homeostasis (self-regulation), as described in mechanics and biology. "Adjustment" is the process by which the individual reaches a state of balance in response to the dysregulation caused by illness (Call & Davis, 1989; Walker, Jackson, & Littlejohn, 2004). Adjustment can

refer to both an outcome and a process; the outcome being positive mental health, and the process being the ability to cope effectively with the demands of the environment (Sharpe & Curran, 2006). Adjustment has been conceptualised in four main ways: 1) an absence of mental ill-health (e.g. depression and anxiety) 2) typical functioning 3) positive wellbeing (as measured by positive affect, self-esteem etc.) and 4) effective or positive coping (e.g. emotional intelligence, resilience or thriving) (Seaton 2009). Researchers often use these elements as units of measurement when investigating adjustment as an outcome, and they can be organised as moving from global to specific. These four dimensions have been summarised in a model of adjustment of positive and negative mental-health and positive and negative (psychological, emotional and social) functioning (Keyes, 2002).

These conceptualisations are useful in the context of understanding the potential impact of IBD and how people cope with this. For example, the painful and stigmatising symptoms in a flare may exacerbate feelings of anxiety and low mood contingent on an individual's perceptions of their illness, perceptions of control of their environment, and subsequent responses to this. Strategies to manage symptoms, such as avoiding social activity and ruminating, may inadvertently result in more entrenched emotional and psychological difficulties, such as isolation and avoidance leading to depression (McCombie, Mulder, & Gearry, 2013).

Moss-Morris (2013) offers a comprehensive cognitive-behavioural model of adjustment to chronic conditions (see Figure 1). This model considers the influence of historical and background factors in influencing response and adaptation to unique illness stressors. It includes psychological and social aspects of adjustment synonymous with the functioning of the dual-continuum model (Snyder & Lopez, 2002, Chapter 4), and additionally encompasses the physical adjustment, which is uniquely dependent on the nature of the chronic condition. Within this model coping is the active process of

returning to and maintaining equilibrium which is the process and outcome of adjustment to the condition, i.e. someone who adjusts successfully is coping well with their condition (Moss-Morris, 2013).

In summary, definitions of coping and adjustment are not always clear, at times overlap and are conceptualised and measured differently. Recent models have attempted to incorporate this multimodality and while there is significant cross over between coping and adjustment, it can also be argued that they are separate. For the purposes of this review, adjustment will be understood as the process and outcome(s) of attempting to live with a chronic condition. Coping will be understood as the various behaviours, including attitudes and cognitions (Bouton, 2009; Reese, 2000) that might be employed to achieve this. These definitions will collectively be referred to as "adjustment and coping".

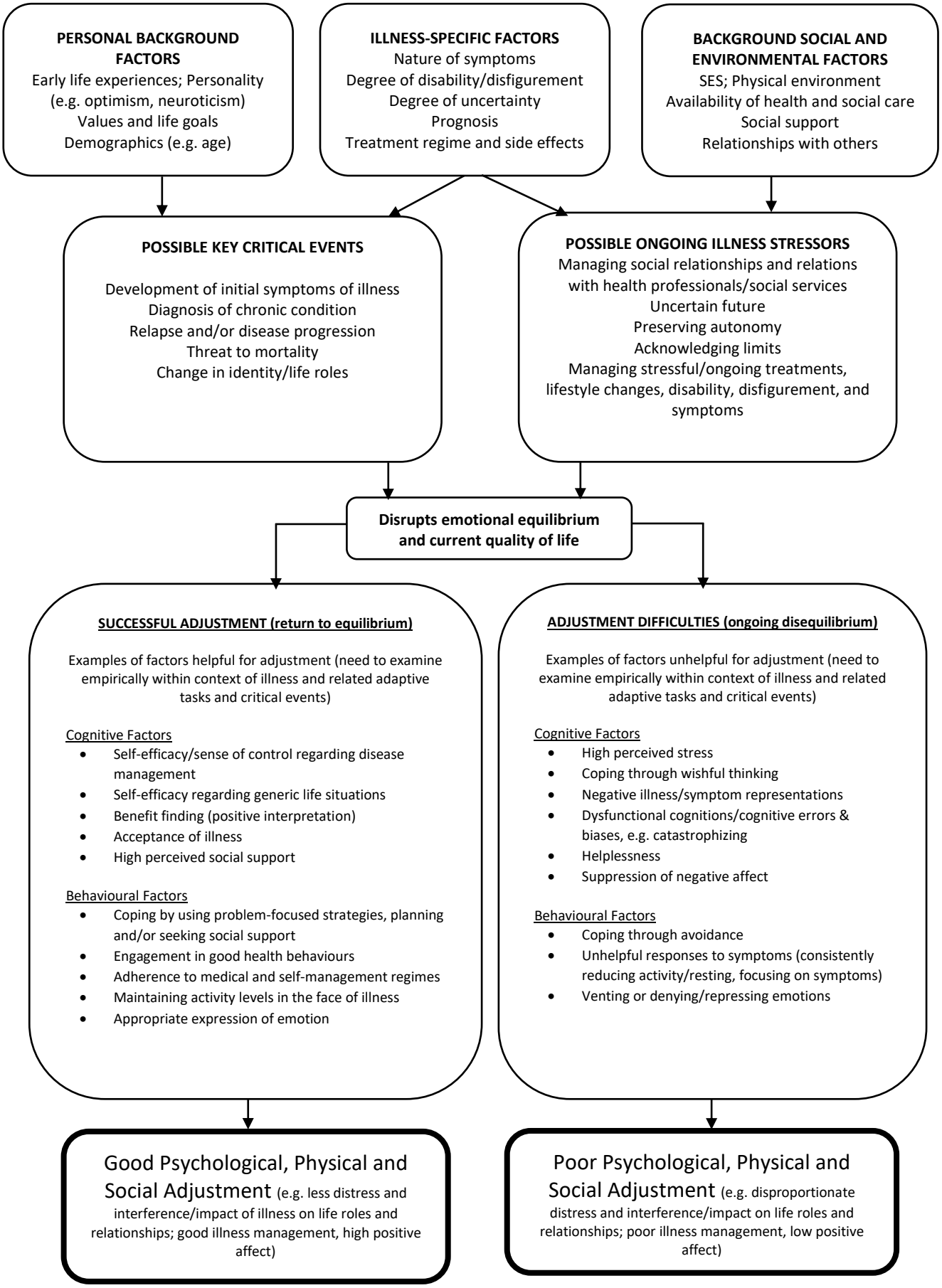


Figure 1. Model of adjustment to chronic conditions adapted from Moss-Morris

**Positive Psychology**

Clinical psychology has traditionally been dominated by Abnormal psychology, which emphasises identifying deficits and reducing symptoms e.g. low mood or high anxiety (Wood & Tarrier, 2010). There are benefits to this approach. For example, cognitive behavioural therapy (CBT) treatment manuals have been demonstrated to have good efficacy for reduction of anxiety and depression (Driessen & Hollon, 2010; Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012; Otte, 2011), and subsequently improved the mental health of the public (Gyani, Shafran, Layard, & Clark, 2013). However, interventions that aim to reduce low mood or anxiety where the stressor is a chronic condition may be ineffective (Moss-Morris, 2013). Psychologists are turning towards approaches that shift the target of intervention away from a focus on reducing distress to one of growing individuals' strengths (Carr, 2011). Borrowing from Positive Psychology (Seligman & Csikszentmihalyi, 2000) this approach has been termed Positive Clinical Psychology (Wood & Tarrier, 2010). Positive Psychological approaches may offer additional options where the focus on the reduction of symptoms has become an impasse.

Positive Psychology is the scientific investigation of happiness, wellbeing, positive traits, and engagement in absorbing activities (Carr, 2011; Lopez, 2013; Snyder & Lopez, 2002). Several processes and factors that contribute to improving levels of happiness, wellbeing and psychological flexibility have been identified (Duckworth, Steen, & Seligman, 2005; Wood & Tarrier, 2010). For brevity this review will focus on positive emotions or affect (Fredrickson, 2004), and positive traits; namely gratitude (Emmons et al, 2003), optimism (Dykema, Bergbower, Doctora, & Peterson, 1996; Higgins & Hay, 2003), hope (Snyder, 2002), and resilience (Tugade & Fredrickson, 2004). In addition to these more traditional domains of positive psychology, self-compassion (Neff, 2011; Neff & Vonk, 2009) and mindfulness (Kabat-Zinn, 2003) will

also be included. Self-compassion and mindfulness are secular constructs drawn from Buddhist Psychology, which, although separate, overlaps significantly with Western Positive Psychology. Self-compassion and mindfulness have been investigated and found to be similarly effective in improving happiness, wellbeing and psychological flexibility (Ivtzan & Lomas, 2016). A brief description of these concepts is outlined in the following sections.

**Positive affect.** Positive affect refers to 'the disposition to experience pleasurable emotional states' (Snyder & Lopez, 2002, p. 106). The structural model of affect put suggests there are three subcomponents and these can be captured in the positive items of the positive and negative affect scale (PANAS; Watson & Clark, 1999, see Table 1). Evidence suggests that people with higher levels of these traits report better quality of life and improved wellbeing. Positive affect has also been shown to be related to coping with stress (Khosla, 2006) and positive affect interventions have been found to enhance coping strategies which encourage finding "positive meaning" in misfortunate such as long-term benefit or personal learning (Yamasaki, Uchida, & Katsuma, 2009). Positive emotions are self-perpetuating (Lopez, 2013, p. 711). The "broaden-and-build" theory (Fredrickson, 2009) suggests positive emotion is important for creating the conditions for open-mindedness and creativity thus facilitating problem solving and building relationships (Garland et al., 2010). Positive affect has been understood to differ between and within individuals (Carr, 2011). Evidence suggests it is possible to activate positive affect in individuals through practice (Bolier et al., 2013; Carr, 2011).

Table 1

*Subcomponents of Positive affect*

| Joviality | Self-assurance | Attentiveness |
|---|---|---|
| Cheerful, happy, lively, enthusiastic | Confident, strong, daring | Alert, concentrating, determined |

**Positive Traits.** Park, Peterson, & Seligman (2004) identified 24 positive traits based on research of transcultural virtues and a systematic review of personality which when exercised can increase happiness and wellbeing (see table 2).

Table 2

*Values In Action -Inventory of Strengths (VIA-IS)*

| | | |
|---|---|---|
| Creativity | Vitality | Humility |
| Curiosity | Love | Prudence |
| Open-mindedness | Kindness | Self-regulation |
| Love of learning | Social intelligence | Appreciation of beauty |
| Perspective | Citizenship | Gratitude |
| Bravery | Fairness | Hope |
| Persistence | Leadership | Humour |
| Integrity | Forgiveness | Spirituality |

**Gratitude.** In psychological research, gratitude, the quality of being aware and thankful of the good things in life, is understood as a "life orientation" wherein individuals are aware of and appreciate the positive in life. Gratitude has been investigated as both a state and a trait characteristic, and found to be strongly associated with wellbeing (Wood, Froh, & Geraghty, 2010), life satisfaction (Beermann, Huber, Proyer, & Ruch, 2007), and more recently better coping and health outcomes in people with chronic conditions (Peterson, Park, & Seligman, 2006; Sirois & Wood, 2017).

**Optimism.** Optimism has been described as both a disposition (Lemola et al., 2010) and explanatory style (Peterson, 1991). Common to both conceptualisations is that optimism captures the extent to which an individual retains a positive view of themselves and the world in the face of adversity or uncertainty. Dispositional optimism is seen as a general expectation that good things will occur in the future (Carr, 2011). Explanatory optimism is the extent to which a person's explanatory style for negative events are attributed to external, transient and specific factors (Chang, 2001). Optimism has been found to be positively related with approach based coping i.e. seeking solutions, or

reappraising the difficulty (Moos, Brennan, Fondacaro, & Moos, 1990) and better adjustment of coping strategies to meet demands in several populations including university student, older adult, cancer, Multiple Sclerosis (MS), and HIV groups (Nes & Segerstrom, 2006).

**Hope.** Snyder's (1991) Hope theory suggests that hope is the interplay between the belief in agency to achieve a goal and beliefs about the possible paths to achieving said goal. Thus if there is too great a discrepancy one might be hopeless, or not need hope at all (assured). For example, having limited knowledge about health and recovery and never having learnt to overcome challenges, an individual may feel hopeless when faced with a distressing chronic health problem. In chronic condition samples hope has been linked to increased adaptive health behaviours which is beneficial for effective self-management (Schiavon, Marchetti, Gurgel, Busnello, & Reppold, 2017).

**Resilience.** The ability to successfully adapt and cope with adversity has been defined as resilience (Tugade & Fredrickson, 2004). There is evidence suggesting that maladaptive coping is associated with low levels of resilience in people with diabetes (Yi-Frazier et al., 2010). This evidence indicates resilience has a role in adapting and coping with a chronic condition.

**Self-Compassion and Mindfulness.** Self-compassion has been defined as comprising of self-kindness, common humanity, and mindfulness (Neff, 2011; Neff & Vonk, 2009). Self-kindness is the quality of relating to the self in a kind and understanding way in times of difficulty or failure. Common humanity is the ability to appreciate the common suffering experienced by all people, and to put oneself into this context. Mindfulness is the ability to hold painful thoughts and feelings in awareness rather than over-identify with them (Neff, 2003). Self-compassion has been found to be strongly associated with psychological health (Woodruff et al., 2014), life satisfaction (Çağlayan Mülazım & Eldeleklioğlu, 2016) and several positive psychological traits

including optimism and positive affect (Neff, Rude, & Kirkpatrick, 2007). Sirois, Molnar, & Hirsch (2015) have found evidence that self-compassion is strongly associated with coping in people with chronic health problems.

Mindfulness has been defined as the quality of "paying attention in a particular way, on purpose in the present moment" (Kabat-Zinn, 2003). While there are several theoretical perspectives on how mindfulness works (Academic Mindfulness Interest Group, 2006; Grabovac, Lau, & Willett, 2011), in Western Psychology it has generally come to be understood as a process that changes how people relate to their experience by promoting awareness of thoughts (Jankowski & Holas, 2014). Trait-mindfulness has been associated with higher levels of life satisfaction, and a number of positive psychological domains including optimism and positive affect (Bowen et al., 2006; Jislin-Goldberg, Tanay, & Bernstein, 2012). In chronic condition populations there is some evidence to suggest that mindfulness practice can improve short-term health and wellbeing outcomes (Carmody, Reed, Kristeller, & Merriam, 2008; Victorson et al., 2015). Mindfulness was also found to have a positive relationship with quality of life in a sample of MS patients (Schirda, Nicholas, & Prakash, 2015).

In summary, there is sufficient evidence to suggest that the positive psychological traits described above are correlated with more successful coping, improved wellbeing and life satisfaction, and thus are worthy of clinical attention. Wood and Tarrier (2010) describe a Positive Clinical Psychology (PCP) approach, which fully integrates the traditional approaches of reducing distress and diagnosing dysfunction with the use of positive psychological approaches to understand strengths and bolstering resilience. PCP highlights positive affect, positive traits, and psychological flexibility as important in advancing clinical psychology research and practice.

Chronic conditions such as IBD present individuals with unique challenges which impact on quality of life and can lead to experiences of anxiety and low mood. Conceptualisations of coping and adjustment to such challenges have often focused on the "negative" strategies which may exacerbate suffering such as maladaptive appraisals or negative affect. Positive psychological theory offers greater understanding of the "positive" strategies, and evidence of the relationship of positive psychological factors and successful coping with chronic conditions is growing. It is important that Practitioner Psychologists working with patients living with chronic conditions do not only have an awareness of negative coping constructs, but also are informed and understand the evidence base for positive psychological factors in coping and adjustment. In doing so, practitioner psychologists address the balance by promoting practice that aims to incorporate both negative and positive factors into theoretical models of illness and adjustment in chronic conditions. These models are of central importance, as they determine focus of research and intervention. The current review aims to investigate the relationship between adjustment and coping among people living with IBD, with the seven traits outlined above: positive affect, gratitude, optimism, hope, resilience, self-compassion and mindfulness.

## Method

### Search strategy

**Database search.** A database search by title, abstract and key term was completed in OVID (including Medline and PsychINFO), Pubmed, Scopus, and CINAHL in November 2017. To ensure the review was conducted systematically and to capture all available literature, reference sections of the final sample of papers were examined, and a forward citation search was conducted.

**Inclusion criteria.** Titles and abstracts were scanned and included if papers were: published in English in a peer-reviewed journal; contained data collected from

participants with diagnoses of IBD, CD or UC; included at least one measure of coping or adjustment, and investigated at least one relevant positive psychological factor (as defined in the current introduction).

**Exclusion criteria.** Papers were excluded if: no mention was made of coping or positive psychological traits (for example psychological function measured by the absence of depression or anxiety without reference to positive psychological traits); data for participants with IBD could not be extracted; review papers, theoretical or discussion pieces.

**Search terms.** The search terms related to positive psychological traits, coping and IBD. These included: positive psychology, gratitude, positive affect, optimism, resilience, hope, mindfulness and self-compassion; coping, adjustment, inflammatory bowel disease, IBD, Crohn's disease, CD – not conduct disorder and Ulcerative Colitis, UC (see appendix A for full list of search terms).

**Data coding and extraction.** A coding scheme (Appendix B) was developed to extract key information from the final sample of studies. Study details included: author, year of publication, country of origin, sample demographics (size, age, gender, ethnicity and diagnosis), comparison conditions, methodology (cross-sectional, retrospective or prospective cohort, with or without control), measures and outcomes (i.e. of positive psychological factors, health, coping and adjustment), statistical procedures, findings and conclusions. This information was entered into a database and interpreted and synthesised by the primary researcher to address the research question for the review.

**Quality appraisal.** Quality appraisal was carried out using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE, 2007) criteria (Appendix C). The STROBE checklist covers 22 questions (a possible 34 items) about each paper that encourage the reader to think about risk of bias, and therefore the quality of the paper. Overall quality of each paper was determined by converting the total score

into a percentage. Rating was completed using a proforma scoring each item as “yes” (met the criteria) “no” (did not meet the criteria) or “NA” (not applicable) (Sorensen, Wojahn, Manske, & Calfee, 2013). Items marked as “NA” were excluded from the overall quality calculation for the specific paper. Higher scores indicate greater quality measured by reliability based on reporting of background, objectives, methods, findings and conclusions (see Appendix D for full ratings). To determine the reliability of the checklist on the current sample of papers a random subset (n = 5) was selected and independently rated by a suitably qualified second rater (trainee clinical psychologist). Interrater reliability was calculated as $\kappa$ = .56 (p <.001), 95% CI = .43, .70 suggesting moderate agreement between raters. Disagreements were discussed as a pair and agreement was reached on final ratings. The STROBE statement does not suggest any minimum scores for exclusion as it is intended to guide readers to interpret quality of studies by considering their reporting and bias. Accordingly, papers were not excluded on basis of their STROBE score. STROBE scores informed the interpretation of study findings.

## Results

The databases were searched systematically using the search terms, resulting in 6601 papers being retrieved. Duplicates were excluded, and all remaining papers were screened by title for relevance using the inclusion and exclusion criteria. The reference lists of remaining papers were examined and forward citation searches were conducted using Google scholar for consistency. 21 full-text articles were considered for inclusion. Of these four were excluded (reasons provided in figure 2) resulting in 17 papers being included in the final synthesis. Quality appraisal was completed for all papers included in the final synthesis. Overall quality (STROBE score) is presented as a percentage in the summary table.

**Study characteristics**

Study characteristics can be found in Table 3 and Figure 3. The 17 studies included a total of 2972 participants with IBD. One sample was analysed in four separate publications (Hirsch and Sirois, 2016; Sirois, Molnar, & Hirsch, 2015; Sirois & Hirsch, 2017; Sirois, & Wood, 2017). Four studies included comparison with other clinical groups, namely arthritis (Hirsch and Sirois, 2016; Sirois, Molnar, & Hirsch, 2015; Sirois, & Wood, 2017) Irritable bowel syndrome (IBS) (Pellissier et al., 2010) and fibromyalgia (Hirsch & Sirois, 2016).

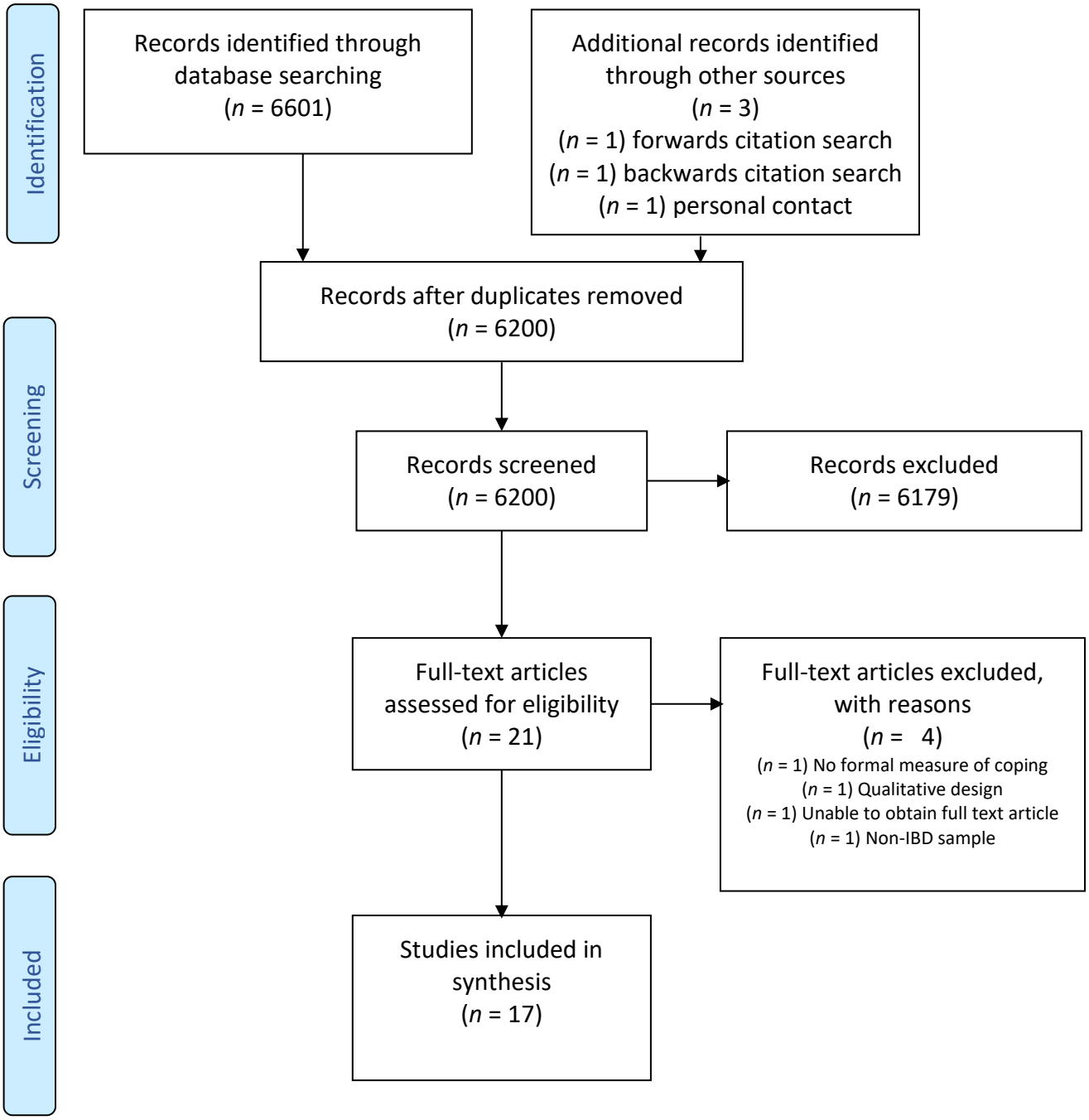


Figure 2. PRISMA flow diagram

Table 3

*Summary of articles included in the final synthesis*

| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| 1 | Flett, G. L., Baricza, C., Gupta, A., Hewitt, P. L., & Endler, N. S.<br><br>2011<br><br>Canada | Cross-sectional | Optimism (Life Orientation Test) | Coping with Health Injuries and Problems ver. 5 (CHIP)<br><br>Sickness Impact Profile (SIP136) | 51<br><br>16 – 80<br><br>60.8%<br><br>53% | Found a medium positive relationship between optimism and instrumental coping ($r$ = .37, $p$ <.001). Found strong negative relationships between optimism and impact of illness ($r$ = -.61, $p$ < .001), and emotional preoccupation ($r$ = -.61, $p$ < .001). | 76% |
| 2 | Freitas, T. H., Hyphantis, T. N., Andreoulakis, E., Quevedo, J., Miranda, H. L., Alves, G. S., … Carvalho, A. F.<br><br>2015 | Cross-sectional | Positive religiousness (Brief RCOPE)* | Brief Religious Coping Operations Preference Enquiry (RCOPE)<br>Hospital Anxiety and Depression Scale (HADS) | 147<br><br>Mean = 45<br>SD = 14.08<br><br>57.1%<br><br>44% | Found a small positive relationship between positive religious coping and health related quality of life ($\beta$ = .297, $p$ < .001). Found small negative relationships between positive religious coping and anxiety ($\beta$ | 86% |

Table 3

*Summary of articles included in the final synthesis*

| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| | Brazil | | | World Health Organisation Quality of Life Questionnaire (WHOQOL-Brief) Crohn Disease Activity Index (CDAI) Truelove-Witts Ulcerative Colitis Severity Index (TWT) Morisky Medication Adherence Scale (MMAS-8) | | = -.256, $p$ = .007) and depression ($\beta$ = - .222, $p$ = .016). Found anxiety mediates the relationship of positive religious coping on health outcomes. | |
| 3 | Graff, L. A., Walker, J. R., Clara, I., Lix, L., Miller, N., Rogala, L., … Bernstein, C. N.<br><br>2009 | Cohort – with control community sample | Positive affect (Psychological Wellbeing Manifestations Scale)* | Canadian Community Health Survey (CCHS) | 356<br><br>17 – 83<br><br>59%<br><br>48% | Found a positive relationship between positive affect and perceived health ($r$ = .55, $p$ < .001), and active coping ($r$ = .37, $p$ < .001). | 73% |

Table 3

*Summary of articles included in the final synthesis*

| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| | Canada | | | | | Found a strong negative relationship between positive affect and distress ($r$ = -.74, $p$ < .001), perceived health ($r$ = -.41, $p$ < .001) and avoidant coping ($r$ = .49, $p$ < .001). Found a small negative relationship between positive affect and self-soothing coping ($r$ = -.21, $p$ < .02). | |
| 4 | Hirsch, J. K., & Sirois, F. M.<br><br>2016<br><br>USA | Cross-sectional with comparison groups<br>Fibromyalgia and arthritis. | Hope (State Hope Scale) | Stress (Depression, Anxiety and Stress Scale 21; DASS-21, Perceived Stress Scale (PSS), Fatigue: Short-Form 36 (SF-36V2) | 428<br><br>Mean = 35.6<br><br>76%<br><br>NR | Found hope to have a strong negative relationship with stress ($r$ = -.70, $p$ < .01), and a medium negative relationship with fatigue ($r$ = -.51, $r$ < .01). | 67% |

Table 3

*Summary of articles included in the final synthesis*

| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| 5 | Jedel et al.,<br><br>2013<br><br>USA | Cross-sectional | Mindfulness (Mindfulness Attention and Awareness scale) | Anxiety: State-Trait Anxiety Inventory (STAI)<br>Depression: Beck Depression Inventory (BDI)<br>HRQoL: Inflammatory Bowel Disease Questionnaire (IBDQ)<br>Stress: Perceived Stress Questionnaire (PSQ) | 50<br><br>21 – 65<br><br>62%<br><br>UC only | Found mindfulness to have a strong and significant negative relationship with anxiety ($r$ = -.54, $p$ <.001), depression ($r$ = -.56, $p$ <.001) and stress ($r$ = -.58, $p$ <.01) in non-symptomatic group. Found a strong and significant positive relationship with mindfulness and HRQoL ($r$ = .57, $p$ <.001).<br>In the symptomatic group found a strong and signifcant relationship with stress only ($r$ = -.88, $p$ <.001). | 71% |
| 6 | Kiebles, J. L., Doerfler, B., & Keefer, L. | Cross-sectional | Acceptance (DDAQ) | The Brief COPE, The Percieved | 38<br><br>22 – 68 | Found a positive relationship between acceptance and quality of life ($r$ = .55, $p$ <.01), | 81% |

Table 3

*Summary of articles included in the final synthesis*

| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| | 2010<br><br>USA | | | Disability Scale (PDS)<br><br>IBDQ<br>Brief Symtom Inventory (BSI)<br>Short-Form 12 (SF-12)<br>Illness Perception Questionnaire Revised (IPQR) | 63%<br><br>45% | disease duration ($r$ = .37, $p$ < .05) and emotional functioning ($r$ = .74, $p$ < .01 and $r$ = .48, $p$ < .05). Found a negative relationship between acceptance and perceived stress ($r$ = -.61, $p$ < .01), emotional representation ($r$ = -.52, $p$ < .01 and $r$ = -.71, $p$ < .01) and negative illness consequences ($r$ = -.51, $p$ < .01 and $r$ = -.70, $p$ < .01). | |
| 7 | Larsson, K., Lööf, L., Rönnblom, A., & Nordin, K.<br><br>2008<br><br>Sweden | Cross-sectional | Optimism (Coping style)* | Jalowiec Coping Scale (JCS)<br>HADS<br><br>HRQoL<br>SF-36 | 742<br><br>19 – 65<br><br>51%<br><br>33% | Optimistic coping style was not significantly correlated with quality of life or mental health. Relationship trends suggested that Optimistic coping styles are associated | 87% |

Table 3

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|---|---|---|---|---|---|---|---|
| | | | | Short Health Scale (SHS) | | with better health and mental health. This did not reach statistical significance. | |
| 8 | McCombie, A. M., Mulder, R. T., & Gearry, R. B.<br><br>2015<br><br>New Zealand | Cohort | Adaptive "emotion focused coping" (use of emotional support, religion, positive reframing, acceptance and humour)* | Brief Coping Operations Preference Enquiry (Brief COPE)<br><br>Short Inflammatory Bowel Disease Questionnaire (SIBDQ) Harvey Bradshaw Index (HBI) Simple Clinical Colitis Activity Index (SCCAI) | 54<br><br>18 – 77<br><br>50%<br><br>54% | Found a negative relationship between adaptive emotion focused coping and HRQoL $r$ = -.31, $p$ < .05.<br>Found no positive or significant correlations for adaptive emotion focused coping. | 81% |
| 9 | Munson, G. W., Wallston, K. A., Dittus, R. S., | Cross-sectional | Optimism (Perceived Expectancies Index, PEI) | Patient Activation Measure (PAM) | 260<br><br>19 – 91 | Found strong positive relationships between optimism and adaptive health behaviours (*r* | 93% |

Table 3

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|---|---|---|---|---|---|---|---|
| | Speroff, T., & Roumie, C. L.<br><br>2009<br><br>USA | | | SIBDQ | 9.2%<br><br>37% | = .44, $p < .0001$) and quality of life ($r = .60$, $p < .0001$). Found a small positive relationship between optimism and self-care ($r = .15$, $p < .03$). | |
| 10 | Opheim, R., Fagermoen, M. S., Jelsness-Jørgensen, L.-P., Bernklev, T., & Moum, B.<br><br>2014<br><br>Norway | Cross-sectional | Sense of coherence (SOC) | General self-efficacy scale (GSE)<br><br>HBI | 428<br><br>18 – 79<br><br>49.5%<br><br>44% | Found SOC to have a strong positive relationship with self-efficacy ($r = .48$, and $r = .51$ respectively, $p < .001$). Found SOC to have a strong negative relationship with fatigue (CD $r = -.42$, and UC $r = -.48$ $p < .001$). | 74% |
| 11 | Pellissier, S., Dantzer, C., Canini, F., Mathieu, N., & Bonaz, B.<br><br>2010 | Cross-sectional with comparison group(s) IBD, Irritable bowel disease and healthy controls. | Positive affect (PANAS) | Ways of Coping Checklist Revised (WCC-R) STAI | 96<br><br>39 – 43<br><br>64.6%<br><br>27% | Found participants classed as having positive affect used more "problem focused" (facing problems and seeking solutions) than | 89% |

Table 3

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|---|---|---|---|---|---|---|---|
| | France | | | Center for Epidemiologic Studies-Depression Scale (CES-D) PSS HBI Ulcerative Colitis Activity Index (UCAI) ANS activity | | emotion-focused coping (denial) compared to those classified as having more negative affect. | |
| 12 | Scardillo, J., Dunn, K. S., & Piscotty, R.<br><br>2016<br><br>USA | Cross-sectional | Resilience (Resilience Scale) | Ostomy Adjustment Inventory-23 (OAI-23) | 48<br><br>31 – 85<br><br>60.4%<br><br>NR | Found resilience to have a strong positive correlation with ostomy adjustment ($r$ = .65, $p$ < .01). | 57% |
| 13 | Sirois, F.M., & Hirsch, J. K.<br><br>2017[†] | Prospective cohort | Thriving and Resilience (Psychological Thriving Scale) | Coping Efficacy Scale (CES) | 159(420)<br><br>16 – 70<br><br>77.9% | Found resilience was characterised by higher coping efficacy, illness acceptance and social support. | 76% |

Table 3

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| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| | United Kingdom (UK), Canada and United States of America (USA) | | | | 51% | Found a significant and strong positive relationship between thriving and coping efficacy at T1 and T2 measured by life satisfaction (T1 $r$ = .54, $p$ < .01, T2 $r$ = .45, $p$ < .01), self-improvement (T1 $r$ = .52, $p$ < .01, T2 $r$ = .38, p < .01), and relationship satisfaction (T1 $r$ = .38, $p$ < .01, T2 $r$ = .23, $p$ <.01). | |
| 14 | Sirois, F. M., & Wood, A. M.<br><br>2017†<br><br>UK | Cohort with comparison group Arthritis | Gratitude (GQ-6) Acceptance | Depressive symptoms – CES-D, Stress - PSS | 427<br><br>16 – 71<br><br>76.8%<br><br>55% | Found a positive relationship between gratitude and social support at baseline ($r$ = .42 $p$ < .01) and follow-up ($r$ = .36, $p$ < .01), baseline self-rated health ($r$ = .24, $p$ < .01), baseline benefit finding ($r$ = .48, $p$ | 87% |

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|---|---|---|---|---|---|---|
| | | | | | < .01), baseline acceptance ($r$ = .40, $p$ < .01), and thriving ($r$ = .50, $p$ < .01). Found a negative relationship between gratitude and depressive symptoms at baseline and follow-up ($r$ = -.49, $r$ = -.43, $p$ < .01), baseline and follow-up stress stress ($r$ = -.49, $r$ = -.36, $p$ < .01), and baseline and follow-up helplessness ($r$ = -.35, $p$ < .01). Found positive relationship between acceptance and social support (T1 $r$ = .25, $p$ < .01 and T2 $r$ = .31, $p$ < .01), benefit finding ($r$ = .47, $p$ < .01) and thriving ($r$ = .43, $p$ <.01). Found a negative relationship between acceptance | |

Table 3

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| | Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|---|
| | | | | | | and depressive symptoms (T1 $r$ = -.43, $p$ <.01, T2 $r$ = -.21, $p$ < .01) and stress (T1 $r$ = -.45, $p$ <.01, T2 $r$ = -.32, $p$ <.01). | |
| 15 | Sirois, F. M., Molnar, D. S., & Hirsch, J. K.<br><br>2015†<br><br>Canada and USA | Cross-sectional with comparison group Arthritis | Self-compassion (Self-compassion scale, SCS) | The Brief COPE, CES | 325<br><br>18 – 72<br><br>83.1%<br><br>51% | Found a positive relationship between self-compassion and active coping ($r$ = .48, $p$ < .05), instrumental support coping ($r$ = .18, $p$ < .05), planning coping ($r$ = .41, $r$ = .05), positive reframing, acceptance coping ($r$ = .28, $p$ < .05) and coping efficacy ($r$ = .47, $p$ < .05). Found a negative relationship between self-compassion and denial ($r$ = -.17, $p$ < .05), disengagement ($r$ = -.42, $p$ < .05), self-blame ($r$ = - .50, $p$ | 94% |

Table 3

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|---|---|---|---|---|---|---|---|
| | | | | | | < .05), and stress (*r* = -.56, *p* < .05). | |
| 16 | van Erp, S. J. H., Brakenhoff, L. K. M. P., Vollmann, M., van der Heijde, D., Veenendaal, R. A., Fidder, H. H., … Scharloo, M.<br><br>2017<br><br>Netherlands | Cross-sectional | Optimism (Coping with Rheumatic Stressors, CORS)<br><br>Comforting cognitions | Coping with Rheumatic Stressors Questionnaire (CORS)<br><br>HBI<br>SCCAI<br>Pain<br>IPQ-R | 211<br><br>Mean = 42.9 (SD = 12.9)<br><br>61.2%<br><br>73% | Found small positive relationships between optimism and good mental health (*r* = .16, *p* < .05), sense of personal control (*r* = .22, *p* <.01) and treatment control (*r* = .18, *p* < .01)<br>Found small negative relationships between optimism and impact of illness (*r* = -.15, *p* < .05). | 73% |
| 17 | Załuski, M., & Matjanowska, A<br><br>2015<br><br>Poland | Cross-sectional | Recalling positives(gratitude)/meaning making (Meaning making questionnaire)* | Acceptance of Illness Scale | 63<br><br>18 – 79<br><br>NR<br><br>100% | Found a positive relationship between perceiving favourable events and adaptation to illness (*r* = .33, *p* < .01), social quality of life (*r* = .35, *p* < .01), and environmental quality of life (*r* = .26, *p* < .05). | 61% |

Table 3

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| Authors (Year) location | Study design | Positive psychological factor (measure) | Coping measure Health measure | Sample size (*N*) Age range (years) % Female % CD | Key Findings/comments | Quality appraisal STROBE % score: |
|---|---|---|---|---|---|---|

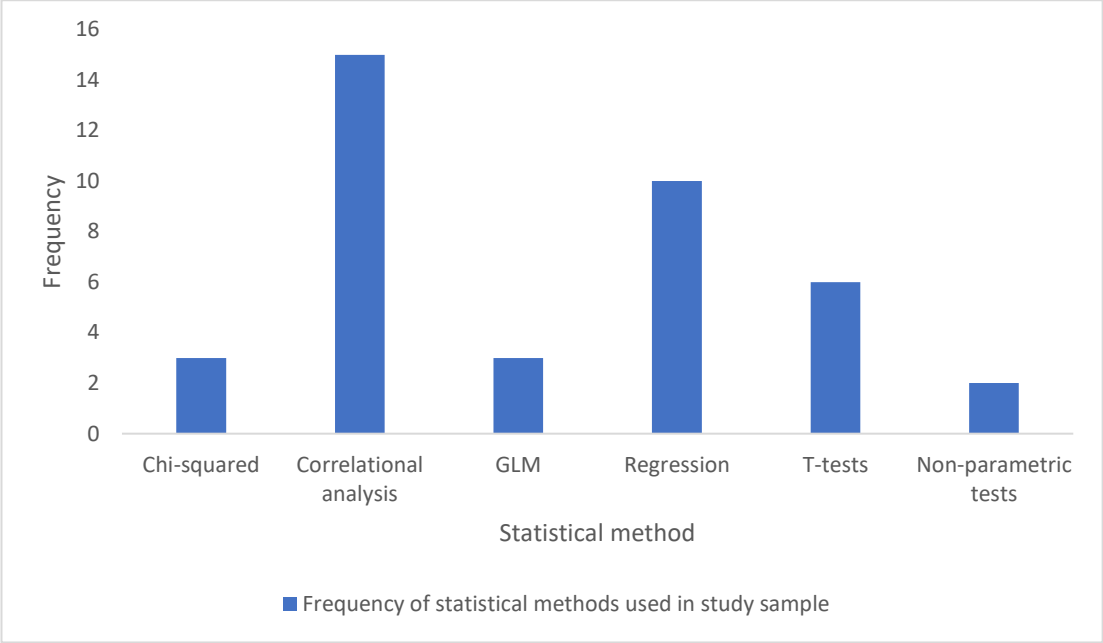


Figure 2 Bar chart displaying frequencies of statistical methods used in study sample

**Measures.** All studies provided demographic participant information including age, sex, and education. 13 papers included a purpose specific measure of coping. Studies primarily measured disease activity, health, psychological and emotional wellbeing examined here as proxy of adjustment to illness. In addition to these measures, 10 papers employed Health Related Quality of Life (HRQoL) measures. These measures were used as outcomes, independent variables or mediators depending on the research question. Finally, as determined by inclusion criteria all studies included measured a positive psychological trait. Eight papers used well-validated positive psychological instruments, while nine used measures that captured positive psychological factors and have been included as proximate measures of positive psychological function (Appendix E).

## Quality Appraisal

Total STROBE score is given as a percentage in column eight Table 2, The mean percentage for the studies was 78% (range acceptable 61% - excellent 94%). Figures 2 to 4 display summaries of STROBE compliance across papers for the individual sections.

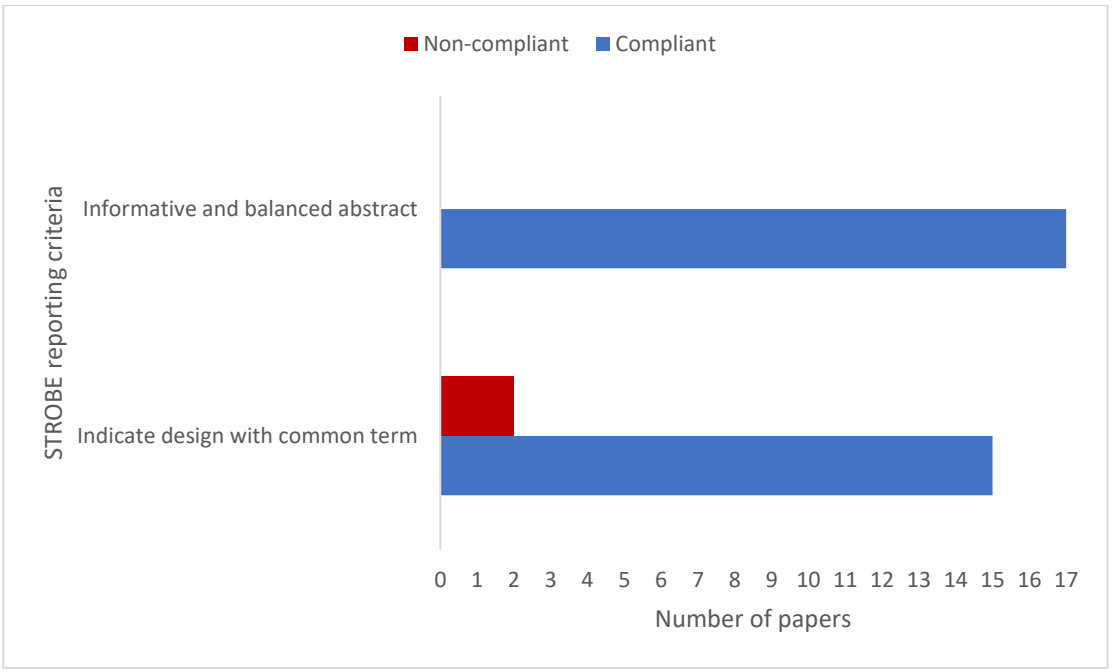


Figure 3 STROBE compliance ratings across papers for reporting title and abstract

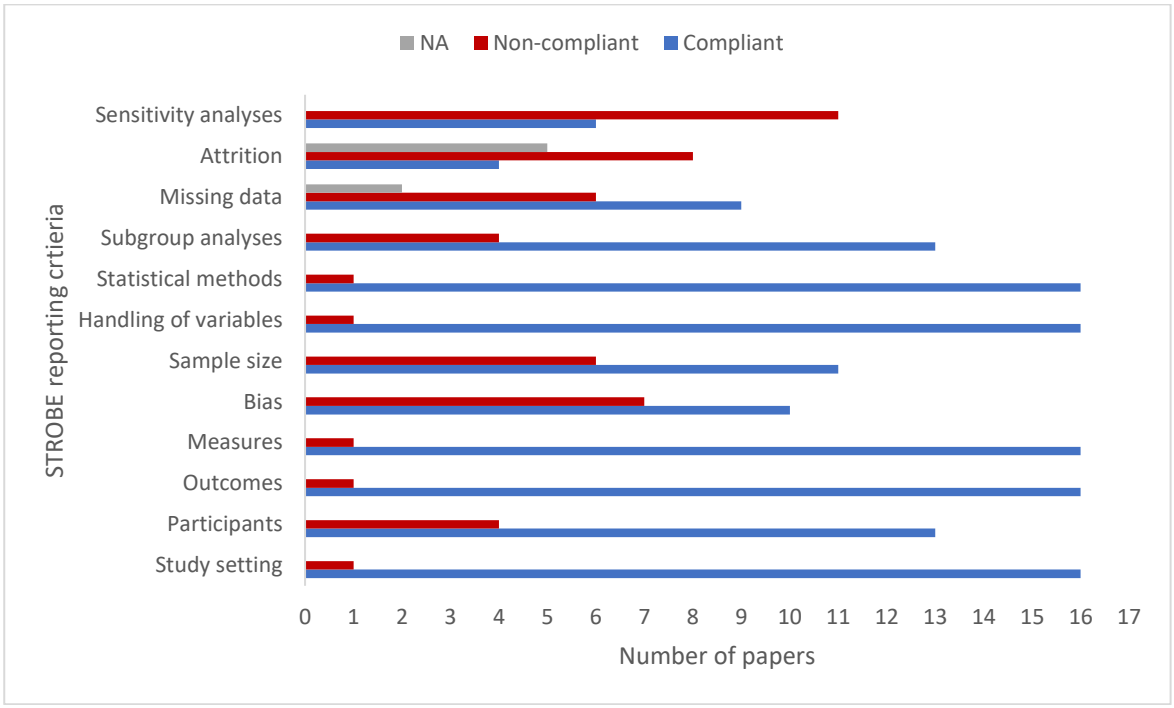


Figure 4 STROBE compliance ratings across papers for reporting methods

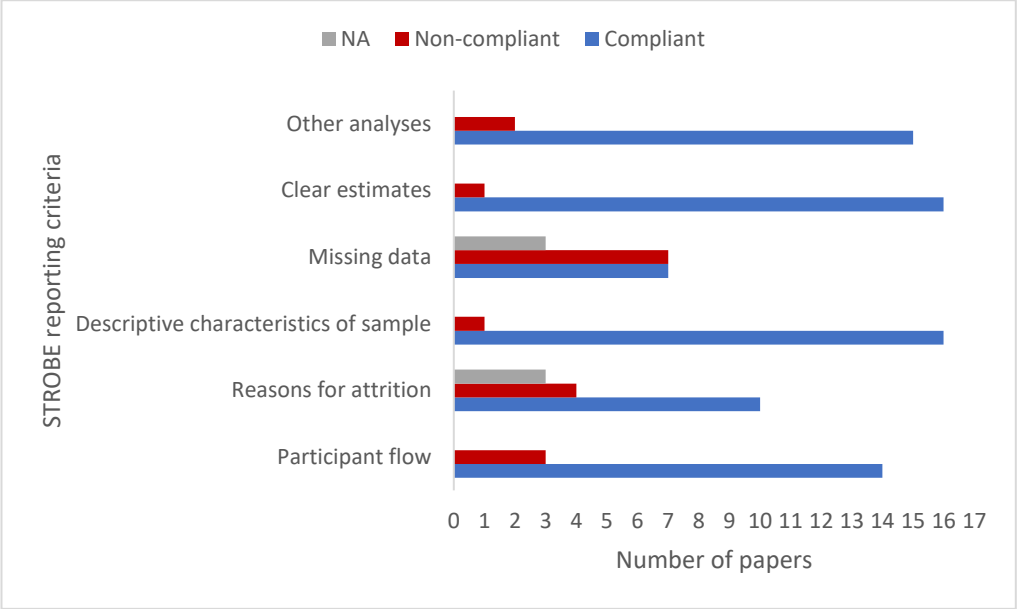


Figure 5 STROBE compliance ratings across papers for reporting results sections

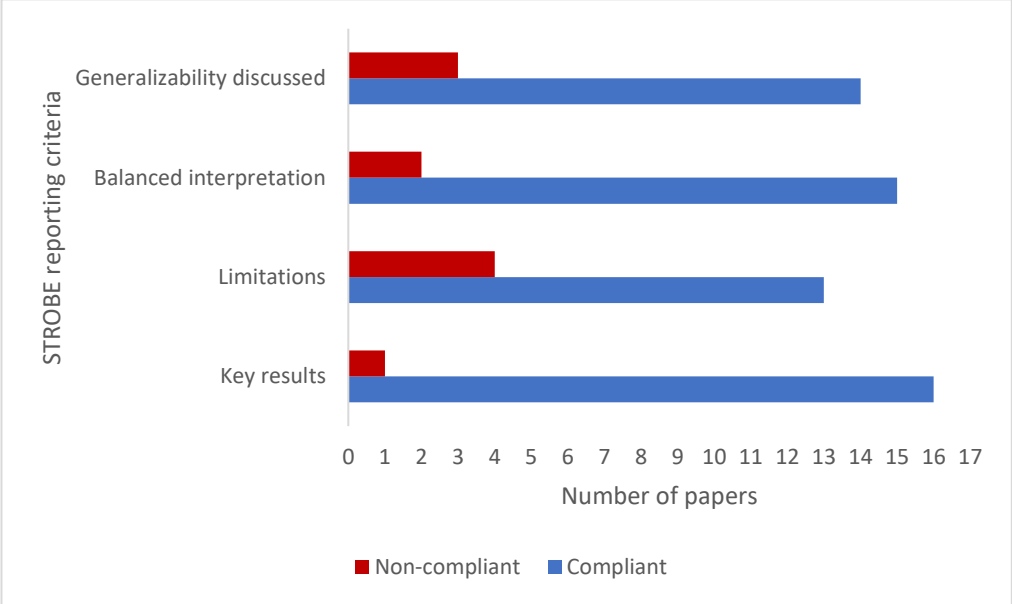


Figure 6 STROBE compliance ratings across papers for reporting discussion sections

**Positive psychological factors associated with adjustment and coping**

Examination of the 17 papers resulted in identification of all seven positive psychological factors of interest (gratitude, hope, optimism, positive affect, resilience, self-compassion and mindfulness). In addition to these, four additional positive psychological related variables were found: acceptance, religiousness, sense of coherence (SOC) and thriving.

**Gratitude.** Two papers examined the relationship between gratitude and adaptive coping and adjustment variables. Załuski & Matjanowska (2015) focused on "meaning making" and "perceiving favourable events and positive moments" which was amalgamated into the gratitude findings, as the concepts seemed analogous to the quality of appreciation. Sirois & Wood (2017) investigated the relationship between gratitude and various health and wellbeing variables over a 6-month period. This study found gratitude, as measured by the GQ-6 (Emmons & McCullough, 2003), had positive relationships with several variables associated with healthy adjustment. In this study gratitude was found to have negative relationships with several variables associated with poor adjustment including depression, stress and helplessness. This paper was rated as good quality, one of four cohort studies included in the review, and included use of a well validated and widely used gratitude measure. However, data used in this study had been analysed as part of a previous publication (Sirois, Molnar & Hirsch 2015).

Załuski M. & Matjanowska (2015) investigated the relationship between thinking styles on measures of adjustment to illness. This study found that "perceiving favourable events and positive moments" was associated with higher levels of adjustment to illness and HRQoL. This study used a regression model to examine the effects of these variables with additional variables of interest (thinking types, sex, and age). Final models including all appreciation related variables (recognition of positive moments, recognition of favourable situations in treatment, remembering positive moments) were found to be positively related to adjustment. This paper was determined as being of lower quality in comparison to other papers in the review, due to a lower than average sample size, and lack of detail on several important aspects of the study design including how variables were handled and adequate participant demographics. The positive and significant effect, considering the above limitations, while interesting,

must be considered carefully as convincing evidence for the effect of gratitude. Considering the findings from these two papers together there appears to be a relationship between gratitude with coping and healthy adjustment to IBD.

**Hope.** One paper (Hirsch & Sirois, 2016) examined the relationship between hope and variables associated with coping and adjustment. Hope was found to have a negative relationship with perceived stress and fatigue. Mediation analysis suggested that perceived stress is a partial mediator in the relationship between hope and fatigue. The direct effect of hope on fatigue remained significant despite a small reduction in the direct effect. This was another high-quality paper, with a relatively large sample, and validated hope measure. However, the measures of coping and adjustment extracted from this paper are outcome indicators of adjustment (as described in the Moss-Morris' 2013 model i.e. *"less distress and interference/impact of illness on life roles and relationships and good illness management*") rather than categorical measures of coping. This paper suggests there is an important relationship between hope and stress that might influence fatigue.

**Mindfulness.** One study (Jedel et al., 2013) using a cross-sectional design found a positive relationship between trait mindfulness and HRQoL, and negative relationships between mindfulness and stress, anxiety and depression. This effect weakened when examined in participants who were symptomatic, leaving only a strong negative relationship with stress. This study was found to have reasonable quality, however its lower than average sample size, and the very small number in the symptomatic group ($n$ = 11) may make it underpowered. Despite these limitations the study provides preliminary evidence for mindfulness in adjustment measured via general indicators of absence of distress and presence of HRQoL.

**Optimism.** Four studies examined the relationship between optimism and variables associated with adaptive coping and adjustment. Munson et al. (2009) found

that optimism was positively associated with adaptive health behaviours, and HRQoL. This study had a relatively older and predominately male sample in comparison to other studies included in the review and samples in IBD research more generally. Despite the differences in sample demographics two papers also demonstrated a small but positive relationship between optimism and positive mental health (van Erp et al., 2017) and a medium positive relationship between optimism and instrumental coping (Flett et al., 2011). Larsson et al. (2008) investigated how IBD patients coped with exacerbation of illness activity found that while optimistic coping styles were the most used, optimistic coping was not found to have strong or significant negative relationships with symptom burden, disease related worry, and poor wellbeing. This suggests that optimism is not involved in reduction of poor adjustment (as defined by Moss-Morris 2013 model i.e. *"disproportionate distress and interference/impact on life roles and relationships, poor illness management, and low positive affect").* The four studies were found to be of varying quality (1 = 76%, 7 = 87%, 9 = 93%, and 16 = 73%). Larsson et al. (2008) was of very good quality, however measured optimistic coping style via a subscale of the Jalowiec Coping Scale (JCS; Jalowiec, Murphy, & Powers, 1984). Van Erp et al. (2017), also of good quality, also measured optimism via a subscale, in this instance of the Coping with Rheumartic Stressors (CORS; Van Lankveld, Bosch, Van De Putte, NäRbng, & Van Der Staak, 1994). The other studies used the Life Orientation Test (LOT; Scheier, Carver, & Bridges, 1994) and the Perceived Expectancies Index (PEI; Scheier & Carver, 1985). The latter scales are validated optimism scales and arguably have greater construct validity increasing the confidence in the conclusions. This pattern of results suggests a unidirectional relationship in that optimism is positively related to positive and healthy coping, however there is no clear relationship between optimism and negative adjustment.

**Positive affect.** Two studies examined positive affect in relation to adaptive coping and adjustment. Pellissier et al. (2009) investigated the impact of positive and negative affect on coping strategies and autonomic nervous system function in IBD and IBS patients. The study found positive affect was associated with more effective "problem-focused coping". Problem-focused coping was defined as the ability to approach and work through problems rather than to avoid them. Participants in this study were categorized to a "positive affect" or "negative affect" group depending on their scores on the PANAS. Differences between these groups of participants suggested that positive affect CD participants and positive affect UC participants had higher problem-centred coping than their negative affect CD and negative UC counterparts. In this same study positive affect CD participants were found to have significantly lower emotion-centred coping than negative affect CD participants. Emotion-focused coping in the current study was understood as maladaptive e.g. denial and avoidance of problems. This study was determined to have good quality, used a validated positive affect measure, included biological markers of health and was one of two included papers that considered a healthy control group. An important limitation was the relatively small sample size and lack of detail on missing data, and how this was accounted for in the analysis. The cohort study by Graff et al. (2009) compared a community sample of patients with IBD to a non-clinical matched community control group. This study found that positive affect as measured by the Psychological Wellbeing Manifestations Scale (Masse et al., 1998) was negatively related to psychological distress and avoidant coping in IBD participants. In the same study positive affect had a positive relationship with perceived health and active coping. This was a good quality paper with a relatively large sample. The cohort design is a strength by enabling longitudinal analysis of target variables. However, the positive affect measure was not validated. Taken together the current findings suggest that positive

affect is associated with more approach rather than avoid coping strategies and linked to healthy adjustment.

**Resilience.** Two studies investigated the relationship between resilience and adjustment. Scardillo et al. (2016) aimed to investigate the factors involved in adjustment to ostomy surgery. Resilience as measured by the Resilience Scale (Wagnild & Young, 1993) was found to have a strong positive relationship with adjustment to ostomy as measured by the Ostomy Adjustment Inventory 23 (OAI-23; Simmons, Smith, & Maekawa, 2009). Sirois & Hirch (2017) investigated resilience as part of an investigation into the relationship between thriving, resilience and loss in adjustment. This paper found that resilience was characterised by higher levels of coping efficacy, illness acceptance, and social support. Scardillo et al. (2016) was found to have the lowest quality in the review, it had a relatively small sample size, and like Munson et al. (2009), a relatively older sample. It would be important to consider the impact of age as a moderator on adjustment in these findings. Resilience was measured using a validated instrument, however adjustment was measured using an ostomy specific instrument. Due to the specific focus on ostomy adjustment It is unclear whether these findings can be generalised to broader aspects of coping in IBD. Sirois & Hirch (2017) was a good quality study, however resilience was measured as a subscale of the thriving scale (Sirois, & Hirsch, 2013). Taken together these papers provide some support to the relationship between resilience and adjustment in IBD.

**Self-compassion.** One paper (Sirois, et al., 2015) investigated the relationship between self-compassion using the Self-Compassion Scale (SCS; Neff, 2003) with two chronic condition samples (arthritis and IBD). For IBD samples, this study found positive relationships between self-compassion and adaptive coping and adjustment outcomes. Self-compassion was found to have negative relationships with perceived stress, and maladaptive coping strategies: “denial”, “behavioural disengagement” and

"self-blame". A pathway analysis of both samples suggested that self-compassion was linked to several adaptive coping styles (instrumental, active, planning, positive reframing, acceptance) that influenced coping self-efficacy, which then influenced stress. As described above this paper makes use of repeatedly analysed data. Despite this, it was determined to be a very good quality paper (94%), and analysed a completely different positive psychological factor. The use of a validated self-compassion instrument and a coping instrument that captures both positive and negative coping strategies allows for clearer interpretation of this factor on coping and adjustment. This paper provides evidence suggesting self-compassion relates to healthy adjustment to IBD.

**Additional positive psychological factors**

**Acceptance.** Two studies found a relationship between acceptance and positive adjustment. Kiebles et al. (2010) explored the relationship between variables that might influence IBD hoping to provide evidence for a theoretical framework of adjustment in IBD. Acceptance was measured using the Digestive Diseases Acceptance Questionnaire (DDAQ, Kiebles & Keefer, 2010) as one of many variables to explore potential factors that may influence adjustment. Sirois & Wood (2017), measured illness acceptance as a subscale of the Illness Cognitions Questionnaire (ICQ; Evers et al., 2001). Kiebles et al. (2010) found a positive relationship between acceptance and HRQoL. Sirois & Wood (2017) found positive relationships between acceptance and social support, benefit finding, and thriving. Both papers found that acceptance was related with both positive and negative adjustment. Sirois & Wood (2017) also found negative relationships with acceptance and depressive symptoms and stress. Interpreted together, these findings suggest that acceptance has a bi-directional relationship with adjustment in IBD.

**Religious coping.** One study (Freitas et al., 2015) aimed to investigate the effects of religious coping on IBD-related wellbeing. Positive religious coping was captured

using the Brief RCOPE. Hierarchical linear multiple regression analyses found positive religious coping to have a negative relationship with anxiety, depression as measured by the HADS, and a positive relationship with psychological HRQoL. This was a good quality paper with a relatively average sample size compared to other studies in the review. This paper provides evidence for positive religious experiences on psychological adjustment to IBD.

**Sense of coherence (SOC).** One study (Opheim et al., 2014) aimed to investigate the relationship of SOC with key health and demographic variables in patients with IBD. SOC measured by the SOC scale (Antonovsky, 1993) was found to have a positive relationship with self-efficacy for both CD and UC participants. This study also found SOC had a negative relationship with fatigue for both CD and UC participants. These results were further supported by regression analyses, which confirmed independent association of higher SOC with higher self-efficacy and higher SOC with lower fatigue. This was a good quality paper, which considering the small sample size and purpose-specific measure provides some preliminary evidence of SOC as a variable of interest when considering factors related to coping in IBD.

**Thriving.** One paper (Sirois & Hirsch, 2017) aimed to examine the relationships between thriving, resilience and healthy adjustment in IBD over 6 months. Thriving, measured using the Psychological Thriving Scale (Sirois & Hirsch, 2013), was found to have positive relationships with several variables associated with successful coping and adjustment. Thriving was found to have a positive relationship with baseline life satisfaction, self-improvement, and relationship quality. This paper was of respectable quality and had a relatively large sample size. It provides evidence of thriving as an important factor to consider when investigating coping and adjustment in IBD.

**Adaptive emotion-focused coping.** One study (McCombie, Mulder & Gearry, 2015), which investigated the relationship between coping strategies and HRQoL over a

6-month period. This study measured “adaptive emotion-focused” coping, which was defined as including “use of emotional support, religion, positive reframing, acceptance and humour”. This concept overlaps with several positive psychological variables captured in studies described in the current review (e.g. social support, benefit finding, religious coping, and acceptance). This study found only one negative correlation between adaptive emotion-focused coping and HRQoL at baseline and no other positive relationships across the other variables of interest at baseline or follow-up. This study had a relatively large sample size, and was determined to be of good quality (81%). It provides contrary evidence to previous studies that positive psychological factors are important, and instead suggests they may contribute to worse adjustment outcomes. This conclusion must be considered in light of the equivocal construct of “adaptive emotion-focused coping”. Deconstructing this factor into specific positive psychological variables may result in factors more akin to those described hitherto.

## Discussion

The current review aimed to investigate the relationship between positive psychological factors, namely: positive affect, gratitude, optimism, hope, resilience, self-compassion and mindfulness with coping and adjustment processes in IBD. In addition to these factors, papers were included which measured acceptance, religiousness, SOC and thriving. A total of 17 papers (14 studies) were examined in the review. Quality appraisal guided by STROBE criteria indicated quality ranged from acceptable to excellent. Optimism was the most investigated psychological factor, followed by positive affect, then gratitude. Most studies included were cross-sectional, thus provided correlational analysis. A wide variety of measures were used to assess health, coping and adjustment. However, few studies included well validated measures of positive psychological factors. This suggests that while positive psychological factors have begun to attract interest in chronic conditions research more widely, including

conditions such as cancer (Gorin, 2010), arthritis (Sirois, 2014), diabetes (Celano, Beale, Moore, Wexler, & Huffman, 2013), and heart disease (Macaskill, 2016), in IBD literature investigation of positive psychological factors is less common.

There was evidence of the relationship between gratitude and successful coping and adjustment. Findings from two studies found gratitude was positively associated with positive markers of healthy adjustment. One study found that gratitude had a negative relationship with depression, which can be measured as a predictor of poor adjustment (De Ridder, Geenen, Kuijer, & van Middendorp, 2008). These findings support empirical evidence suggesting that gratitude occupies an important role in mediating quality of life differences in patients living with a chronic condition (Toussaint et al., 2017). Gratitude has been linked to successful coping, and has been hypothesized as a buffer against mental health problems (Wood, Froh, & Geraghty, 2010).

Evidence also suggested that optimism and hope are related to healthy coping and adjustment in IBD. These findings are consistent with optimism research in general populations, suggesting that higher levels of optimism predict better health and wellbeing outcomes (Carver, Scheier, & Segerstrom, 2010). Hope, another positive psychological factor concerned with perceived and expected outcomes, was also found to have a negative relationship with perceived stress and reports of reduced fatigue. Again, this is consistent with positive psychology literature, highlighting the role of hope on improved wellbeing outcomes (Duggleby et al., 2012). Optimism and hope are both concerned with expectations for future positive events, however literature suggests they differ theoretically in fundamental ways. For example, hope theory describes hope as a positive mental state that galvanises goal directed behaviour (Snyder, 2004). As such its major mechanism in coping and adjustment may be the adoption and persistence of positive health behaviours which contribute to improved coping and

adjustment with disease. Optimism is often described as a style or disposition (Carver & Scheier, 2014). There is longitudinal evidence that demonstrating the influence of optimism on distress during illness (Fournier, de Ridder, & Bensing, 2002). This evidence suggests the mechanism of optimism is related to the individual's view and approach to their illness, and as such reduces associated distress relative to those described as more pessimistic (Alarcon, Bowling, & Khazon, 2013; Schiavon, Marchetti, Gurgel, Busnello, & Reppold, 2017).

Two studies explored positive affect in relation to coping. Evidence suggests that people with higher levels of positive affect employed more adaptive coping strategies, and positive affect was associated with lower levels of distress. These findings are consistent with experimental studies, suggesting that positive affect increasing interventions lead to increased self-esteem and positive behaviour change (Charlson et al., 2014). Together such effects may play a role in healthy coping and adjustment. The broaden-and-build hypothesis (Fredrickson, 2009) might explain the facilitation of learning of new adaptive behaviour and greater flexibility when facing problems encountered by illness.

One paper found a specific link with resilience and better adjustment to ostomy surgery. Future research could further illuminate this relationship by examining resilience in relation to other aspects of IBD; For example, daily stressors as measured by IBD-specific measures of quality of life, or illness perceptions. Self-compassion was found to have a positive relationship with adaptive coping strategies, and a negative relationship with perceived stress. This finding was consistent with the self-compassion and chronic conditions literature (Sirois, and Rowse, 2016), suggesting that self-compassion is potentially an important factor in improving the health-related outcomes for people living with a chronic condition. Mindfulness too was found to be positively related to outcomes of successful coping. This may have implications for the provision

of mindfulness interventions in supporting people to live well with IBD (Berrill, Sadlier, Hood, & Green, 2014; Schoultz, Macaden, & Hubbard, 2016). Future studies could build on this evidence by investigating the extent to which specific coping strategies are present or absent in relation to levels of trait mindfulness. Finally, acceptance, religiousness, SOC and thriving were all associated with positive outcomes. However, this research is sparse. Replications of these studies that involve longitudinal or experimental conditions would be valuable for elucidating the effects of these factors for their potential benefits.

One study found that "adaptive emotion-focused coping", a concept that overlaps with many of the positive psychological factors described, was found not to have a strong relationship with adjustment. However, this general concept was possibly not reliable enough to stand as a specific positive psychological factor and so contribution to the findings may be considered lightly. Taken together the findings support previous research suggesting that positive psychological factors are important to consider in understanding and supporting the coping and adjustment of IBD patients. The findings of the current review can be incorporated into Moss-Morris' (2013) model of adjustment. As positive psychological factors explored hitherto can be included as "cognitive factors" which contribute to successful adjustment.

**Limitations**

The findings of this review must be interpreted in light of a number of limitations. First, the papers included in the final review were peer-reviewed articles published in English. As such it is possible that the findings are not a complete reflection of available literature on positive psychological factors associated with coping and adjustment in IBD. It is possible that the results are biased towards favourable conclusions as papers that find a significant effect are more likely to be submitted, more likely to be published, and therefore more likely to be selected for inclusion using the

current method of systematic review (Sterne, Gavaghan, & Egger, 2000). While efforts were made to search grey literature, no papers were found. It is unclear whether studies with contrary findings exist.

Second, a decision was made not to complete meta-analysis of the current findings due to the variation in methodological design, outcome measurement, and lack of widely used validated positive psychological measures. This opens the current synthesis to criticisms of researcher bias. The interpretation and synthesis of the current findings were drawn by the primary reviewer, and as such despite best efforts to minimise bias by use of an objective coding scheme and bias checklist, the conclusions are vulnerable to a degree of subjectivity. Future research can address these criticisms by the inclusion of more than one researcher in quality appraisal and interpretation of the findings.

Third, a significant number of included studies had proximate measures or subscales measuring positive psychological factors. Inclusion of such measures limits the extent to which it can be confidently concluded that positive psychological factors have been measured. This reflects the aim of the systematic search strategy to successfully retrieve all relevant papers for the research question (sensitivity) while excluding papers that are not applicable (specificity) (Boluyt, Tjosvold, Lefebvre, Klassen, & Offringa, 2008). Given the niche area of positive psychological factors in IBD some flexibility in inclusion is warranted. Closely related to this point, there is wide variety of measurement of adjustment (as described in the introduction) thus comparisons are not straightforward, and the findings and conclusions are vulnerable to criticisms of reliability. More stringent inclusion/exclusion might address this, however, again given the current literature of positive psychology in IBD this will most certainly reduce the number of papers eligible for inclusion.

Finally, the results of the current review are largely based on correlational analyses. The evidence suggests positive psychological factors are related to healthy coping and adjustment, however the direction of causation cannot be implied. There are findings from longitudinal studies from non-clinical samples which may provide some supportive evidence that can inform direction. However, to properly address this limitation, future research focusing on specific positive psychological factors in IBD is needed. Future studies employing longitudinal, experimental, or randomised controlled designs, involving multiple measurements over time, and manipulation of independent variables on outcome variables are necessary (Gorin, 2010). Such designs recruiting IBD samples will determine whether increasing levels of positive psychological factors have a subsequent effect on coping and adjustment. For example, a study which measures gratitude, its relationship to outcomes of coping and adjustment (i.e. wellbeing), investigates whether this can be increased by intervention, and whether wellbeing changes as a result will circumstantiate the findings of the current review.

**Clinical implications**

Despite these limitations the current review suggests that positive psychological factors, similar to other clinical populations are important in understanding healthy coping and adjustment in IBD. It is important for clinicians to be aware of these positive psychological factors when assessing their patients. Positive psychological factors may be important in considering how a patient might cope in the short-term and long-term with their illness, by indicating how they may appraise their symptoms and how they might relate to help that is available. By identifying those patients who due to their positive dispositions will be more likely to "approach" when help is needed, or make use of available social support. This is in contrast to patients who are more likely to "avoid" help where needed (Baker & Berenbaum, 2007; Fredrickson, 2004). This latter group of patients might require more active monitoring and support to engage in helpful

health promoting behaviours. For example, expanding on Moss-Morris (2013) working model, positive psychological factors can be included as additional cognitive and behavioural elements, which predict successful adjustment. Secondly, if positive psychological factors are indeed related to improved levels of coping, then it is also relevant that clinicians are familiar with interventions to support patients to foster these attributes. For example, these findings suggest it may be important to consider (or at least empirically investigate further) specific positive psychological interventions such as gratitude interventions (Emmons & McCullough, 2003) or positive affect interventions (Moskowitz et al., 2012), which can increase these positive psychological qualities. It follows that increasing these qualities in patients will lead to further improvements in coping, adjustment and health. These findings also provide indirect support for therapies such as Mindfulness based therapies (Victorson et al., 2015), Acceptance and Commitment Therapy (ACT; Hayes, 2016), and Compassion Focused Therapy (CFT; Gilbert, 2014). These therapies, although not specific positive psychology interventions, overlap quite significantly with positive psychological factors. Providing IBD patients with access to such therapies may be important for increasing positive psychological states, which may improve coping and adjustment to IBD.

**Conclusion**

To conclude the current review suggests that positive psychological factors are positively related to successful coping (as described by Moss-Morris 2013) and adjustment in IBD. However, these findings are at risk of researcher bias, and the papers included were not all designed specifically to investigate positive psychological factors. As such the findings must be considered as indicative of an interesting and potentially important relationship that warrants further focused investigation. Future longitudinal and experimental studies, which include well-validated and widely used positive

psychological measures, and measures of coping are required to further evaluate the relationship and direction of positive psychological factors on coping, adjustment and health outcomes in IBD.

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# Appendices

## Appendix A – Full list of search terms

*Search terms related to positive psychological factors, coping, adjustment and IBD (OR used within columns)*

| | | | | |
|---|---|---|---|---|
| Positive psychological<br>Positive psychology<br>Gratitude<br>Gratefulness<br>Grateful<br>Thankfulness<br>Positive affect<br>positive emotion<br>Optimism<br>Optimistic<br>Resilience<br>Hope<br>Self-compassion<br>Mindfulness | *AND* | Coping<br>Adjustment | *AND* | Inflammatory Bowel Disease<br>IBD<br>Crohn's disease<br>Crohn's<br>CD (Not conduct disorder, not chronic disease)<br>Ulcerative colitis<br>UC |

## Appendix B: Coding scheme

| | *Information extracted from final sample* |
|---|---|
| 1 | Authors |
| 2 | Year of publication |
| 3 | Country of origin |
| 4 | Database found |
| 5 | Publication type |
| 6 | Study design |
| 7 | Exclusion and inclusion criteria |
| 8 | Sample size |
| 9 | Diagnosis % CD |
| 10 | Age (M, range where available) |
| 11 | Ethnicity %White |
| 12 | Gender %Female |
| 13 | Inclusion of healthy comparison group |
| 14 | Inclusion of clinical comparison group |
| 15 | Statistical methods used |
| 16 | Positive psychological trait and measure |
| 17 | Coping and adjustment measure(s) |
| 18 | Health measure(s) |
| 19 | Findings (effect sizes where appropriate) |

## Appendix C: STROBE checklist

STROBE Statement—checklist of items that should be included in reports of observational studies

| | Item No | Recommendation |
|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found |
| **Introduction** | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses |
| **Methods** | | |
| Study design | 4 | Present key elements of study design early in the paper |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection |
| Participants | 6 | (*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up<br>*Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls<br>*Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants |
| | | (*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed<br>*Case-control study*—For matched studies, give matching criteria and the number of controls per case |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group |
| Bias | 9 | Describe any efforts to address potential sources of bias |
| Study size | 10 | Explain how the study size was arrived at |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding |
| | | (*b*) Describe any methods used to examine subgroups and interactions |
| | | (*c*) Explain how missing data were addressed |
| | | (*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed<br>*Case-control study*—If applicable, explain how matching of cases and controls was addressed<br>*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy |
| | | (*e*) Describe any sensitivity analyses |
| **Results** | | |

| | Item No | Recommendation |
|---|---|---|

| | | |
|---|---|---|
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed |
| | | (b) Give reasons for non-participation at each stage |
| | | (c) Consider use of a flow diagram |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders |
| | | (b) Indicate number of participants with missing data for each variable of interest |
| | | (c) *Cohort study*—Summarise follow-up time (eg, average and total amount) |
| Outcome data | 15* | *Cohort study*—Report numbers of outcome events or summary measures over time |
| | | *Case-control study*—Report numbers in each exposure category, or summary measures of exposure |
| | | *Cross-sectional study*—Report numbers of outcome events or summary measures |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included |
| | | (*b*) Report category boundaries when continuous variables were categorized |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses |
| **Discussion** | | |
| Key results | 18 | Summarise key results with reference to study objectives |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results |
| **Other information** | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

# Appendix D: Quality appraisal of final sample of studies

| | Title and Abstract | | Introduction | | Methods | | | | | | | | | | | | | | Results | | | | | | | | | | Discussion | | | | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | 2 | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | 10 | 11 | 12 | | | | | 13 | | | 14 | | | 15 | 16 | | | 17 | 18 | 19 | 20 | 21 | 22 |
| | a | b | | | | | a | b | | | | | | a | b | c | d | e | a | b | c | a | b | c | | a | b | c | | | | | | |
| 1 | YES | YES | YES | YES | YES | YES | NO | NA | YES | YES | NO | YES | YES | YES | NO | YES | NA | NO | YES | YES | NO | YES | YES | NA | YES | YES | NA | NA | NO | YES | YES | YES | YES | NO |
| 2 | YES | YES | YES | NO | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | NA | NO | YES | NA | NA | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES |
| 3 | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | NO | YES | YES | NO | YES | NO | NO | NO | YES | YES | NA | YES | YES | NO | NO | YES | YES |
| 4 | YES | YES | YES | YES | YES | YES | NO | NA | YES | YES | YES | NO | YES | YES | YES | YES | NO | YES | NO | NO | NO | NO | NO | NA | NO | NO | NA | NA | YES | YES | YES | YES | YES | YES |
| 5 | YES | YES | YES | YES | YES | NO | YES | NA | YES | YES | NO | NO | YES | YES | YES | NA | NO | NO | YES | NA | NO | YES | NA | NA | YES | YES | YES | NA | YES | YES | NO | YES | YES | NO |
| 6 | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | NO | YES | NA | NA | YES | YES | YES | YES | YES | NO |
| 7 | YES | YES | YES | YES | YES | YES | NO | NA | YES | YES | NO | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | NO | NA | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES |
| 8 | NO | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | YES | YES | NO | NO | YES | YES | NO | YES | NO | YES | YES | YES | NA | NA | YES | YES | YES | YES | YES | NO |
| 9 | YES | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | NO | YES | NA | NO | YES | YES | YES | YES | YES | NA | YES | YES | NA | NA | YES | YES | YES | YES | YES | YES |
| 10 | YES | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | NO | YES | YES | YES | NO | NO | NO | YES | YES | NO | YES | NO | NA | YES | YES | YES | NA | YES | YES | NO | YES | YES | NO |
| 11 | NO | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | YES | NA | NA | YES | YES | NA | NO | YES | NA | NA | YES | YES | YES | NA | YES | YES | YES | YES | NO | YES |
| 12 | YES | YES | YES | YES | YES | YES | YES | NA | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | YES | YES | NA | YES | YES | NA | NA | YES | YES | YES | YES | YES | NO |
| 13 | YES | YES | YES | YES | YES | YES | NO | NA | YES | YES | NO | YES | YES | YES | NO | YES | NA | NO | YES | YES | NO | YES | YES | NA | YES | YES | NA | NA | NO | YES | YES | YES | YES | NO |
| 14 | YES | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | NO | NO | YES | YES | YES | YES | YES | NA | NA | YES | YES | YES | YES | YES | NO |
| 15 | YES | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | NA | NA | YES | YES | YES | YES | YES | NO |
| 16 | YES | YES | YES | YES | YES | YES | YES | NA | YES | YES | YES | YES | YES | YES | YES | NO | NO | NO | NO | NO | NO | YES | NO | NA | YES | YES | NA | NA | YES | YES | YES | YES | NO | YES |
| 17 | YES | YES | YES | YES | YES | YES | YES | NA | YES | YES | NO | NO | YES | YES | YES | NO | NA | YES | YES | NO | NO | YES | NO | NA | NA | YES | NA | NA | YES | NO | NO | NO | NO | NO |

## Appendix E: Summary of included measures extracted from final sample of studies

*Summary of variables and corresponding measures*

| Variable | Instrument | Study ID |
|---|---|---|
| **Demographic** | | |
| Age | SR | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 |
| Sex | SR | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 |
| Ethnicity | SR | 2, 6, 7, 8, 10, 11, 12, 13, 16 |
| Employment | SR | 5, 7, 10, 12, 13, 14 15, 16 |
| Marital/relationship status | SR | 2, 3, 5, 7, 8, 10, 12 13, 14, 15, |
| Education | SR | 13, 15, 14, 2, 3, 8, 7, 12, 10 |
| Mental health | SR | 8, 13, 14 |
| Religion | SR | 2 |
| Household income/situation | SR | 2, 8, 12, 13 |
| Insurance | SR | 12 |
| Country | SR | 13, 14, 15 |
| Birthplace | SR | 8 |
| **Health or disease activity** | | |
| Comorbid illness | SR | 3, 16, 12, 10 |
| Disease Activity | SR, Harvey Bradshaw Index (HBI), Simple Clinical Colitis Activity Index (SCCAI), Ulcerative Colitis Activity Index (UCAI), Crohn Disease Activity Index (CDAI), Truelove-Witts Ulcerative Colitis Severity Index (TWT), Manitoba IBD Index (MIBDI), Short Health Scale (SHS) | 2, 3, 6, 7, 8, 10, 11, 13 |
| Disease duration | | 1, 3, 5, 7, 9, 11, 13, 15, 16, 17 |
| Fatigue | Five-Item Fatigue Severity Scale (FSS-5) | 10 |
| Health perceptions | Single-item questionnaire | 3 |
| Hospitalization | SR | 8 |
| IBD Type | SR, Montreal classification | 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 |

*Summary of variables and corresponding measures*

| Variable | Instrument | Study ID |
|---|---|---|
| Medication adherence | SR, Morisky Medication Adherence Scale (MMAS-8), MMAS | 2, 9 |
| Medication/treatments | SR | 2, 7, 8, 9, 11, 16 |
| Ostomy length of time | SR | 4 |
| Ostomy type | SR | 4 |
| Other stressors | SR | 7 |
| Pain | SR, Inflammatory Bowel Disease Questionnaire (IBDQ) pain subscale | 4, 14, 16 |
| Self-care service use | Likert scale | 9 |
| Smoker | SR | 7, 8, 10, 11 |
| Surgery | SR | 1, 2, 7, 8 |
| **HRQoL** | | |
| Generic | SF-36, World Health Organization Quality of Life Questionnaire (WHOQOL-BREF), Short-Form 12v2 (SF-12v2) | 2, 6, 7, 16, 17 |
| IBD specific | IBD Quality of Life (IBDQ), Short Inflammatory Bowel Disease Questionnaire (SIBDQ), Psychosocial Impact subcale of Sickness Impact Profile (SIP136), Ostomy Adjustment Inventory-23 (OAI-23) | 1, 5, 8, 9, 12 |
| **Psychological and emotional adjustment** | | |
| Anxiety | State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Beck Depression Inventory (BDI), Depression Scale (HADS) | 2, 5, 8, 11 |
| Depression | Center for Epidemiologic Studies-Depression Scale (CES-D), HADS | 2, 5, 10, 11, 13, 14 |
| Negative mood | Positive and Negative Affect Scale (PANAS), Kessler Psychological Distress Scale (K-10), Brief Symptom Inventory (BSI) | 3, 6, 11 |
| Stress | Autonomic nervous system – Heart rate variability | 4, 5, 6, 7, 11, 15 |

*Summary of variables and corresponding measures*

| Variable | Instrument | Study ID |
|---|---|---|
| | (HRV), Perceived Stress Scale (PSS), Perceived Stress Questionnaire (PSQ) | |
| **Coping** | | |
| Activity and work impairment | Work Productivity and Activity Impairment Questionnaire (WPAI), Perceived Disability Scale (PDS), | 6, 16 |
| Coping efficacy | Coping Efficacy Scale | 15 |
| General | Brief Coping Operations Preference Enquiry (COPE), scale developed by Statistics Canada based on Coping Strategy Indicator and COPE scale, Patient Activation Measure (PAM), General Self-Efficacy Scale (GSE) | 2, 3, 6, 8, 9,15 |
| Illness perceptions | Illness Perceptions Questionnaire-revised (IPQ-R), Illness Cognition Questionnaire (ICQ) | 6, 14, 16 |
| Perceived social support | Duke-UNC Functional Social Support questionnaire | 13, 14 |
| Strategies/Style | Coping with Rheumatic Stressors Questionnaire (CORS), Ways of Coping Checklist Revised (WCC-R), Coping with Health Injuries and Problems (CHIP), Jalowiec Coping Scale (JCS) | 1, 7, 16 |
| **Positive Psychological factors** | | |
| Acceptance | Illness Cognition Questionnaire – Acceptance subscale (ICQ)[1], Acceptance of Illness Scale, DDAQ[1] | 6, 13, 17 |
| Gratitude | Gratitude Questionnaire-6 (GQ-6) | 14 |
| Hope | Trait Hope Scale (THS) | 4 |
| Meaning making | Original questionnaire | 17 |
| Mindfulness | Mindfulness Attention and Awareness Scale (MAAS) | 5 |

*Summary of variables and corresponding measures*

| Variable | Instrument | Study ID |
|---|---|---|
| Optimism | Perceived Expectancies Index (PEI)[1], Life Orientation Test (LOT)[1] | 9, 16, 1 7 |
| Positive affect | PANAS, Psychological Wellbeing Manifestations Scale[1] | 3, 8, 11 |
| Recalling positives | SR | 17 |
| Religiousness (positive) | Brief RCOPE[1] | 2 |
| Resilience | Resilience Scale | 12 |
| Self-compassion | Self-Compassion Scale (SCS) | 15 |
| Sense of coherence (SOC) | Sense of Coherence Scale | 10 |
| Thriving | Psychological Thriving Scale | 13, 14 |
| **Other** | | |
| Health locus of control | Multi-dimensional Health Locus of Control Scale (MHLCS) | 11 |
| Mastery | The Mastery Scale | 3 |
| Neuroticism | Neuroticism scale of abbreviated Revised Five-Factor Personality Inventory (NEO-PI-R) | 1 |
| Perfectionism | Multidimensional Perfectionism Scale-Short form (MPS), Perfectionistic Self-Presentation Scale (PSPS) | 1 |
| Personality | Eysenck Personality Questionnaire-Brief Version (EPQ-BV) | 8 |
| Rumination | Rumination Scale | 17 |

SR = Self report, 1 = proximate measure of positive psychological functioning

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# Part II: Research report

A randomised controlled trial of a brief gratitude intervention to improve wellbeing and coping in people living with inflammatory bowel disease

## Abstract

### Objectives

This study aimed to investigate the effectiveness of an online gratitude intervention in improving wellbeing and coping in Inflammatory Bowel Disease (IBD).

### Method

129 individuals with an IBD diagnosis were randomised to a daily gratitude condition or to an active control condition. Participants completed measures of wellbeing and coping before, immediately after and eight weeks post intervention. gratitude, mood, pain, health, and sleep were measured daily in order to examine the relationship between gratitude and wellbeing over time.

### Results

Gratitude was positively correlated with positive measures of wellbeing (IBDQ $r$ = .44, $p$ <.01) and negatively correlated with indicators of poor adjustment (DASS $r$ = -.48, $p$ < .01). Multilevel modelling suggested there were no differences between groups over the course of the intervention for measures of gratitude, mood, pain, health and sleep. Analysis of Covariance suggested there were no differences between groups post intervention or at follow-up for measures of wellbeing. Secondary analysis suggested that participants in the intervention group had increased levels of positive emotion regulation (ER) post intervention ($F(1, 63) = 7.89$, $p = .007$, $\eta_p^2 = .11$), and increased levels of self-efficacy at follow-up in comparison to the control group ($F(1, 30) = 6.45$, $p = .017$ , $\eta_p^2 = .18$).

### Conclusions

A one week daily online gratitude intervention was not effective in increasing gratitude and improving wellbeing for participants with IBD. However, there were positive improvements in positive ER and a delayed improvement in self-efficacy. It might be that gratitude practice improves self-efficacy by promoting positive

reorientation and approach self-regulation strategies. Further research is needed which investigates the dose, and differential effect of gratitude on positive and negative outcomes of wellbeing and adjustment in IBD.

**Practitioner points**

- Gratitude is strongly correlated with wellbeing and successful adjustment.
- Gratitude practices may supplement psychological therapies for people with IBD by helping to increase positive ER strategies and self-efficacy.
- Online interventions may be important means for increasing access to psychological interventions for people with IBD. However, while gratitude interventions have been shown to be effective for non-clinical populations, their effectiveness for IBD populations remains uncertain.

**Limitations**

- There was a high level of attrition in the current study which may have weakened the overall power of the study.
- There were no measures of positive affect to investigate the relationship of positive affect on wellbeing.
- The study was completely online. It might be that the sample is not representative of broader IBD samples.

## Introduction

Inflammatory Bowel Disease (IBD) is an autoimmune disease that primarily affects the digestive system. The two most common forms of the condition, Ulcerative colitis (UC) and Crohn's disease (CD) are estimated to affect about 300,000 people in the UK (Molodecky et al., 2012), 1,171,000 in the United states (Kappelman, Moore, Allen, & Cook, 2013; Molodecky et al., 2012) and between 2,000,500-3,000,000 in Europe (Burisch, Jess, Martinato, & Lakatos, 2013). These conditions are characterised by symptoms which include abdominal pain, anaemia, diarrhoea, fatigue, mouth ulcers, and weight loss (Rampton & Shanahan, 2006). IBD is also characterised by periods of remission and relapse where symptoms become more severe during periods of active inflammation. In the UK, it is estimated to cost the NHS over £1 billion a year (Ghosh & Premchand, 2015).

IBD is a chronic illness, currently without cure, and thus presents a significant burden to individuals who live with the disease. IBD has come to be associated with elevated levels of stress, anxiety and depression (Mikocka-Walus et al., 2016; Targownik et al., 2015). Recent evidence suggests "bi-directional" effects between IBD activity and psychological disorder (Gracie, Guthrie, Hamlin, & Ford, 2018). This longitudinal prospective study found that higher illness activity predicted later anxiety and depression, and psychological disorder predicts later illness severity. Despite the need for services to address the psychological needs of people living with IBD, the National audit of adult Inflammatory Bowel Disease service provision (2014) found only 12% of services had access to a clinical psychologist via a designated referral pathway. Thus, access to psychological support is often unavailable or must be found outside of IBD services. Additionally, the evidence for current psychological treatments in IBD is modest with evidence for small effects for psychological treatments on various outcomes of wellbeing including anxiety, depression, and quality of life (QoL

or health related quality of life HRQoL) (McCombie, Mulder, & Gearry, 2013; Timmer et al., 2011).

One explanation for the modest findings of the current research might be the focus of widely available approaches (such as cognitive behavioural therapy; CBT, Beck, 1979) on identifying deficits and reducing symptoms i.e. "abnormal psychology" (Wood & Tarrier, 2010). It is possible that due to the nature of IBD such approaches are limited when taking into account its symptom profile and chronic nature (Moss-Morris, 2013). Interventions which complement such approaches by improving self-efficacy, and increasing levels of positive affect may prove helpful (Carr, 2011; Seligman & Csikszentmihalyi, 2000). Self-efficacy has been defined as an individual's belief in their ability to successfully manage a specific situation, and has been linked to engagement in adaptive coping behaviour (Bandura & Adams, 1977). In addition, Emotion regulation (ER), described as the ability of individuals to manage their own emotional experiences to engage optimally with the environment, can be seen as key to successful coping and adjustment (Koole, 2009). For example, Gross & John, (2003) found reappraisal ER strategies (reframing potentially highly emotive situations) to be associated with improved wellbeing and social functioning. It can be argued that increasing self-efficacy and ER can improve self-management which is an important aspect of promoting wellbeing in IBD (Plevinsky, Greenley, & Fishman, 2016).

Positive psychology is the study of happiness, strengths and resilience. There is evidence that positive approaches can improve levels of wellbeing, adaptive coping, and reduce stress in non-clinical samples (Bolier et al., 2013; Seligman, Rashid, & Parks, 2006). Positive psychological factors have strong relationships with positive adjustment in clinical samples including diabetes, Multiple Sceloris (MS), and HIV (Nes & Segerstrom, 2006; Schiavon, Marchetti, Gurgel, Busnello, & Reppold, 2017; Yi-Frazier et al., 2010). Positive Clinical Psychology (PCP), is an approach that aims to integrate

both abnormal and positive psychologies in theory, research and practice (Wood & Tarrier, 2010). One positive psychological factor that has been shown to be related to improved wellbeing and coping is gratitude (Sheldon, Kashdan, & Steger, 2011, Chapter 16).

Gratitude is described as a "life orientation" where individuals "notice and appreciate the positive in life" (Wood, Froh, & Geraghty, 2010). This includes gratitude towards others, for possessions, events, and non-events (events that have not occurred e.g. near misses). There is evidence that gratitude interventions can improve levels of wellbeing, ER, adaptive coping and reduce stress in non-clinical (Cheng, Tsui, & Lam, 2015; Davis et al., 2016) and clinical samples (Kerr, O'Donovan, & Pepping, 2015; Otto, Szczesny, Soriano, Laurenceau, & Siegel, 2016). There is evidence to suggest that gratitude is related to higher levels of wellbeing in people living with IBD (Sirois & Wood, 2017). These findings suggest that gratitude interventions may be effective in improving wellbeing and adaptive coping in people with IBD.

The gratitude list (also known as the "count your blessings" exercise) was employed by Emmons & McCullough (2003) as a gratitude intervention, and has since been replicated (Jackowska, Brown, Ronaldson, & Steptoe, 2016; Kerr et al., 2015; Lau & Cheng, 2017). The findings from these studies suggest that this brief, relatively inexpensive intervention can improve levels of wellbeing by increasing positive affect, and improving low mood. This has important implications for service providers, as the mechanism of the intervention is to build strengths rather than reduce symptoms, and that it can be delivered fairly inexpensively via self-help manuals or electronic formats. This makes the intervention suitable as a waiting-list intervention, or a less intensive step in stepped care models of psychological support. Providing the intervention online is also another way of increasing access to psychological therapy, and there is some

evidence to suggest that such formats are preferable to people living with IBD (McCombie, Gearry, & Mulder, 2014).

In summary, IBD is a chronic condition that has a high comorbidity with mood and anxiety disorders. The evidence for current psychological therapies in addressing these issues is modest, and access to such therapies for individuals with IBD are limited. It is possible that online formats may help in increasing access to psychological support. There is evidence to suggest that positive psychological factors, namely gratitude are strongly and positively related to improved wellbeing, and adjustment in chronic illness samples including IBD. There is also evidence that gratitude interventions can improve wellbeing. Therefore it is hypothesised that a gratitude intervention will improve wellbeing and adjustment outcomes for people living with IBD.

**Aims**

The aim of the current study was to test the hypothesis that a brief online gratitude intervention can improve wellbeing for people living with IBD. A secondary aim was to examine the extent to which gratitude is associated with wellbeing.

**Primary hypotheses:**

1. A brief gratitude intervention will improve wellbeing and adjustment outcomes of people living with IBD, as measured by improvement in health, mood, psychological distress, coping efficacy and positive ER in the treatment group from pre- to post- intervention.
2. Levels of gratitude and levels of wellbeing will be greater for the intervention group in comparison to the control group.

**Secondary hypotheses:**

3. Participants with higher levels of dispositional gratitude will report higher levels of self-efficacy and positive ER when measured pre-intervention.

4. Participants with higher levels of dispositional gratitude will report higher levels of wellbeing when measured pre-intervention.

## Method

### Design

The current study was a balanced randomised (1:1), single-blind, active-control, parallel-group intervention trial conducted online. The trial aimed to investigate the superiority of a gratitude intervention compared to an active-control condition. The decision to include an active-control was informed by previous evidence which suggests future trials need to employ more robust control conditions to account for possible monitoring effects (Woodworth, O'Brien-Malone, Diamond, & Schüz, 2017).

### Procedure

On successful completion of the screening survey, eligible participants were automatically allocated to one of two groups (1:1) by Qualtrics (Qualtrics, Provo, UT) randomizer element and given a unique ID. This ID was generated and displayed to the participant to record, and sent again in an email with a link to the baseline (T1) survey triggered after successful completion of the screening survey. Participants who completed the T1 survey continued to the intervention phase of daily data collection (Day 1 to 7). Following the one-week intervention phase, participants repeated the T1 survey (T2). Eight weeks later a follow-up survey was sent by email (T3).

### Ethics

Ethical approval was granted by the University of Sheffield Ethics Committee in February 2017 (Reference 012370, Appendix A).

### Participants

Individuals, aged 16 or over who self-identified as having received an IBD diagnosis by a doctor or physician were eligible to participate in the study. However,

being entirely online participation required access to a device with an internet connection.

From May 2017 to February 2018, participants were invited by online advertisement with support from IBD charities in the UK (Crohn's & Colitis UK, CORE charity and forCrohns, #IBDSuperHeroes, and Cure Crohn's Colitis), online academic research participation sites (callforparticipants, inmind.org, psychological research on the net), social media IBD support groups and via email to individuals held on a University database. As a result, most participants were from the UK, with a smaller number from the US, Canada, Europe and one individual from outside Europe.

Information about the study aims, procedure, right to withdraw, data storage, and risks were presented on the screening page (Appendix B). Informed consent was confirmed by completing the screener (see appendix C). This information was presented again at the start of the baseline survey, and with every email a link was provided to "opt out" of further emails. Personal and identifiable information was kept securely on an encrypted password protected database accessible only to the lead investigator.

**Intervention**

Following allocation, Qualtrics was pre-programmed to schedule in advance emails required for participants to receive the appropriate intervention tasks dependent on group. Automated emails were sent by Qualtrics containing a hyperlink to daily tasks at the same time every evening (approximately 18:00 local participant time) for a period of one week (Appendix D). The daily tasks expired the following day at approximately 04:00. To support adherence to the daily task, a trigger was created to send a reminder email to participants who had not yet completed the daily task three hours after the initial email. The reminder emails were designed to support participation by reminding participants of task expiry times, and subsequent task emails (Appendix D1). Following the intervention period an email was sent the next day thanking participants for their

participation, providing a link to the post-intervention (T2) survey, and providing information about the follow-up (T3) (Appendix D2) survey sent eight weeks later (Appendix D3).

Participants in the intervention group completed the gratitude intervention, and daily measures of gratitude, mood, pain, health, and sleep (Appendix E). The gratitude intervention was presented as a single item on the daily task that asked participants to record at least three things they felt thankful for that day (Emmons and McCollough 2003). For purposes of standardization participants in the control group received the exact same task as the intervention group, with the only exception being the instruction to record at least *three things that happened* that day (Appendix F). The gratitude task was purposefully presented after the daily measures to minimize priming effects (Storbeck & Clore, 2008).

Participants were blinded to condition as much as possible. No mention of "gratitude" or "positive psychology" was made until successful completion of the follow-up in a final thank you email (Appendix G). This email included information about the intervention condition and resources to keep a gratitude journal if after completing the intervention participants wished to continue, or if in the control group participants wanted to complete the gratitude task themselves.

**Measures (Appendix H)**

**Demographic information.** At baseline all participants completed a survey that captured basic demographic information including age, sex, ethnicity, country of residence, highest level of education, employment status and mental health history.

**Health information.** Information was gathered about current health status. This included IBD type (Crohn's, Ulcerative colitis, or other), date of diagnosis (month/year), whether their IBD symptoms were active or in remission, whether they currently took medication for their IBD, had surgery, or a stoma.

**Primary pre- post- and follow-up outcomes**

**Trait gratitude.** The Gratitude Questionnaire six (GQ-6; McCullough, Emmons, & Tsang, 2002). The GQ-6 is a six-item measure that captures dispositional gratitude. Items were presented in a Likert-scale format ranging from 1 to 7, with higher scores on the scale indicating higher levels of trait gratitude. It has been found to have high internal reliability. Reliability estimates (Cronbach's α) for this study were α = .87.

**IBD quality of life.** Participants IBD severity was measured using the UK version of the Inflammatory Bowel Disease Questionnaire ($IBDQ^{UK}$; Cheung, Garratt, Russell, & Williams, 2000), which was administered at baseline (T1), post-intervention (T2) and eight-weeks post-intervention at follow-up (T3). The $IBDQ^{UK}$ is a 32-item validated instrument that measures quality of life and symptom severity of IBD with an overall score. Responses to items are given on a Likert-scale ranging from 1 to 4, with higher scores indicating better outcomes. The scale is widely used and recommended for use in outcome research involving individuals with IBD (Cheung et al., 2000), and has excellent internal reliability and test-retest reliability. Reliability estimates for the $IBDQ^{UK}$ in current study were α = .95.

**IBD related stress.** Participants completed an IBD-specific measure of stress at T1, T2 and T3 adapted from previous work by F. M. Sirois (personal communication, July 27, 2016). This brief instrument measured IBD-related stress using five items covering disease, complications, body stigma, sexual intimacy, and "any other" (participant choice). Responses to items are given on a Likert-scale ranging from 1 to 6, with higher scores indicating higher levels of IBD-specific stress. Reliability estimates for the scale in the current sample was α = .76.

**Generic psychological distress.** The Depression Anxiety and Stress Scale (DASS-21; Henry & Crawford, 2005) was completed at T1, T2 and T3. This 21-item measure provides an overall psychological distress score, and separate scores for

depression, anxiety and stress. Each scale has seven items which are measured on a Likert scale ranging from 0 to 3, with higher scores indicating higher levels of distress. The DASS is a widely used instrument that has been demonstrated to have high internal reliability. Reliability estimate for the DASS in the current study was $\alpha = .94$ for total scale.

**Primary daily intervention outcomes.** During the one-week intervention period (D1 – D7), all participants completed a series of brief items to measure state gratitude, mood, health, pain and sleep.

**State gratitude.** The Gratitude Adjectives checklist (GAC; McCullough et al., 2002) is a three-item subscale from the Positive and Negative Affect Scale (PANAS; Watson & Clark, 1999). The PANAS and its subscales have been demonstrated to have high internal consistency. The three items are measured on a Likert scale ranging from 1 to 7, Higher scores on the GAC indicate higher levels of state gratitude. Reliability estimate for the GAC in the current sample was in this study was $\alpha = .94$. There was a positive relationship between the dispositional and state measures of gratitude $r = .65$ $p < .001$.

**Mood.** A visual analogue scale (van Rijsbergen et al., 2014) was used to measure mood daily, ranging from 0 “sad” to 10 “happy” ($\alpha = .72$).

**Health.** The Short Health Questionnaire (McDermott, Keegan, Byrne, Doherty, & Mulcahy, 2013) is a brief four-item measure that has been used to capture disease severity for individuals with IBD. It is made up of four visual analogue scale questions that assess bowel symptoms, disruption to daily activities, worry, and general wellbeing. It has been demonstrated to have good internal reliability, test-retest reliability and correlate with the IBDQ ($\alpha = .96$).

**Pain.** A visual analogue scale was used to measure pain daily, ranging from 0 “no pain” to 10 “extreme pain” ($\alpha = .90$).

**Sleep.** Sleep quality (for the previous night) was measured using a single item "star" rating scale (Johnson et al., 2016). The scale ranges from no stars "very poor" to "fair" to 5 stars "very good". Participants could rate their sleep in increments of 0.5 (α = .80).

**Secondary outcomes pre- post- and follow-up outcomes (coping)**

**Self-efficacy.** The IBD Self-efficacy scale (IBD-SES; Keefer, Kiebles, & Taft, 2011) was completed at T1, T2 and T3. The IBD-SES is a 29-item self-report measure of ability to manage disease related difficulties. Responses to items are given on a Likert scale ranging from 1 to 10, with overall higher scores indicating self-efficacy. The scale has been found to have high internal consistency, test and re-test reliability and construct validity. Reliability estimates for the scale in the study were α = .95 for overall SE (26 items).

**Emotion regulation.** The Emotion Regulation Questionnaire-Revised (ERQ-R; Spaapen, Waters, Brummer, Stopa, & Bucks, 2014) was completed at T1, T2 and T3 to measure ER. The scale is made up of two subscales: antecedent or reappraisal strategies (5 items), and response-focused or suppression strategies (4 items). The prior being associated with greater levels of positive emotions, and wellbeing compared to the latter. Therefore, reappraisal has been categorised as adaptive ER and suppression as maladaptive. Responses to items are given on a Likert scale ranging from 1 to 7, With higher scores on each scale indicating a higher presence of adaptive or maladaptive ER. The nine-item version has been found to have a better model of fit across samples, with high internal reliability. Reliability estimates for the scales in this study were α = .89, and α = .80 for reappraisal and suppression respectively.

**Sample size**

An apriori power analysis was conducted using GPower 3.1 (Faul, Erdfelder, Buchner,& Lang, 2009) to encompass the Multilevel Modelling analytical method.

Using an estimated effect size of $d$ = .46 based on a meta-analysis by Davis et al. (2016) converted to $f$ = .23 for gratitude as the primary variable for change and a significance level of alpha = .05 (two-tailed), for the first and second levels of analysis (level 1: between two groups of participants, and level 2: within groups) a total sample size of 20 per group was needed to achieve 80% power (Appendix I). For the correlational analysis, a minimum sample sizes table for detecting a correlation coefficient ($r$) (Cohen 1988, 1992) was consulted using the relationship between gratitude and depression scores taken from Sirois and Wood (2016) $r$ = .5 as a target relationship. The table suggested that keeping a significance level of alpha = .05 (two-tailed), and aiming for 80% power, a minimum sample size of 29 was required.

**Data preparation.** The data was checked for missing data, outliers and parametric assumptions of normality (Appendix J). Missing data were predominately found at T2 and T3. For the daily intervention analysis if data for more than three time-points were missing cases were excluded from the multilevel modelling. Missing data were handled by multiple imputation using the expectation maximization method (Appendix K). Outliers were examined for impossible scores, and included in the analysis in order to make full use of the data available. Comparison between multiple imputed data and untreated data did not change the estimates (Appendix L). All subsequent analysis is reported on the original dataset.

**Preliminary analyses.** Descriptive analysis of all demographic, health and outcome variables were run at baseline for the entire sample (percentages, averages (M), variance (SD), and range). Correlational analyses were run on all variables to explore relationships between demographic variables, gratitude, and outcome measures.

Subgroup analysis of gender (male-female), symptom activity (remission-active), and diagnosis (UC-CD) were carried out to confirm successful randomization, determine whether differences existed between these groups, and whether in addition to

the continuous variables their effect required consideration in the main analysis. This analysis was completed by running parametric and non-parametric tests for differences between groups on main and secondary outcome variables.

## Intervention Analysis

**Preliminary analysis.** The baseline intervention and control groups were analysed to check parametric assumptions for homogeneity of variance between groups, and for differences between groups on demographic variables and outcome measures (IBDQ, DASS and IBD-stress) at T1 using independent t-tests.

The level of attrition for the overall sample, and the two groups in the study from T1 to T2 was 52%. For T2 to T3, the overall level of attrition was 33%, for intervention 29% and for the control group 38%. Subgroup analysis of completers and non-completers was done in order to determine whether there were any differences between groups which may be important when considering the results of the main analysis (Kraemer, Frank, & Kupfer, 2006).

**Gratitude manipulation check.** To determine whether the gratitude intervention influenced state gratitude (measured by the GAC) a multilevel model (MLM) analysis was conducted to investigate the effect of group (intervention versus control) and time on state gratitude controlling for T1 gratitude (GAC) scores (see MLM below).

**Multilevel Modelling.** The main analysis was an intention-to-treat (ITT) analysis using all available data using longitudinal multilevel modelling for gratitude, and the four primary daily measures (mood, pain, SHS and sleep) separately. The MLM makes use of all available data (including outcome variables and covariates to model and calculate effects over time). As such it is robust in handling missing data. The models examined changes in specified outcome over time. Modelling of outcome variables was completed in planned iterative steps in-line with recommended multi-

level modelling procedures for examining effects of psychological intervention over time (Gallop & Tasca, 2009; Tasca & Gallop, 2009). The first step of the analysis involved fitting a base or null model, which would act as a comparison for subsequent models (model 1). Using the base model visual analysis of time trend was competed to choose whether any time transformations were required. Based on the analysis a linear or quadratic structure was adopted. The second step involved introducing "TIME" at level 1 (model 2), and controlling for mean centred T1 score and trait gratitude at the participant level (model 3). The third step introduced the "GROUP" variable to level 2 to test the main hypothesis that the intervention improved outcome for participants (model 4). Model comparison was conducted by examining the -2 Loglikelihood Ratio (-2LL) change, and significance, for each model using chi-square tests (likelihood ratio test statistic LRTS), examining regression plots, and changes in β-coefficients, and variance estimates for increasingly complex models. Intraclass correlations coefficient (*ICC1*) was computed to assess the proportion of variance in the outcomes attributed to between participant differences. More complex models were considered to have better fit and explain greater proportion of variance when this difference (LTRS) was statistically significant ($p < 0.05$) using a chi-square test adjusting for new parameters (degrees of freedom) added to the model. The final adjusted conditional model included time, group, the group by time interaction, grand mean centred T1 scores, and gratitude. Additional sensitivity analysis was completed including level 2 covariates (sex and symptom status) identified from the preliminary analysis (model 5).

**Repeated measure analysis.** A "completer" analysis of the pre-, post-, and follow-up measures was completed using an Analysis of covariance (ANCOVA). The completer analysis included only participants who provided data for time-points analysed. The ANCOVA tests the hypothesis that the intervention influenced outcome (T1 – T2) if an effect was found, a second analysis was planned to determine whether this effect was

sustained at follow-up (T2 – T3). Finally, if there was no effect at T1-T2, a second ANCOVA was conducted to rule out the possibility that the effect of the intervention was delayed (T1 – T3). Measures which violated the assumptions required for parametric procedures were rank transformed for the ANCOVA (Conover, 2012). All data analysis was conducted using IBM© SPSS© Statistics Version 24.

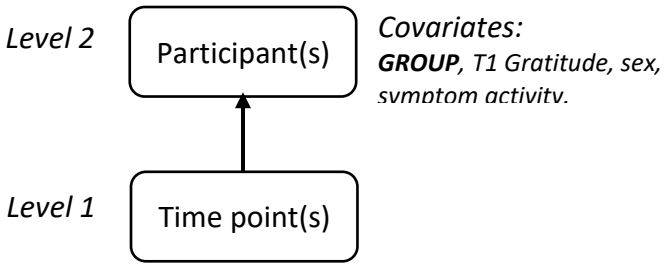


Figure 1. Conceptual MLM model

## Results

**Participant flow.** Figure 3 shows the number of participants that completed the screening questionnaire, were eligible for inclusion, completed the weekly task, and were included in the final analysis.

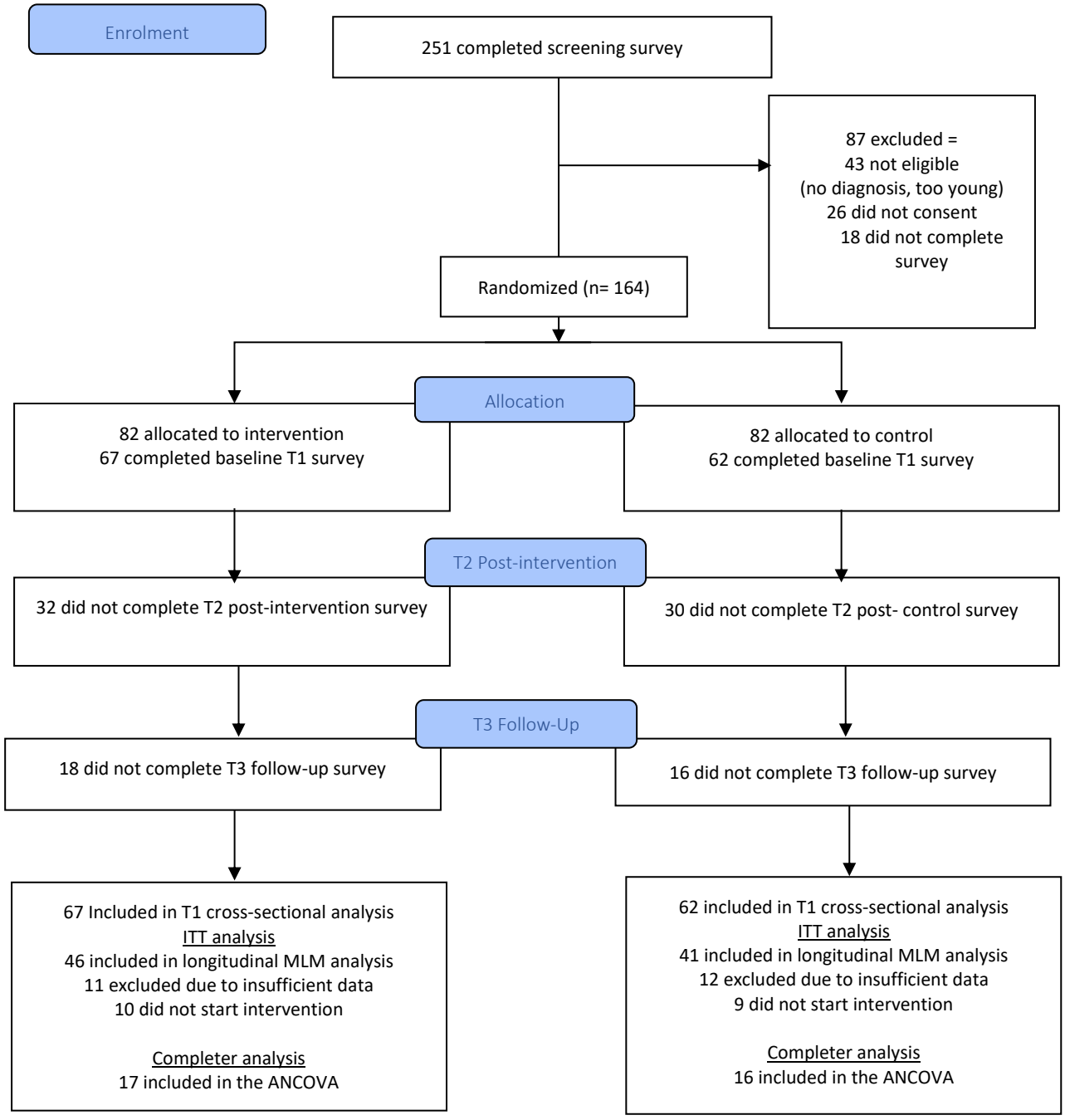


Figure 2. CONSORT diagram

**Exploratory baseline analysis and randomization check**

Table 1 shows baseline demographic and health characteristics for each group.

**Baseline correlational analysis.** Table 2 shows the correlations between the primary and secondary outcome variables at baseline.

Table 1

*Baseline demographic and clinical characteristics of participants overall and by group*

| | Overall *N* = 129 | Intervention *N* = 67 | Control *N* = 62 |
|---|---|---|---|
| Sex (% female) | 76.7 | 74.6 | 79 |
| Mean Age (SD) | 34.6(11.8) | 35 (11.83) | 34.2(11.9) |
| Age Range (years) | 17 – 70 | 18 – 70 | 17 – 64 |
| Ethnicity (%) | | | |
| British | 71.3 | 70.2 | 72.6 |
| European | 6.2 | 6 | 6.5 |
| Any other White background | 14 | 16.4 | 11.3 |
| Mixed/multiple background | 2.9 | 3 | 2.9 |
| Black African or Caribbean | 1.6 | 1.5 | 1.6 |
| Any other ethnic group | 2.9 | 1.5 | 6.1 |
| Missing | <1 | 1.5 | |
| Residence (%) | | | |
| United Kingdom | 85.2 | 86.4 | 83.9 |
| United States | 8.5 | 6.1 | 11.3 |
| Canada | 3.1 | 3 | 3.2 |
| Europe | 2.4 | 3 | 1.6 |
| Outside of Europe | <1 | 1.5 | |
| Missing | <1 | 1.5 | |
| Employment status (%) | | | |
| Full-time | 47.3 | 49.3 | 45.2 |
| Part-time | 24 | 25.4 | 22.6 |
| Student | 15.5 | 14.9 | 16.1 |
| Unemployed/retired | 13.2 | 10.4 | 16.1 |
| Education (%) | | | |
| High school | 45 | 40.3 | 50 |
| Undergraduate | 32.6 | 37.3 | 27.4 |
| Postgraduate | 14.7 | 14.9 | 14.5 |
| Ph.D, law or medical degree | 5.4 | 6 | 4.8 |
| Missing | 2.3 | 1.5 | 3.2 |
| Mental health (%) | 28.7 | 22.4 | 35.5 |

Table 1

*Baseline demographic and clinical characteristics of participants overall and by group (continued)*

| | Overall *N* = 129 | Intervention *N* = 67 | Control *N* = 62 |
|---|---|---|---|
| Type of IBD (%) | | | |
| Crohn's Disease | 50.4 | 49.3 | 51.6 |
| Ulcerative Colitis | 42.6 | 44.8 | 40.3 |
| Other IBD | 7 | 6 | 8.1 |
| Years since diagnosis (SD) | 8.9(8.3) | 8.1 (7.9) | 9.7(8.6) |
| Range | 1< – 42.1 | 1< – 29.8 | 1< – 42.1 |
| Symptom status (%) | | | |
| Active | 55 | 49.3 | 59.7 |
| Remission | 45 | 50.7 | 40.3 |
| IBD medication | 82.9 | 80.6 | 85.5 |
| IBD surgery | 38 | 32.8 | 43.5 |
| Has stoma | 12.4 | 13.4 | 11.3 |

*Note.* SD = standard deviation.

**Baseline subgroup analysis**

**Gender.** Independent samples t-test found males had higher scores than females on the IBDSES (male mean =168.14, *SD* = 48.64, female mean = 136.34, *SD* = 46), *t*(125) = -3.28, *p* = .001, and IBDQ than females (male mean = 92.52, *SD* = 20.6, female mean = 84.4, *SD* = 17), *t*(126) = -2.17, *p* = .032, and lower IBD-stress scores (male mean = 13.38, *SD* = 6.2, female mean 16.61, *SD* = 5.7), *t*(125) = 2.601, *p* = .010). Non-parametric Mann-Whitney U tests showed males had higher GAC scores (male median = 12, female median = 10), *U* = 962.5, *p* = .006 than females.

**Symptom activity.** Independent sample t-tests found participants in remission had higher IBDQ (remission mean = 98.49, *SD* = 12.91, active mean 76.28, *SD* = 15.36), *t*(126) = 8.71, *p* < .001, and IBDSES (remission mean = 163.4, *SD* = 49.91, active mean = 127.34, *SD* = 40.45), *t*(126) = 4.52, *p* < .001. Mann-Whitney U tests found length of years since diagnosis was longer for participants in remission (remission median = 10 , active median = 4.5), *U* = 1364.5, *p* = .001; DASS scores were higher for participants with active symptoms compared to those in remission (active

median = 25, remission median = 14.5), $U = 2859.5$, $p < .001$; IBD-stress scores were higher for participants with active symptoms compared to those in remission (active median = 17, remission median = 12.5), $U = 2808$, $p < .001$; GQ6 scores were higher for participants in remission compared to those with active symptoms (remission median = 34, active median = 32), $U = 1588.5$, $p = .026$; and GAC scores (remission median = 12, active median = 9), $U = 1421$, $p = .002$.

**Diagnosis.** A Kruskal-Wallis test found that length of diagnosis was significantly higher for participants with Crohn's disease (median 9.9) compared to ulcerative colitis (median 4.5) and other (including indeterminate colitis, pouchitis, and microscopic colitis) (median 6.6). There were no other statistically significant differences between diagnoses type.

Table 2

*Pearson correlations among study variables at T1 (N = 129)*

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Trait gratitude (GQ6) | _ | | | | | | | | | |
| 2. State gratitude (GAC)† | .65** | _ | | | | | | | | |
| 3. HRQoL (IBDQ) | .44** | .48** | _ | | | | | | | |
| 4. Mood symptoms (DASS) | -.52** | -.48** | -.71** | _ | | | | | | |
| 5. IBD stress | -.33** | -.29** | -.62** | .56** | _ | | | | | |
| 6. IBD self-efficacy‡ | .58** | .51** | .62** | -.65** | -.54** | _ | | | | |
| 7. Reappraisal coping† | .31** | .29** | .20* | -.31** | .47** | .47** | _ | | | |
| 8. Suppression coping† | -.22* | -.098 | -.015 | .25** | -.22* | -.017 | .010 | | | |
| 9. Active symptoms | -.20* | -.27** | -.62** | .33** | .31** | -.36** | -.11 | .087 | _ | |
| 10. Gender (F) | -.14 | -.21* | -.18* | .11 | .22* | -.29 | .01 | -.13 | .30 | _ |
| 11. Unemployment‡ | -.18* | -.14 | -.09 | .065 | .05 | -.10 | -.07 | -.08 | .08 | .56 |
| Mean | 32.4 | 10.2 | 86.2 | 21.3 | 15.9 | 143.7 | 22.65 | 16 | _ | _ |
| SD | 6.4 | 3.2 | 18 | 13.4 | 6 | 48.1 | 6.3 | 5.2 | _ | _ |

*Note.* DASS = depression anxiety and stress scale; GAC = gratitude adjectives checklist; GQ6 = gratitude questionnaire six; IBDQ = inflammatory bowel disease questionnaire.

*†n = 125, ‡n = 128.*

**p* < .05, ***p* < .01.

Table 3

*Raw mean (SDs) for pre- post- and follow-up outcome variables*

| | Baseline (T1) | | | | Post-intervention (T2) | | | | Follow-up (T3) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intervention | | Control | | Intervention | | Control | | Intervention | | Control | |
| **Primary outcomes** | *n* | *M(SD)* | *n* | *M(SD)* | *n* | *M(SD)* | *n* | *M(SD)* | *n* | *M(SD)* | *N* | *M(SD)* |
| GAC | 63 | 10.2 (2.9) | 62 | 10.2(3.5) | 36 | 9.6(3.2) | 32 | 9.9(3.5) | 17 | 10.2(3.8) | 15 | 10.5(3.4) |
| IBDQ | 67 | 87.7(18.0) | 62 | 84.5(18.0) | 36 | 88.81(15.6) | 32 | 85.27(17.9) | 17 | 97.69(12.5) | 16 | 87.67(19.8) |
| DASS | 67 | 20.6(12.4) | 62 | 22(14.5) | 36 | 20.4(9.5) | 32 | 18.6(12.7) | 17 | 15.1(8.2) | 16 | 22.1(17.8) |
| IBD-stress | 66 | 15.7(6.1) | 62 | 16(5.9) | 36 | 15.5(5.9) | 32 | 15.7(5.8) | 17 | 12.3(5.2) | 16 | 14.4(5.6) |
| **Secondary outcomes** | | | | | | | | | | | | |
| IBDS-SES | 67 | 139.3(49.8) | 62 | 148.5(46.2) | 36 | 148.6(45.7) | 32 | 152(34.9) | 17 | 164.5(50.0) | 16 | 146.6(49.0) |
| Suppression coping | 63 | 16(5.0) | 62 | 15.97(5.5) | 35 | 15.7(5.5) | 32 | 15.5(5.3) | 17 | 14.1(5.4) | 15 | 17.5(4.4) |
| Reappraisal coping | 63 | 21.8(6.5) | 62 | 23.6(5.9) | 35 | 24.3(5.5) | 32 | 22.9(4.8) | 17 | 21.9(6.3) | 15 | 25.6(5.0) |

*Note.* DASS = depression anxiety and stress scales; GAC = gratitude adjectives checklist; IBDQ = inflammatory bowel disease questionnaire; IBD-SES = inflammatory bowel disease self-efficacy scale; IBD-stress = inflammatory bowel disease stress scale; ER = emotion regulation.

**Completers vs. non-completers**

Table 4 and 5 display baseline characteristics for completers and non-completers.

Table 4

*Baseline demographic and clinical characteristics of participants overall and by completion status*

| | Overall *N* = 129 | Completer *N* = 76 | Non-completer *N* = 53 |
|---|---|---|---|
| Sex (% female) | 76.7 | 54.5 | 45.5 |
| Mean Age (SD) | 34.6 (11.8) | 37 (12) | 31.2 (10.8) |
| Range (Years) | 17 – 70 | 17 – 70 | 18 – 63 |
| | | | |
| Ethnicity (%) | | | |
| British | 71.3 | 73.7 | 69.8 |
| European | 6.2 | 5.3 | 7.5 |
| Any other White background | 14 | 13.1 | 15.1 |
| Mixed/multiple background | 2.9 | 3.9 | 1.9 |
| Black African or Caribbean | 1.6 | 1.3 | 1.9 |
| Any other ethnic group | 2.9 | 0 | 3.8 |
| | | | |
| Residence (%) | | | |
| United Kingdom | 85.2 | 86.8 | 83 |
| United States | 8.5 | 5.3 | 13.2 |
| Canada | 3.1 | 4 | 1.9 |
| Europe | 2.4 | 2.6 | 1.9 |
| Outside of Europe | <1 | 1.3 | |
| | | | |
| Employment status (%) | | | |
| Full-time | 47.3 | 47.4 | 47.2 |
| Part-time | 24 | 27.6 | 18.9 |
| Student | 15.5 | 10.5 | 22.6 |
| Unemployed/retired | 13.2 | 14.5 | 11.3 |
| | | | |
| Education (%) | | | |
| High school | 45 | 41.9 | 51.9 |
| Undergraduate | 32.6 | 33.8 | 32.7 |
| Postgraduate | 14.7 | 16.2 | 13.5 |
| Ph.D, law or medical degree | 5.4 | 8 | 1.9 |
| | | | |
| Mental health (%) | 28.7 | 22.4 | 37.7 |
| Type of IBD (%) | | | |
| Crohn's Disease | 50.4 | 51.3 | 49.1 |
| Ulcerative Colitis | 42.6 | 40.8 | 45.3 |
| Other IBD | 7 | 7.9 | 5.7 |
| Years since diagnosis (SD) | 8.9 (8.3) | 9.3 (7.7) | 8.3 (9) |
| Range | 1< – 42.1 | 1< – 29.8 | 1< – 42.1 |
| Symptom status (%) | | | |
| Active | 55 | 56.6 | 52.8 |
| Remission | 45 | 43.4 | 47.2 |

Table 4

*Baseline demographic and clinical characteristics of participants overall and by completion status*

| | Overall *N* = 129 | Completer *N* = 76 | Non-completer *N* = 53 |
|---|---|---|---|
| IBD medication | 82.9 | 84.2 | 81.1 |
| IBD surgery | 38 | 39.5 | 35.9 |
| Has stoma | 12.4 | 13.2 | 11.3 |

Table 5

*Raw baseline outcome scores of participants overall and by completion status*

| | Overall *N* = 129 | Completer *N* = 76 | Non-completer *N* = 53 |
|---|---|---|---|
| **Primary outcomes** | | | |
| GAC (SD) | 10.2(3.2) | 10.1(3.3) | 10.4(3.1) |
| Range | 3 – 15 | 3 – 15 | 3 – 15 |
| IBDQ (SD) | 86.2(18.0) | 86.3(17.7) | 86.0(18.6) |
| Range | 43 – 124 | 43 – 124 | 45 – 115 |
| DASS (SD) | 21.3(13.4) | 19.4(12.2) | 23.9(14.8) |
| Range | 1 – 62 | 1 – 62 | 1 – 55 |
| IBD-stress (SD) | 15.9(6.0) | 15.7(5.8) | 16.1(6.3) |
| Range | 5 – 30 | 5 – 30 | 5 – 30 |
| **Secondary outcomes** | | | |
| IBD-SES (SD) | 143.7(48.1) | 146.1(45.8) | 140.2(51.6) |
| Range | 15 – 250 | 48 – 250 | 15 – 246 |
| Suppression coping (SD)* | 16.0(5.2) | 15.1(5.3) | 17.3 (4.9) |
| Range | 4 – 28 | 4 – 28 | 7 – 26 |
| Reappraisal coping (SD) | 22.7(6.3) | 23.1(5.5) | 22.0(7.2) |
| Range | 5 – 44 | 10 – 35 | 5 – 44 |

*Note.* DASS = depression anxiety and stress scales; GAC = gratitude adjectives checklist; IBDQ = inflammatory bowel disease questionnaire; IBD-SES = inflammatory bowel disease self-efficacy scale; IBD-stress = inflammatory bowel disease stress scale; ER = emotion regulation.
*Mann-Whitney U test found significant different at the $p < .05$ level

**Intent-to-treat multilevel modelling intervention analysis**

**Gratitude manipulation check.** Figure 3 plots the observed mean scores of gratitude over the course of intervention by group. Visual analysis of the plot suggests gratitude was slightly higher in the intervention compared to the control group over the course of the intervention. The base model variance estimates suggested that approximately 65% of the variance (*ICC1* = .65) was attributed to between participant differences. Fixed effects for the fully adjusted model including group and the group*time interaction are shown in table 7 (model 4). This model suggested there was no significant difference between groups in gratitude score at baseline. The main interaction group*time suggested no difference between groups over time and was not statistically significant. Figure 4 plots the predicted mean scores based on the final model.

Table 6

*n provided participant data for longitudinal MLM by day during intervention*

| Day | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Control | 41 | 36 | 36 | 37 | 34 | 36 | 28 |
| Intervention | 46 | 43 | 37 | 38 | 39 | 38 | 32 |

Table 7

*Longitudinal multilevel fixed effect estimates for GAC*

| Model | Variable | *β* | *SE* | *p* | Likelihood ratio test statistic (df i.e. new parameters) | % additional residual variance explained |
|---|---|---|---|---|---|---|
| 1 Base/null model | Intercept | 9.54 | .298 | <.001 | | |
| 2 Unconditional linear | Intercept | 9.52 | .307 | <.001 | Null (3) | 3% |
| | Time | .003 | .406 | .945 | | |
| 3 Conditional linear (controlling for baseline) | Intercept | 9.47 | .307 | <.001 | 51(2)* | 3% |
| | Time | .004 | .435 | .992 | | |
| | Baseline GAC | .588 | .068 | <.001 | | |
| 4 Fully adjusted conditional linear (including group and group*time interaction) | Intercept | 9.47 | .288 | <.001 | Negative | Null |
| | Time | .003 | .050 | .960 | | |
| | Baseline GAC | .589 | .078 | <.001 | | |
| | Group (control) | -.008 | .459 | .986 | | |
| | Group*Time | .002 | .094 | .981 | | |
| 5 Sensitivity analysis | Intercept | 7.05 | 1.95 | <.001 | 9(3)* | Null |
| | Time | .020 | .089 | .819 | | |
| | Baseline GAC | .538 | .069 | <.001 | | |
| | Group (control) | .131 | .430 | .762 | | |
| | Group*Time | -.026 | .129 | .843 | | |
| | Female | 1.84 | 1.98 | .355 | | |
| | Male | 1.99 | 2.01 | .325 | | |
| | Symptoms (remission) | 1.14 | .439 | .011 | | |

*Note.* GAC = gratitude adjectives checklist; SHS = short health scale.
*$p < .05$

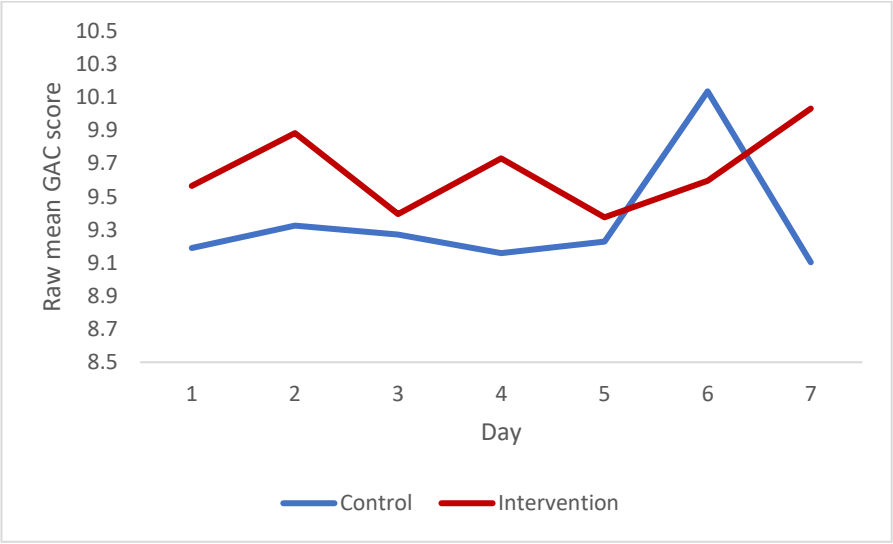


Figure 3. Mean raw trait gratitude score by group over time

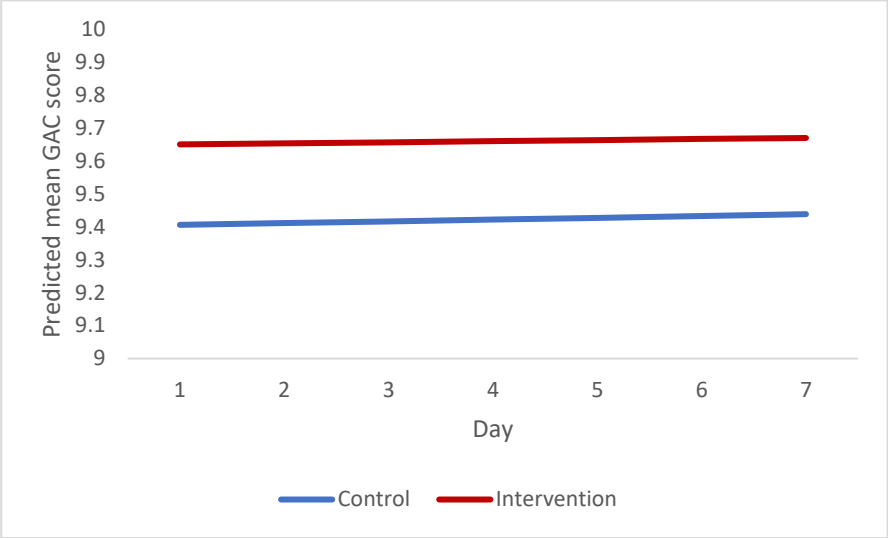


Figure 4. Mean predicted gratitude score by group over time (model 4)

**Mood.** Examination of the plot of mean mood scores over the course of the intervention suggest very little difference between groups in mood (Figure 5). Examination of the visual trend of mean plots showed that there was no discernible change in mood over the course of the intervention. The base model variance estimates suggested that approximately 42% (*ICC1* = .42) of variance was attributed to between participant differences. Model 2 suggests there was no change in mood over time. Addition of control variables (model 3) significantly improved model fit, and there was a significant effect for gratitude on mood. The time estimate remained non-significant. The main hypothesis test for group*time was not significant (model 4). Controlling for gender and symptom activity did not change these findings.

Table 8

*Longitudinal multilevel fixed effect estimates for daily mood*

| Model | Variable | *β* | *SE* | *p* | Likelihood ratio test statistic (df i.e. new parameters) | % additional residual variance explained |
|---|---|---|---|---|---|---|
| 1 Base/null model | Intercept | 5.89 | .137 | <.001 | | |
| 2 Unconditional linear | Intercept | 5.95 | .156 | <.001 | Null | 7% |
| | Time | -.019 | .035 | .578 | | |
| 3 Conditional linear (controlling for baseline) | Intercept | 3.31 | .239 | <.001 | 220(2)* | 28% |
| | Time | -.027 | .032 | .413 | | |
| | Baseline mood | .400 | .060 | <.001 | | |
| | Baseline GAC | .278 | .023 | <.001 | | |
| 4 Fully adjusted conditional linear (including group and group*time interaction) | Intercept | 3.44 | .259 | <.001 | Null | Null |
| | Time | -.049 | .045 | .275 | | |
| | Baseline mood | .405 | .060 | <.001 | | |
| | Baseline GAC | .277 | .023 | <.001 | | |
| | Group | -.236 | .191 | .222 | | |
| | (control) | .048 | .065 | .461 | | |
| | Group*Time | | | | | |
| 5 Sensitivity analysis | Intercept | 4.94 | .792 | <.001 | Null | Null |
| | Time | -.049 | .045 | .274 | | |
| | Baseline mood | .420 | .064 | <.001 | | |
| | Baseline GAC | .281-.204 | .023 | <.001 | | |
| | Group | .048 | .193 | .296 | | |
| | (control) | -1.58 | .065 | .461 | | |
| | Group*Time | -1.50 | .785 | .050 | | |
| | Female | -.064 | .801 | .067 | | |
| | Male | | .182 | .725 | | |
| | Symptoms (remission) | | | | | |

*Note.* GAC = gratitude adjectives checklist.
*$p < .05$

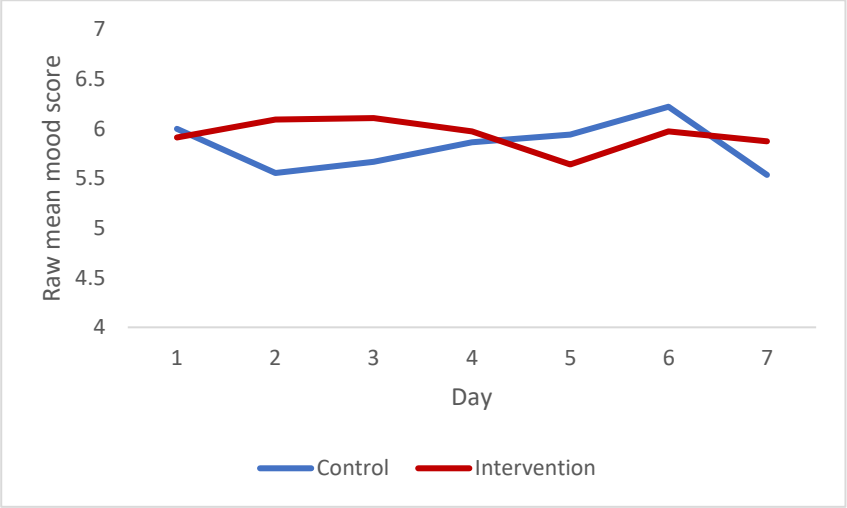


Figure 5. Raw mean mood score by group over time

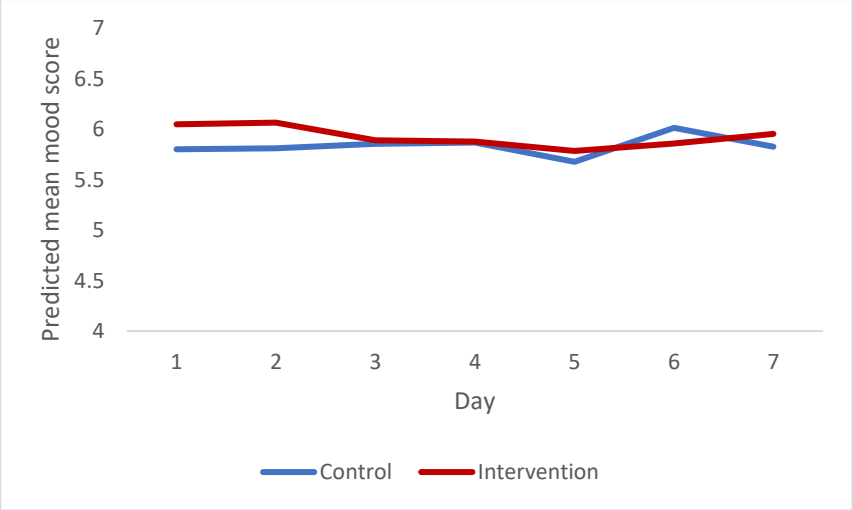


Figure 6. Predicted mean mood score by group over time (model 4)

**Pain.** Examination of the plot of mean pain scores suggest that pain was lower in the intervention group (Figure 7). This was consistent over the intervention period. The base model variance estimates suggested that approximately 66% (*ICC1* = .66) of the variance was attributed to between participant differences. The addition of the fixed and random effects of time suggested there was a significant effect for time. Model fit was not significantly improved. Model 3 found a negative relationship between gratitude and pain. Addition of group suggested that the mean pain score for the control group was higher than the intervention group. The hypothesis testing the group*time interaction was negative and non-significant. Sensitivity analysis including gender and symptoms did not change the effect for time and there was a negative relationship

between pain and symptoms in remission. Model fit determined by examination of the LRTS was improved suggesting that gender and symptoms explained a significant amount of variance in the model.

Table 9

*Longitudinal multilevel fixed effect estimates for daily pain*

| Model | Variable | *β* | *SE* | *p* | Likelihood ratio test statistic (df i.e. new parameters) | % additional residual variance explained |
|---|---|---|---|---|---|---|
| 1 Base/null model | Intercept | 2.87 | .225 | <.001 | | |
| 2 Unconditional quadratic | Intercept | 2.77 | .254 | <.001 | 4(4) | 8% |
| | Time | .290 | .112 | <.001 | | |
| | $Time^2$ | -.060 | .018 | <.001 | | |
| 3 Conditional linear (controlling for baseline) | Intercept | 3.86 | ..311 | <.001 | 125(2)* | 7% |
| | Time | .272 | .109 | .0013 | | |
| | $Time^2$ | -.058 | .018 | .001 | | |
| | Baseline pain | .781 | .058 | <.001 | | |
| | Baseline GAC | -.118 | .029 | <.001 | | |
| 4 Fully adjusted conditional linear (including group and group*time interaction) | Intercept | 3.62 | .326 | <.001 | 3(2) | Null |
| | Time | .301 | .115 | .009 | | |
| | $Time^2$ | -.058 | .018 | .001 | | |
| | Baseline pain | .771 | .057 | <.001 | | |
| | Baseline GAC | -.119 | .028 | <.001 | | |
| | Group (control) | .552 | .236 | .021 | | |
| | Group*Time | -.064 | .080 | .425 | | |
| 5 Sensitivity analysis | Intercept | 2.35 | .992 | .020 | 13(3)* | Null |
| | Time | .302 | .115 | .009 | | |
| | $Time^2$ | -.057 | .018 | .001 | | |
| | Baseline pain | .696 | .058 | <.001 | | |
| | Baseline GAC | -.113 | .028 | <.001 | | |
| | Group (control) | .441 | .232 | .060 | | |
| | Group*Time | -.067 | .078 | .390 | | |
| | Female | 1.62 | .996 | .108 | | |
| | Male | 1.78 | 1.01 | .083 | | |
| | Symptoms (remission) | -.830 | .240 | .001 | | |

*Note.* GAC = gratitude adjectives checklist.
*$p < .05$

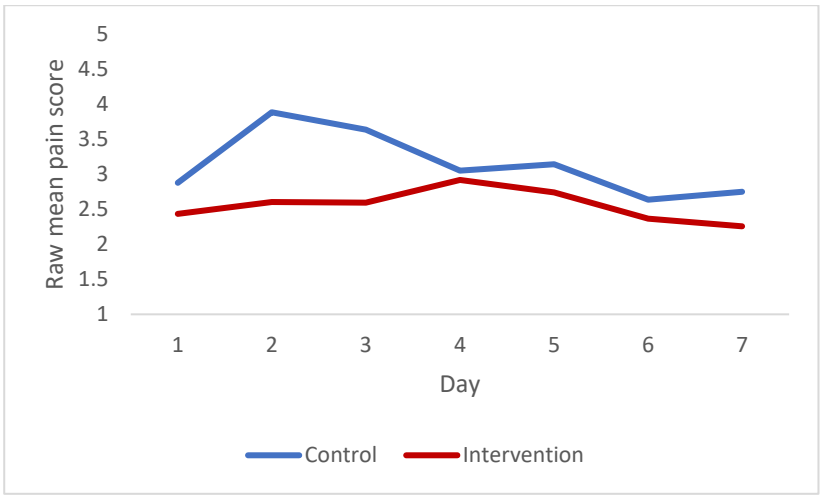


Figure 7. Raw mean pain score by group over time

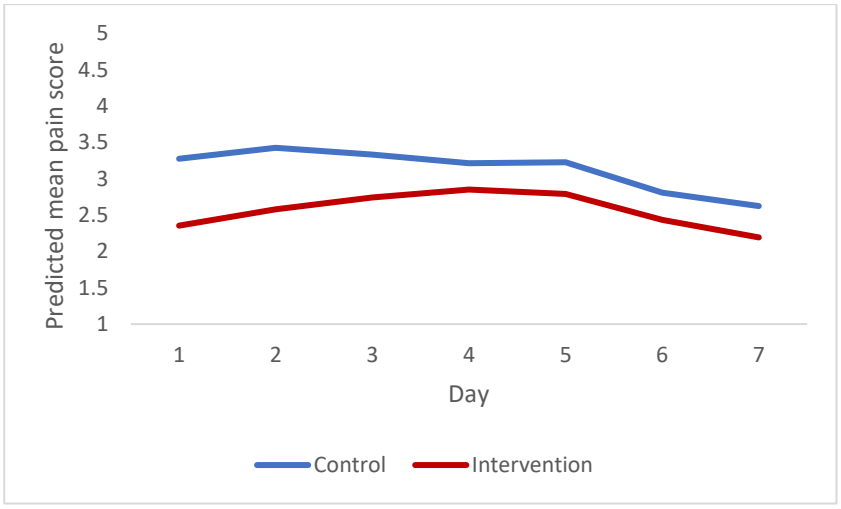


Figure 8. Predicted mean pain score by group over time (model 4)

**Subjective health.** Examination of the plot of mean SHS scores suggested that there was a slight trend towards decrease in SHS scores for both groups, however the intervention group generally had lower SHS scores (Figure 9). The base model variance estimates suggested that approximately 80% (*ICC1* = .80) of the variance was attributed to between participant differences. Model 2 suggested there was no significant effect for time on SHS scores. There was significant improvement in model fit by examining the change in the -2LL statistic. Model 3 did not change the effect of time on SHS scores, and explained additional variance in the model. The effect of gratitude on SHS was negative and significant. The main hypothesis testing the group*time interaction was negative and non-significant. Sensitivity analysis including gender and symptoms did

not change these patterns of effects. Model fit determined by examination of the LRTS was improved suggesting that gender and symptoms explained a significant amount of variance in the model.

Table 10

*Longitudinal multilevel fixed effect estimates for daily SHS*

| Model | Variable | *β* | *SE* | *p* | Likelihood ratio test statistic (df i.e. new parameters) | % additional residual variance explained |
|---|---|---|---|---|---|---|
| 1 Base/null model | Intercept | 16.45 | .835 | <.001 | | |
| 2 Unconditional linear | Intercept | 17.01 | .869 | <.001 | 11(3)* | 11% |
| | Time | -.203 | .104 | .055 | | |
| 3 Conditional linear (controlling for baseline) | Intercept | 21.73 | .774 | <.001 | 223(2)* | 12% |
| | Time | -.188 | .105 | .079 | | |
| | Baseline SHS | .776 | .039 | <.001 | | |
| | Baseline GAC | -.512 | .074 | <.001 | | |
| 4 Fully adjusted conditional linear (including group and group*time interaction) | Intercept | 21.39 | .828 | <.001 | 2(2) | Null |
| | Time | -.045 | .106 | .762 | | |
| | Baseline SHS | .774 | .039 | <.001 | | |
| | Baseline GAC | -.511 | .074 | <.001 | | |
| | Group (control) | .694 | .633 | .276 | | |
| | Group*Time | -.299 | .213 | .166 | | |
| 5 Sensitivity analysis | Intercept | 24.67 | 2.90 | <.001 | 11(3)* | Null |
| | Time | -.041 | .148 | .782 | | |
| | Baseline SHS | .746 | .47 | <.001 | | |
| | Baseline GAC | -.503 | .074 | .272 | | |
| | Group (control) | .710 | .642 | .160 | | |
| | Group*Time | -.304 | .214 | .290 | | |
| | Female | -9.094 | 2.91 | .383 | | |
| | Male | -2.50 | 3.0 | .207 | | |
| | Symptoms (remission) | -.970 | .763 | | | |

*Note.* GAC = gratitude adjectives checklist; SHS = short health scale.
*$p < .05$

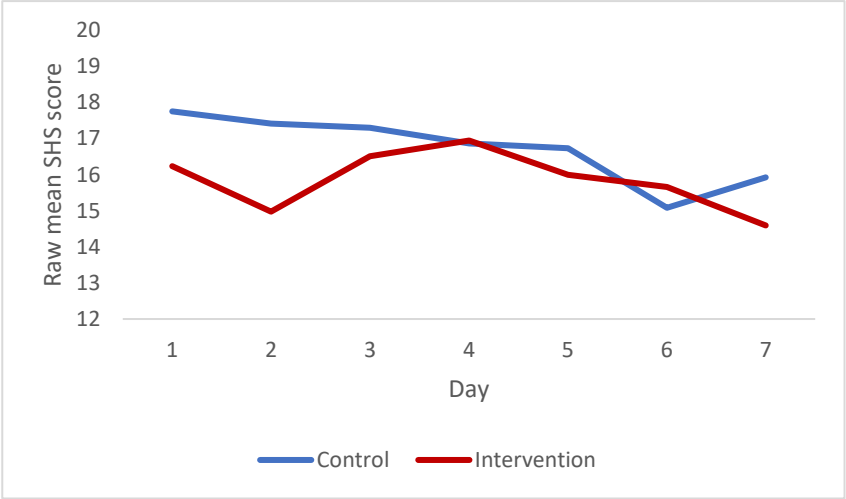


Figure 9. Raw mean SHS scores by group over time

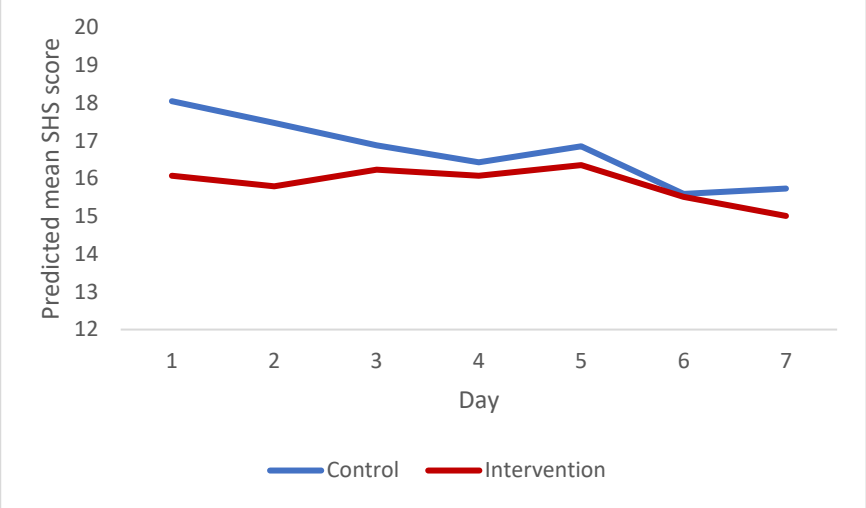


Figure 10. Predicted mean SHS score by group over time (model 4)

**Sleep quality.** Examination of the plot of mean sleep scores suggest that sleep satisfaction was similar in both groups, however, slightly better in the intervention group (Figure 11). The base model variance estimates suggested that approximately 44% (*ICC1* = .44) of the variance was attributed to between participant differences. Model 2 suggested there was no significant effect for time on sleep and there was no improvement in model fit. Model 3 did not change the effect of time on sleep and the effect of gratitude on sleep was not significant. Model 4 suggested that there was no difference in sleep scores between the baseline and control group. The main hypothesis testing the group*time interaction was negative and non-significant. Sensitivity analysis

including gender and symptoms did not change these patterns of effects or improve model fit.

Table 11

*Longitudinal multilevel fixed effect estimates for daily sleep*

| Model | Variable | *β* | *SE* | *p* | Likelihood ratio test statistic (df i.e. new parameters) | % additional residual variance explained |
|---|---|---|---|---|---|---|
| 1 Base/null model | Intercept | 3.13 | .081 | <.001 | | |
| 2 Unconditional linear | Intercept | 3.05 | .093 | <.001 | Null | 3% |
| | Time | .027 | .018 | .150 | | |
| 3 Conditional linear (controlling for baseline) | Intercept | 2.83 | .147 | <.001 | 29(2)* | 16% |
| | Time | .023 | .030 | .442 | | |
| | Baseline sleep | .650 | .059 | <.001 | | |
| | Baseline GAC | .026 | .014 | .064 | | |
| 4 Fully adjusted conditional linear (including group and group*time interaction) | Intercept | 2.82 | .158 | <.001 | Null | Null |
| | Time | .034 | .041 | .402 | | |
| | Baseline sleep | .649 | .059 | <.001 | | |
| | Baseline GAC | .027 | .014 | .063 | | |
| | Group (control) | .016 | .113 | .885 | | |
| | Group*Time | -.023 | .059 | .690 | | |
| 5 Sensitivity analysis | Intercept | 3.52 | .494 | <.001 | Null | 2% |
| | Time | .034 | .041 | .410 | | |
| | Baseline sleep | .646 | .058 | <.001 | | |
| | Baseline GAC | .026 | .015 | .074 | | |
| | Group (control) | .046 | .113 | .685 | | |
| | Group*Time | -.023 | .059 | .701 | | |
| | Female | -.757 | .502 | .133 | | |
| | Male | -.922 | .510 | .072 | | |
| | Symptoms (remission) | .184 | .115 | .109 | | |

*Note.* GAC = gratitude adjectives checklist.
*$p < .05$

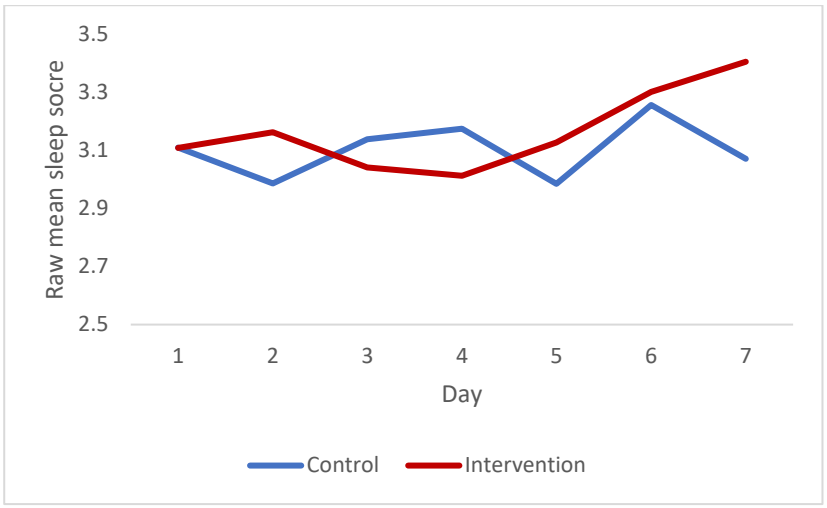


Figure 11. Raw mean sleep score by group over time

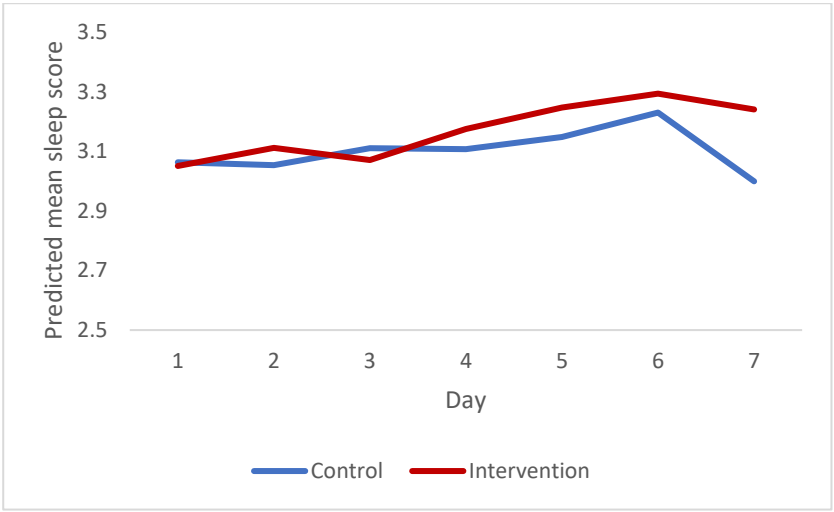


Figure 12. Predicted mean sleep score by group over time (model 4)

## Completer Analysis

### Primary and secondary pre-post and follow-up outcomes analysis

Table 12 presents the ANOVA results for primary and secondary outcome measures at T2 (post-intervention) and T3 (eight-week follow-up).

Table 12

*ANCOVA results for completer analysis of primary and secondary outcome measures*

| **Primary outcomes** | $df$ (between, within) | $F$ | $\eta_p^2$ | $p$ |
|---|---|---|---|---|
| T2 IBDQ[a] | 1, 64 | .506 | .008 | .479 |
| T3 IBDQ[a] | 1, 30 | 1.65 | .052 | .209 |
| T2 DASS[a, c] | 1, 65 | .336 | .005 | .564 |
| T3 DASS[a, c] | 1, 30 | .002 | .00006 | .840 |
| T2 IBD-stress[a] | 1, 65 | .041 | .001 | .840 |
| T3 IBD-stress[a] | 1, 30 | 1.05 | .034 | .313 |
| **Secondary outcomes** | | | | |
| T2 IBD-SES[a] | 1, 64 | .058 | .0011 | .810 |
| T3 IBD-SES[a] | 1, 30 | 6.45 | .18 | .017* |
| T2 Suppression ER[a, c] | 1, 63 | .719 | .011 | .400 |
| T3 Suppression ER[a, c] | 1, 29 | 2.48 | .079 | .126 |
| T2 Reappraisal ER[a, c] | 1, 63 | 7.89 | .11 | .007* |
| T3 Reappraisal ER[b, c] | 1, 22 | 4.062 | .16 | .056 |

*Note*. DASS = depression anxiety and stress scales; IBDQ = inflammatory bowel disease questionnaire; IBD-SES = inflammatory bowel disease self-efficacy scale; IBD-stress = inflammatory bowel disease stress scale; ER = emotion regulation.
a = controlling for T1 score; b controlling for T2 score; c = rank transformed data
*$p < .05$.

**HRQoL.** Results from a two-way ANCOVA to examine the difference in IBDQ in the intervention group in comparison to the control group post intervention controlling for baseline scores suggested there was no difference between groups at T2 and T3.

**Psychological distress.** Results from a two-way ANCOVA on to examine the difference in DASS in the intervention group in comparison to the control group post intervention (controlling for baseline scores) suggested there was no significant difference between groups at T2 and T3.

**IBD-stress**. Results from a two-way ANCOVA to examine the difference in IBD-stress in the intervention group in comparison to the control group post intervention controlling for baseline scores suggested there was no significant difference between groups at T2 and T3.

### Secondary outcomes analysis

**Self-efficacy.** Results from a two-way ANCOVA to examine the difference in coping efficacy, as measured by the IBD-SES, in the intervention group in comparison to the control group post intervention controlling for baseline scores suggested there was no difference between groups at T2. A second analysis at T3 showed the intervention group had higher IBD-SES scores (mean difference = 25.58).

**Reappraisal ER.** Results from a two-way ANCOVA to examine the difference in reappraisal (positive) ER in the intervention group in comparison to the control group post intervention controlling for baseline scores found a significant difference between groups, with participants in the intervention group scoring higher than the control group (mean rank difference = 9.6). This was not found at T3.

**Suppression ER.** Results from a two-way ANCOVA to examine the difference in suppression (negative) ER in the intervention group in comparison to the control group post intervention controlling for baseline scores suggested there was no significant difference between groups at T2 and T3.

## Discussion

### Summary of findings

The aims of the current randomized controlled trial were to evaluate the effectiveness of a one-week gratitude intervention on increasing state levels of gratitude, improving wellbeing, and promoting coping in individuals living with IBD.

The current findings suggest levels of gratitude did not change during or after the intervention in both groups. The findings also suggest that there were no significant changes in mood, pain, perceived health stress and sleep in the intervention group in comparison to the active control group over the intervention period. Post-intervention analysis found no differences between groups immediately following the intervention, and at eight-week follow-up on measures of IBD quality of life, IBD specific distress

and general distress. Taken together these results suggest that there was no direct effect of a daily online one-week gratitude intervention on wellbeing for individuals living with IBD.

Secondary analysis of coping outcomes suggests that participants in the intervention group reported higher levels of reappraisal (positive) ER relative to the control group post-intervention. However, this was not sustained at follow-up. Finally, while there were no differences in IBD self-efficacy post-intervention, participants in the intervention group reported higher levels of IBD self-efficacy at eight-weeks follow-up relative to the control group. There were no significant differences in suppression (negative) ER between groups immediately post-intervention and at follow-up. These results suggest participation in the intervention had an effect on positive ER and a delayed effect on self-efficacy.

While levels of gratitude did not appear to change following the intervention, exploratory and main analysis consistently found gratitude was positively related to outcomes associated with positive wellbeing such as mood, and coping; and inversely negatively related to outcomes associated with negative wellbeing such as pain, health-related stress, and general distress. There was no relationship found between gratitude and sleep.

**Relationship of the current findings to previous research**

**The effect of gratitude interventions on gratitude and wellbeing.** The current findings which suggest that the intervention did not improve gratitude or improve mood are in conflict with previous studies of gratitude interventions which have demonstrated increases in levels of gratitude and wellbeing (especially positive mood and depression). These effects have been found following intervention and at follow-up in both non-clinical and clinical samples (Davis et al., 2016; Dickens, 2017; Kerr et al., 2015). A recent meta-analysis of gratitude interventions also suggests that there is a risk of "file

drawer" problems given the lack of any published research of null effects of gratitude interventions. The file drawer problem presents issues pertaining to potential inflation of intervention effects, which may result in conclusions which overstate implications of the findings (Mongrain & Anselmo-Matthews, 2012). While the findings of the current study are unusual in respect to the wider gratitude literature, they are important in interpreting the findings from previous gratitude intervention research and also in the design and development of future studies.

**The effect of gratitude intervention on health outcomes.** To the knowledge of the researcher the current study is the first to investigate the effects of a gratitude intervention on health outcomes in people living with IBD. While the seminal paper by Emmons & McCullough (2003) found an improvement in physical health symptoms, for people with neuromuscular conditions, following a gratitude intervention these findings have not yet been replicated in a chronic condition sample.

**The effect of gratitude intervention on coping outcomes.** Despite the null findings for gratitude, the findings from the current study suggest that participants' use of reappraisal ER temporarily increased post-intervention and IBD specific self-efficacy increased at follow-up. These findings corroborate and to some degree extend the findings of (Wood, Joseph, & Linley, 2007). This pattern of results show a positive relationship between gratitude and positive ER and gratitude and IBD specific self-efficacy. These results also suggest that gratitude interventions can have, a small, however positive effect on these attributes as this change was observed in the intervention group only. Previous research suggests that grateful people demonstrate a profile of coping marked by approach rather than avoid strategies such as positive reinterpretation, and active coping (Wood et al., 2007). The current findings suggest that a one-week gratitude intervention can increase reappraisal ER strategies, however it is possible that without ongoing practice this effect is not sustained. In addition to this it

seems the gratitude practice may increase feelings of IBD specific self-efficacy, albeit not immediately post-intervention. It is not clear whether these effects are sustained further than eight weeks, and to what extent these effects were an artefact of differences between participants lost to follow-up (see limitations).

**Explaining the effectiveness of the intervention**

**The dose of the intervention.** One explanation for this difference in findings is the "dose" of gratitude intervention. For example, many gratitude studies take place over a longer period of time (two to 10 weeks), and are also less intensive (one to three entries per week). It is possible that the one-week daily intervention design is less than optimal to have an effect. This can be seen in the study by Seligman, Steen, Park, & Peterson (2005) which involved a similar one-week daily design and found no immediate effect post-intervention on gratitude. Accordingly, Lyubomirsky, Sheldon, & Schkade (2005) suggest that there is potential for experience of positive interventions when regularly repeated in a routine manner to lead to "hedonic adaptation". This is contrary to the hypothesised effect of positive psychological interventions in reorienting attention to positive aspects of life, and fostering a fresh appreciation for the taken for granted experiences. They cite an example from Emmons & McCullough (2003) gratitude intervention which found completing gratitude tasks once a week is more effective than completing gratitude tasks three times a week. It is possible the one-week daily design was not long enough for the gratitude effect to be observed and too repetitive to prevent habituation to the activity.

**Participant characteristics in positive psychology intervention and online research.** Additionally, the lack of effect might be related to participant characteristics of "self-selection" in positive psychological intervention research. Lyubomirsky, Dickerhoof, Boehm, & Sheldon (2011) investigated the effects of self-selection of participants as a potential inflator of effects in studies of positive psychological

interventions. They demonstrated that outcome effects are more pronounced for participants who have chosen to take part in an intervention they are expecting to make them happier. In the current research participants in both groups were blinded to the intervention, and information about the potential benefits of the intervention were concealed until trial completion which may have inhibited this expectancy effect.

The lack of effect might also be explained by the characteristics of online participants. Jones, Bratten, & Keefer (2007) in a cross-sectional study of IBD and IBS patients found that participants recruited online reported lower QoL than patients recruited from clinics. They conclude that participants recruited online may represent a distinct population and question the generalizability of results from online samples to broader populations. It is possible that the effects for gratitude in the present study were suppressed due to the higher symptom severity of the online sample. Future studies can investigate this further by comparing the effects of gratitude interventions for both online and community clinic based samples.

**The effects of the intervention on coping and potential mechanisms for improvement.** One explanation for the increase in reappraisal ER post-intervention is the inherent quality of the gratitude practice to encourage re-orientation to the positive (Wood et al., 2010, 2007) which is likely to promote active reappraisal. For example, Pavani et al. (2016) demonstrated, using an experience sampling method, that use of reappraisal strategies were preceded by increases in positive affect, which subsequently supported greater use of positive coping strategies including reappraisal and appreciation. It is possible gratitude practice increased positive reappraisal by increasing positive affect and facilitating greater access to positive reappraisal, and the second by increasing access to positive cognitions again facilitating access to positive appraisal. By regularly practicing gratitude it is possible that the ability to reappraise difficult emotions becomes more manifest.

The delayed increase in IBD specific self-efficacy at T3 might be explained by the underlying relationship between gratitude and approach vs. avoid coping strategies (Wood et al., 2007). There is evidence to suggest that low levels of self-efficacy are associated with increased avoidance strategies (Baker & Berenbaum, 2007; De Castella, Platow, Tamir, & Gross, 2017). Avoidance strategies are associated with short-term gains and long-term costs (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Adopting approach strategies may help break cycles of avoidance thus promoting increased feelings of self-efficacy (Bandura & Adams, 1977). It is possible that gratitude broadens the response repertoire by facilitating approach behaviour instead of negative affect motivated behaviour, which fundamentally involves narrowing down of focus, and limits responses to avoid or attack (Wood et al., 2010). By fostering positive emotions, and freeing up resources previously restricted to this limited repertoire the individual is able to be more creative and flexible in their behaviours which increases choice and overall self-efficacy (Fredrickson, 2004). The initial change in reappraisal may have represented a practice effect marking the beginning of this process. The changes in positive affect, and reorientation may over time lead to more increased approach behaviours and in turn to higher levels of self-efficacy (Garland et al., 2010).

**Strengths, limitations and future directions**

The strengths of the current study are the randomised controlled design, which reduces sampling error which might inadvertently bias findings. The data analysis involved the use of multi-level modelling and as such the main ITT analysis made use of all available data. The modelling allowed the exploration of changes over time as well as between groups. This study is the first systematic investigation into gratitude as an intervention for people living with IBD. As such it contributes to the current literature on gratitude interventions which until now has focused on non-clinical samples or has not measured condition specific outcomes in response to intervention.

The findings of the current research must be considered in light of several limitations. Firstly, despite the RCT design of the current study there has been a very high level of attrition, which has weakened the overall power of the study. While the baseline analysis suggested no significant differences between participants it is not clear how participants who dropped out of the study might have differed in their response to the intervention potentially biasing the current results. Alternatively, this attrition may be an issue of design. For example, the intervention was shorter and more intense than typical gratitude interventions, participants might have found the user-interface non-intuitive or the tasks not engaging enough to continue. Recent evidence suggests that attrition to online research might be related to low interaction with facilitators, low computer confidence, or high stress or busyness (Rübsamen, Akmatov, Castell, Karch, & Mikolajczyk, 2017).

Future research might address these limitations in three ways: 1) by offering participants the option of pen-and-paper format if preferable 2) by varying the length of the intervention and if possible comparing different lengths and intensities of gratitude interventions to investigate how this might influence outcomes and 3) by employing the use of experience sampling methods possibly by incorporating smart device apps which are more user friendly and interactive. By incorporating the use of such technology participants and researchers have more flexibility of how and when the intervention is delivered and accessed, as well as increased accuracy on data collected (Hofmann & Patel, 2015; Steinhubl, McGovern, Dylan, & Topol, 2017). For example, multiple prompts can be sent throughout the day, and customised by both parties to suit the participant leading to an overall more streamlined experience. This can facilitate the collection of more ecologically valid recordings and reduce memory strain (Verhagen, Hasmi, Drukker, van Os, & Delespaul, 2016). There is evidence to suggest that

retrospective ratings of emotions are more biased than momentary recording of emotions over time (Mill, Realo, & Allik, 2016).

This study investigated the effects of the intervention using IBD specific measures of wellbeing and coping. However, there were no measures of general positive affect, or positive wellbeing as typically measured in gratitude intervention studies. While reduction of distress in such interventions is an important outcome for measurement, future studies could address this by including both a measure of condition specific health and wellbeing outcomes and a measure of positive affect change. Including these measures can enable exploration of questions around how positive emotions change as a result of intervention and subsequently impact on clinical outcomes (Wood & Tarrier, 2010).

**Conclusions and clinical implications**

This study was a randomised-controlled trial which investigated the effects of a one-week online gratitude intervention. The findings suggest that a one-week intervention did not change gratitude, or improve health and wellbeing outcomes in people living with IBD. Exploratory analysis suggested that gratitude is related to positive wellbeing and negatively related with emotional distress in IBD populations. Secondary analyses also suggested that the intervention has a limited positive impact on coping strategies and delayed effect on reported IBD self-efficacy. This is an important finding for clinicians who potentially can draw on these relatively simple, low-cost strategies to support their clients to help foster positive coping strategies and self-efficacy. The use of the internet in clinical research is an important endeavour. With the advancements in technology it is possible to collect data in more accurate and ecologically valid mediums. Future research is needed which incorporates these advances in technology while also investigating varied intervention periods, limiting attrition, and measuring specific health, general wellbeing and positive psychological

outcomes. Such studies will provide a more comprehensive understanding of the utility of gratitude interventions to improve wellbeing.

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# Appendices

## Appendix A: Ethics approval

The University Of Sheffield.

Downloaded: 16/02/2017
Approved: 16/02/2017

Peter Ugochukwu Isebor
Registration number: 150123783
Psychology
Programme: Doctorate in Clinical Psychology

Dear Peter Ugochukwu

**PROJECT TITLE:** A randomised controlled trial of a brief gratitude intervention in improving well-being and coping in people living with inflammatory bowel disease
**APPLICATION:** Reference Number 012370

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 16/02/2017 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 012370 (dated 09/02/2017).
- Participant information sheet 1027107 version 2 (09/02/2017).
- Participant information sheet 1027108 version 2 (09/02/2017).
- Participant consent form 1027109 version 2 (09/02/2017).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Yours sincerely

Thomas Webb
Ethics Administrator
Psychology

## Appendix B: Participant information

The University Of Sheffield.

**A study on reflection and monitoring in IBD**

This is an investigation looking at the effects of monitoring and reflecting on daily events and how this relates to IBD and well-being.

*What do I have to do?*

As part of the study you will be asked to complete a survey (which should take no longer than 15 minutes). The survey will ask you questions about your self-perceptions and well-being.
After this initial survey you will be asked to do a short online exercise once a day to monitor your mood and the events of the day. This daily exercise should take no longer than 8 minutes in total, but you can spend longer if you wish. We will ask you to complete this exercise daily over the course of one week. After which, you will be asked to complete the first survey again.
In eight weeks, we will contact you again with one more survey as a follow-up.

*Are there any benefits or risks?*

There are no risks except the time taken to complete online tasks.
Your participation in this study is voluntary, and you have the right to withdraw at any point during the study if you so wish.
Any personal information you provide will be kept anonymous, safe and secure.

This study is part of a Doctoral thesis which forms part of my clinical psychology training, and may be written up for publication in a peer reviewed journal. All data will be anonymous and grouped so individual data will not be able to be identified.

If you have any questions or concerns about the study, please contact:

Peter Isebor
pcisebor1@sheffield.ac.uk

If you are happy to continue with the study, please complete the consent form and screening questions on the next page.

Thank you for taking the time to read this invitation.

## Appendix C: Screening questionnaire

How old are you?

- ○ Under 16
- ○ 16 - 24
- ○ 25 - 34
- ○ 35 - 44
- ○ 45 - 54
- ○ 55 - 64
- ○ 65 - 74
- ○ 75 or older

**Have you ever been diagnosed with an inflammatory bowel disease by a doctor or physician?**

- ○ Yes
- ○ No

Please confirm your participation by agreeing to the following:

- ☐ I confirm that I have read and understand the information for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
- ☐ I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical or legal rights being affected.
- ☐ I agree to take part in the above study.
- ☐ I would like to receive a copy of the study results, once available.

## Appendix D: Daily email message(s)

Dear Participant,

It looks like you have not completed your exercise today. Please remember this link will be available until 4am tomorrow morning. Don't worry if you have missed it, please look out for the next task around 6pm.

**SURVEY LINK**

Many thanks,

Peter

**OPT OUT LINK**

## Appendix D1: Reminder email

Dear Participant,

It looks like you have not completed your exercise today. Please remember this link will be available until 4am tomorrow morning. Don't worry if you have missed it, please look out for the next task around 6pm.

**SURVEY LINK**

Many thanks,

Peter

**OPT OUT LINK**

## Appendix D2: Post-intervention email

Dear Participant,

You have now completed this phase of the study. Thank you for your engagement with the daily tasks. Please see below for a link to the next part of the study. After this, we will send you one final survey in 8-weeks time.

**SURVEY LINK**

Best wishes,

Peter

**OPT OUT LINK**

## Appendix D3: Follow-up email

Dear Participant,

Thank you for your participation with the study thus far. Please see below the final survey which completes your participation in the study:

**SURVEY LINK**

For more detailed information about the what the study was investigating please CLICK HERE

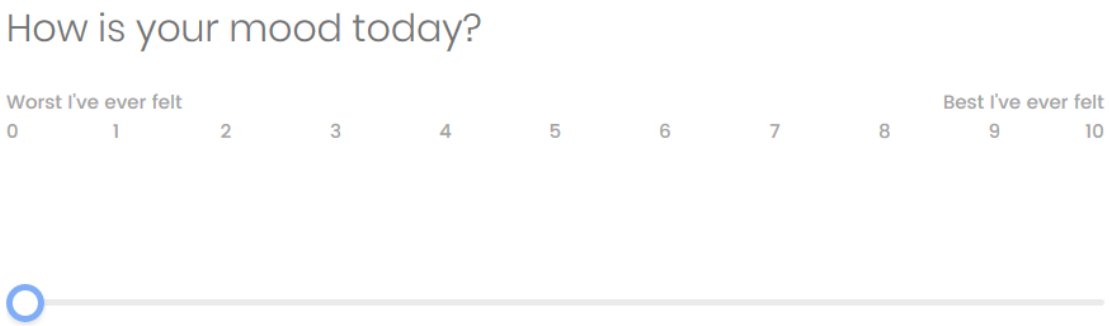
I am grateful for your participation and wish you all the best in the future.

Best wishes,

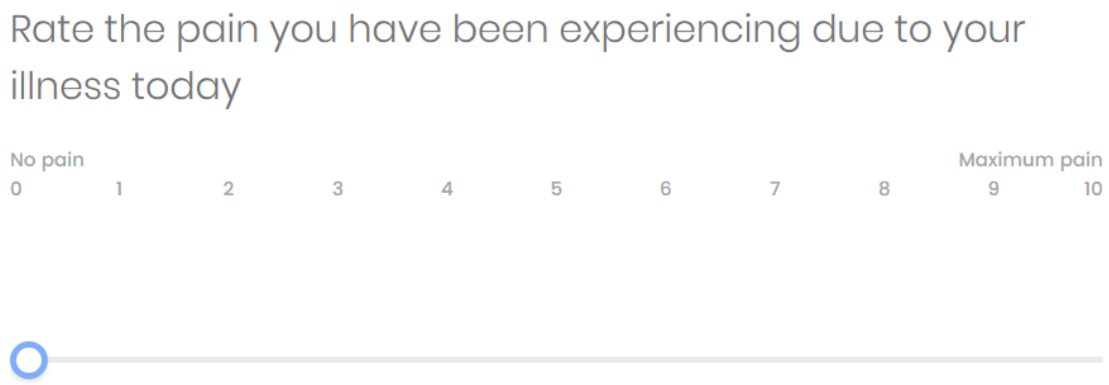
Peter

## Appendix E: Daily measures

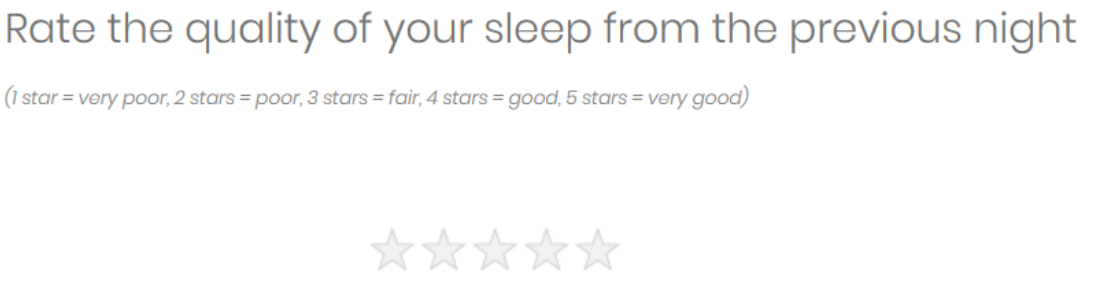
### Mood




### Pain




### Sleep



**Health – Short Health Scale**

How much worry does your bowel disease cause?

No worry 0 1 2 3 4 5 6 7 8 9 10 Constant worry

How is your general feeling of well being?

Dreadful 10 9 8 7 6 5 4 3 2 1 0 Very good

How severe are the symptoms you suffer from your bowel disease?

No symptoms 0 1 2 3 4 5 6 7 8 9 10 Very severe symptoms

Do your bowel problems interfere with your activities in daily life?

Not at all 0 1 2 3 4 5 6 7 8 9 10 Interfere to a very high degree

**Gratitude (Gratitude Adjectives Checklist)**

This scale consists of some words that describe different feelings and emotions. Read each item and then select the statement from the scale below next to each word that indicates to what extent you feel this way **right now**, that is, **at the present moment**.

| | Very slightly or not at all | A little | Moderately | Quite a bit | Extremely |
|---|---|---|---|---|---|
| Appreciative | ○ | ○ | ○ | ○ | ○ |
| Thankful | ○ | ○ | ○ | ○ | ○ |
| Grateful | ○ | ○ | ○ | ○ | ○ |

**Appendix F: Intervention instructions**

**Gratitude condition:**

There are many things in our lives, both large and small, that we might be grateful about. Think back over the course of the day, and write down in the space below three things in your life that you are grateful or thankful for.

If you would like to you can include why you are grateful for each thing:

e.g. "I'm grateful for **the sun** because **it's warmth feels good on my skin**".

**Active control condition:**

There are many things in our lives, both large and small, that might happen. Think back over the course of the day, and write down in the space below three things that happened today.

e.g. "*I walked to the bus stop today*".

## Appendix G: Final message – participant information

**An investigation into the effects of a brief gratitude intervention on wellbeing of people living with IBD**

Thank you for taking part in this research. The study investigated the effects of keeping a gratitude diary on the wellbeing of people living with IBD.

Previous research has demonstrated that by cultivating gratitude it is possible to improve mood and health (see video). The current study investigated this by comparing two groups of participants: one group completed a daily gratitude journal while the other group completed a neutral daily monitoring task. We expect that participants in the gratitude group will show greater positive change on all measures of health and wellbeing that were given.

If you were in the control group and would like to have the opportunity to keep a gratitude journal it is easy enough to keep one using a notepad or there are a number of apps on the iOS appstore or Android play store to use. In addition there are a number of websites that host gratitude journals and exercises which you can complete such as:

http://elementofgratitude.org/

https://ggia.berkeley.edu/practice/three-good-things#

http://www.actionforhappiness.org/take-action/find-three-good-things-each-day

I would like to take this opportunity to say thank you for participating in this research, and that your time is very much appreciated. I do hope those of you in the intervention group found the gratitude journal exercise useful and will continue to use it in the future and hope those of you in the comparison group do give it a trial and enjoy the benefits of the exercise.

I wish you all the best in the future.

**Peter Isebor**
**Trainee Psychologist**
**University of Sheffield DClinPsy**

## Appendix H: Measures

### Demographics

Age:
Sex: Male Female Transgender
Ethnicity:
Country of residence:
Highest level of education
Employment (if employed complete Job satisfaction questionnaire)
Full time/Part time (hours a week)
Have you been diagnosed with a mental health condition?

### Health

What type of IBD do you have? (check one only)
Crohn's Disease
Ulcerative Colitis
Other
When were you first diagnosed with IBD?
Do you current take any medication for IBD?
Have you ever had any surgery for IBD?
Do you have a stoma?
Are your symptoms: in remission or active

| **The UK Inflammatory Bowel Disease Questionnaire (IBD-Q UK)** |
|---|
| This questionnaire has been removed for copyright reasons. |

### Mood and Stress

| **The depression anxiety and stress scale 21 (DASS)** | | | | |
|---|---|---|---|---|
| Please read each statement and select a number 0, 1, 2, or 3 which indicates how much the statement applies to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement. | | | | |
| The rating scale is as follows:<br>0 Did not apply to me at all<br>1 Applied to me to some degree, or some of the time<br>2 Applied to me a considerable degree, or a good part of the time<br>3 Applied to me very much or most of the time | 0 | 1 | 2 | 3 |
| I found it hard to wind down | 0 | 1 | 2 | 3 |
| I was aware of dryness of my mouth | 0 | 1 | 2 | 3 |
| I couldn't seem to experience any positive feeling at all | 0 | 1 | 2 | 3 |
| I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion) | 0 | 1 | 2 | 3 |
| I found it difficult to work up the initiative to do things | 0 | 1 | 2 | 3 |

| | | | | |
|---|---|---|---|---|
| I tended to over-react to situations | 0 | 1 | 2 | 3 |
| I experienced trembling (e.g. in the hands) | 0 | 1 | 2 | 3 |
| I felt that I was using a lot of nervous energy | 0 | 1 | 2 | 3 |
| I was worried about situations in which I might panic and make a fool of myself | 0 | 1 | 2 | 3 |
| I felt that I had nothing to look forward to | 0 | 1 | 2 | 3 |
| I found myself getting agitated | 0 | 1 | 2 | 3 |
| I found it difficult to relax | 0 | 1 | 2 | 3 |
| I felt down-hearted and blue | 0 | 1 | 2 | 3 |
| I was intolerant of anything that kept me from getting on with what I was doing | 0 | 1 | 2 | 3 |
| I felt I was close to panic | 0 | 1 | 2 | 3 |
| I was unable to become enthusiastic about anything | 0 | 1 | 2 | 3 |
| I felt I wasn't worth much as a person | 0 | 1 | 2 | 3 |
| I felt that I was rather touchy | 0 | 1 | 2 | 3 |
| I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat) | 0 | 1 | 2 | 3 |
| I felt scared without any good reason | 0 | 1 | 2 | 3 |
| I felt that life was meaningless | 0 | 1 | 2 | 3 |

**IBD stress**

Below is a list of general problems that people with inflammatory bowel disease (IBD) often report cause them stress. For each problem, please indicate how stressful this concern has been for you over the past 6 months. If you did not experience the problem listed then simply check the box for "Did not experience ". If you experienced stress because of other problems related to IBD that are not listed below, please write this concern under "other problems" and indicate how stressful this problem has been for you.

| | **Did not experience** | **Not stressful** | **A little stressful** | **Somewhat stressful** | **Very stressful** | **Extremely stressful** |
|---|---|---|---|---|---|---|
| Disease-related problems (e.g., uncertainty about disease changes, effects of medications, energy level, being a burden on others, loss of bowel control) | 1 | 2 | 3 | 4 | 5 | 6 |
| Complications (e.g., having surgery, developing cancer) | 1 | 2 | 3 | 4 | 5 | 6 |
| Body stigma problems (e.g., producing unpleasant odours, feeling dirty or smelly) | 1 | 2 | 3 | 4 | 5 | 6 |
| Sexual intimacy problems (e.g., intimacy difficulties, loss of sexual drive, ability to perform sexually) | 1 | 2 | 3 | 4 | 5 | 6 |
| Other problem:<br>Please describe<br>_____<br>____ | 1 | 2 | 3 | 4 | 5 | 6 |

**Coping**

| **IBD Self-efficacy scale (IBD-SES)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Over the past 2 weeks, how confident have you felt in your ability to perform each of the following tasks? | | | | | | | | | |
| **Not confident at all** | | | | **Somewhat confident** | | | | **Totally confident** | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Managing your stress and emotions** | | | | | | | | | |
| Keep myself from getting stressed? | | | | | | | | | |
| Do something to make yourself less stressed? | | | | | | | | | |
| Keep from getting discouraged? | | | | | | | | | |
| Keep from feeling sad or down in the dumps? | | | | | | | | | |
| Do something to make yourself feel better when sad? | | | | | | | | | |
| Keep sadness or anxiety from interfering? | | | | | | | | | |
| Do something to make yourself feel better when sadness or anxiety interferes? | | | | | | | | | |
| Get emotional support from family or friends? | | | | | | | | | |
| **Managing your medical care** | | | | | | | | | |
| Follow instructions for your prescription medications? | | | | | | | | | |
| Take your prescription medications at appropriate times? | | | | | | | | | |
| Take the medications to prevent flare-up of IBD as directed? | | | | | | | | | |
| Work with your doctor or nurse to reach an agreement on a treatment plan? | | | | | | | | | |
| Ask your doctor about your illness? | | | | | | | | | |
| Discuss openly with your doctor any problems related to your medications? | | | | | | | | | |
| Work out differences with your doctor? | | | | | | | | | |
| Ask your doctor about your medications? | | | | | | | | | |
| **Managing your symptoms and disease** | | | | | | | | | |
| Reduce your symptoms in general? | | | | | | | | | |
| Keep sleep problems from interfering? | | | | | | | | | |
| Keep physical discomfort or pain from interfering? | | | | | | | | | |
| Keep diarrhoea and/or urgency from interfering? | | | | | | | | | |
| Decrease your fatigue? | | | | | | | | | |
| Keep fatigue from interfering? | | | | | | | | | |
| **Maintaining remission** | | | | | | | | | |
| Manage your disease in general? | | | | | | | | | |
| Keep your disease in remission? | | | | | | | | | |
| Engage in self-care? (exercise, rest, diet, etc) | | | | | | | | | |
| Maintain your sense of wellbeing? | | | | | | | | | |

**Gratitude (trait)**

| **Gratitude Questionnaire-6 (GQ-6)** |
|---|

| Using the scale below as a guide, write a number beside each statement to indicate how much you agree with it. | | | | | | |
|---|---|---|---|---|---|---|
| 1 strongly disagree | 2 disagree | 3 slightly disagree | 4 neutral | 5 slightly agree | 6 agree | 7 strongly agree |
| I have had so much in life to be thankful for | | | | | | |
| If I had to list everything that I felt grateful for, it would be a very long list | | | | | | |
| When I look at the world, I don't see much to be grateful for | | | | | | |
| I am grateful to a wide variety of people | | | | | | |
| As I get older I find myself more able to appreciate the people, events, and situations that have been part of my life history | | | | | | |
| Long amounts of time can go by before I feel grateful to something or someone | | | | | | |

**Gratitude (state)**

| Positive Affect and Negative Affect Schedule (PANAS) **Gratitude Adjectives Checklist (GAC) in bold** | | | | | |
|---|---|---|---|---|---|
| This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below (i.e. using 1 – 5) next to each word.<br>Indicate to what extent you feel this way right now, that is, at the present moment. | | | | | |
| | Very slightly or not at all | A little | Moderately | Quite a bit | Extremely |
| Interested | 1 | 2 | 3 | 4 | 5 |
| **Appreciative** | 1 | 2 | 3 | 4 | 5 |
| Distressed | 1 | 2 | 3 | 4 | 5 |
| Excited | 1 | 2 | 3 | 4 | 5 |
| Upset | 1 | 2 | 3 | 4 | 5 |
| **Thankful** | 1 | 2 | 3 | 4 | 5 |
| Guilty | 1 | 2 | 3 | 4 | 5 |
| Scared | 1 | 2 | 3 | 4 | 5 |
| Hostile | 1 | 2 | 3 | 4 | 5 |
| Enthusiastic | 1 | 2 | 3 | 4 | 5 |
| Proud | 1 | 2 | 3 | 4 | 5 |
| Irritable | 1 | 2 | 3 | 4 | 5 |
| Alert | 1 | 2 | 3 | 4 | 5 |
| Ashamed | 1 | 2 | 3 | 4 | 5 |
| Inspired | 1 | 2 | 3 | 4 | 5 |
| Nervous | 1 | 2 | 3 | 4 | 5 |
| Determined | 1 | 2 | 3 | 4 | 5 |
| Attentive | 1 | 2 | 3 | 4 | 5 |
| **Grateful** | 1 | 2 | 3 | 4 | 5 |
| Jittery | 1 | 2 | 3 | 4 | 5 |
| Active | 1 | 2 | 3 | 4 | 5 |
| Afraid | 1 | 2 | 3 | 4 | 5 |
| Strong | 1 | 2 | 3 | 4 | 5 |

**Emotion Regulation**

| The Emotion Regulation Questionnaire-9 (ERQ-9) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer | | | | | | | |
| | 1 strongly disagree | 2 disagree | 3 slightly disagree | 4 neutral | 5 slightly agree | 6 agree | 7 strongly agree |
| When I want to feel more positive (such as joy or amusement), I change what I'm thinking about. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I keep my emotions to myself. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| When I am feeling positive emotions, I am careful not to express them. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| When I'm faced with a stressful situation, I make myself think about it in a way that helps me calm down. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I control my emotions by not expressing them. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

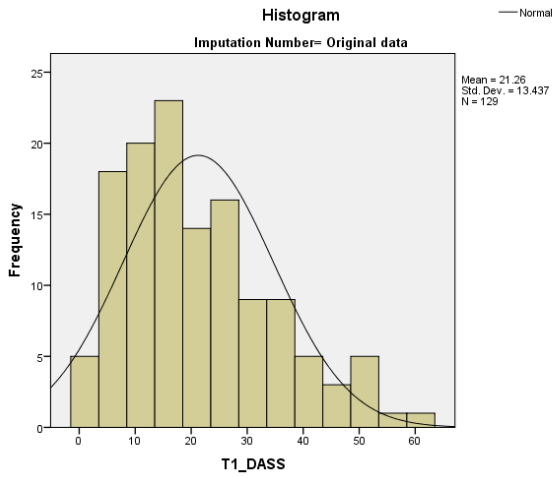
## Appendix I: Power analysis

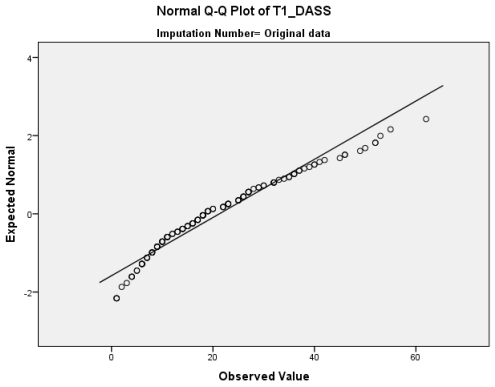
**F tests** - ANOVA: Repeated measures, within-between interaction **Analysis**: A priori: Compute required sample size
**Input**: Effect size f = 0.23
α err prob = 0.05
Power (1-β err prob) = 0.80
Number of groups = 2
Number of measurements = 7
Corr among rep measures = 0.5
Nonsphericity correction ϵ = 1
**Output**: Noncentrality parameter λ = 14.8120000 Critical F = 2.1836569
Numerator df = 6.0000000
Denominator df = 108
Total sample size = 20
Actual power = 0.8119333

# Appendix J: Normality plots

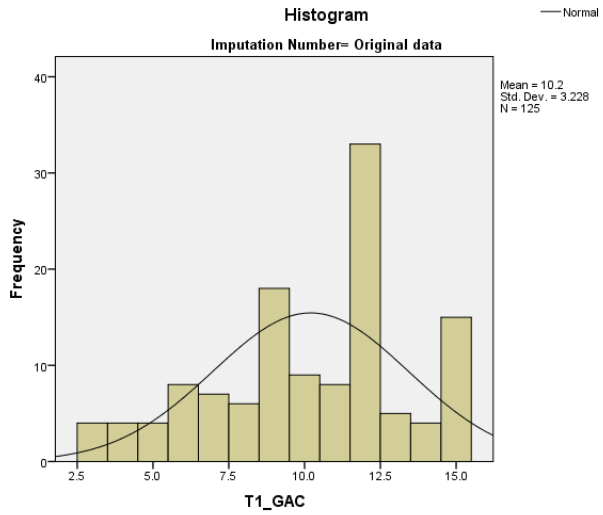
## Histogram and Q-Q plots overall sample outcome measures at T1

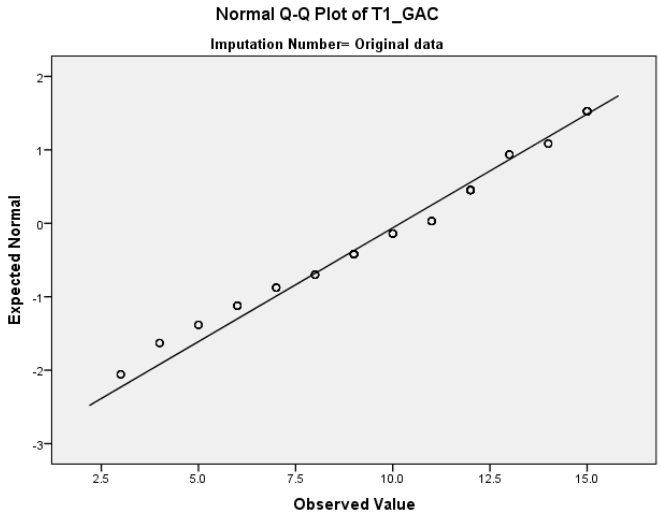
## DASS



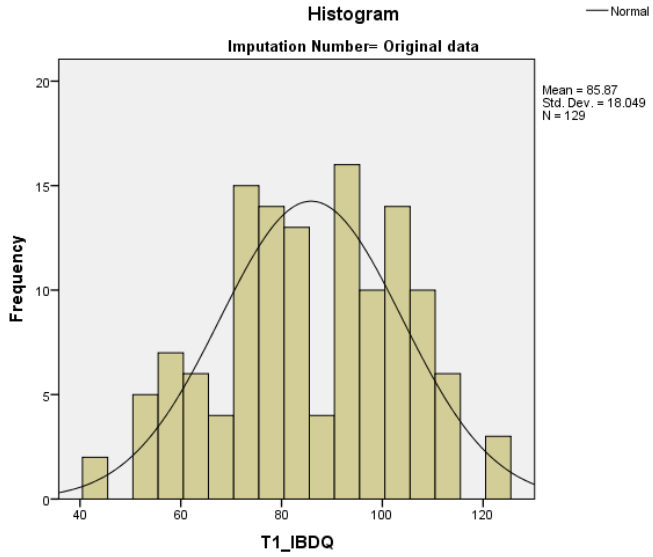



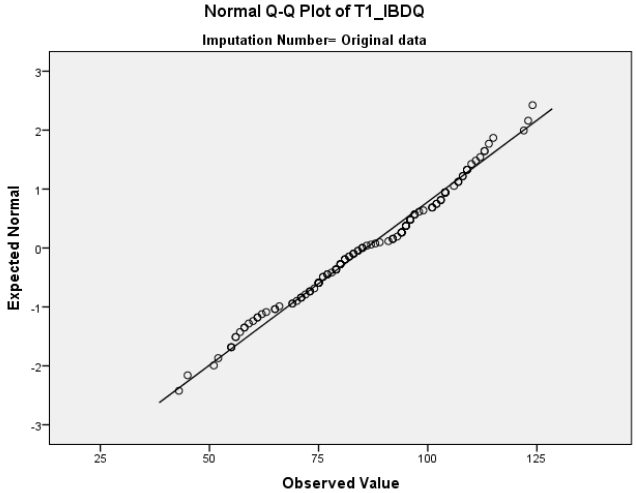

GAC



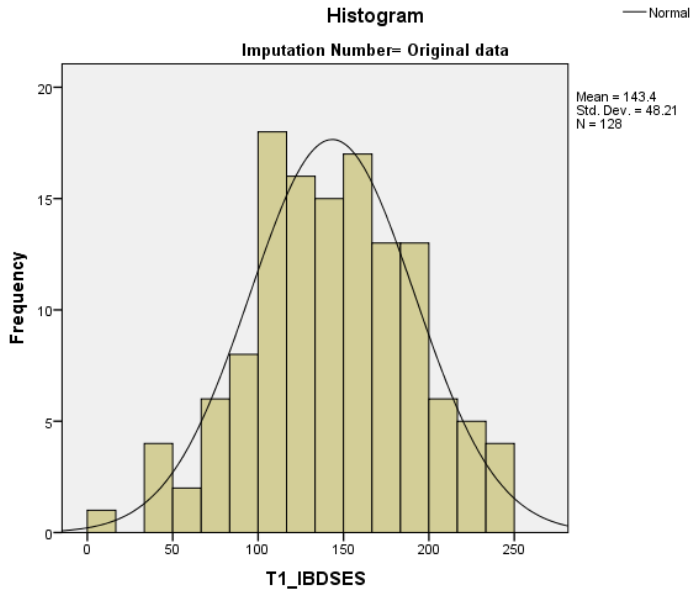

Normal Q-Q Plot of T1_GAC
Imputation Number= Original data
Expected Normal
Observed Value
2
1
0
-1
-2
-3
2.5
5.0
7.5
10.0
12.5
15.0

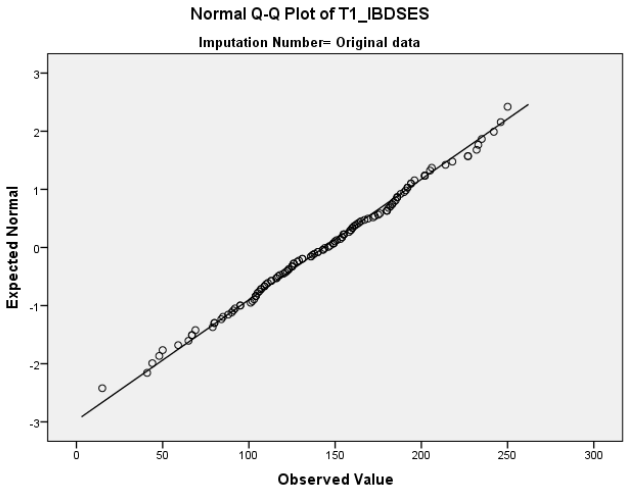
IBDQ


Histogram
Normal
Imputation Number= Original data
Mean = 85.87
Std. Dev. = 18.049
N = 129
Frequency
T1_IBDQ
20
15
10
5
0
40
60
80
100
120

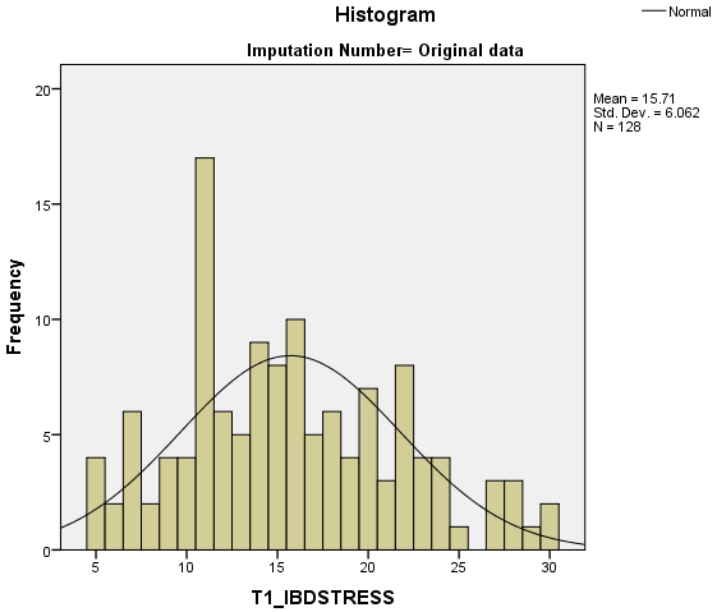

Normal Q-Q Plot of T1_IBDQ
Imputation Number= Original data
Expected Normal
Observed Value
3
2
1
0
-1
-2
-3
25
50
75
100
125

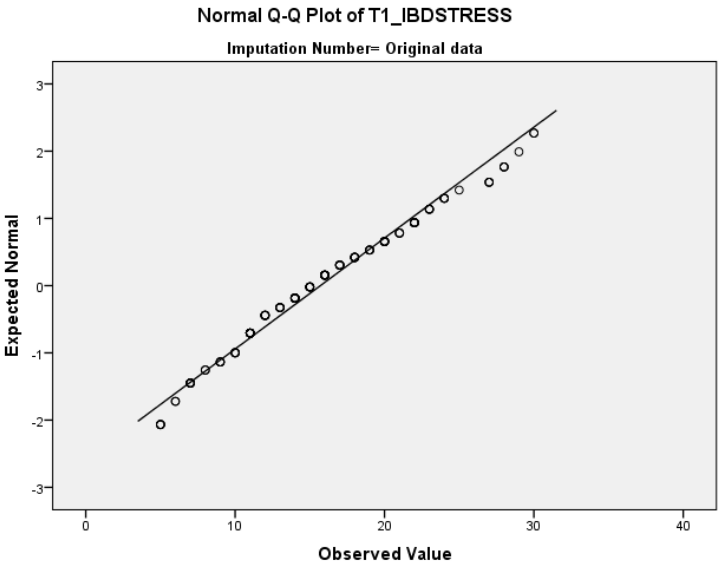
IBDSES


Histogram
Normal
Imputation Number= Original data
Mean = 143.4
Std. Dev. = 48.21
N = 128
Frequency
T1_IBDSES

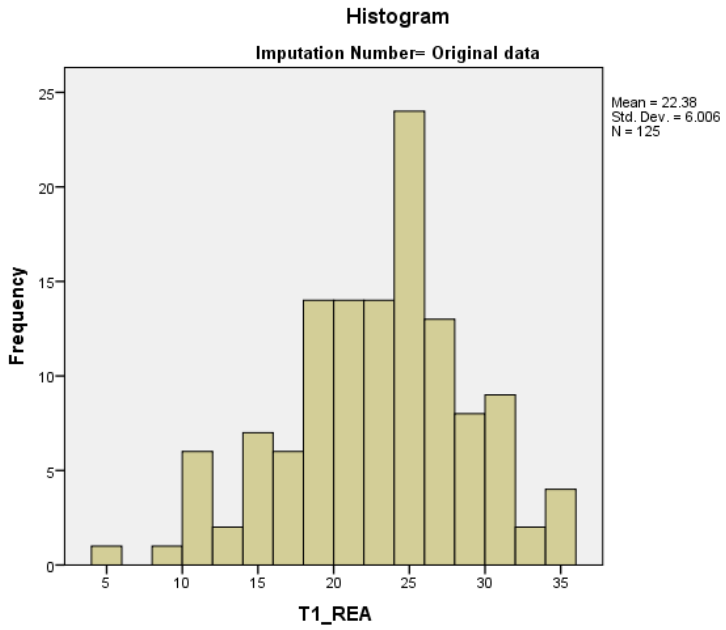

Normal Q-Q Plot of T1_IBDSES
Imputation Number= Original data
Expected Normal
Observed Value

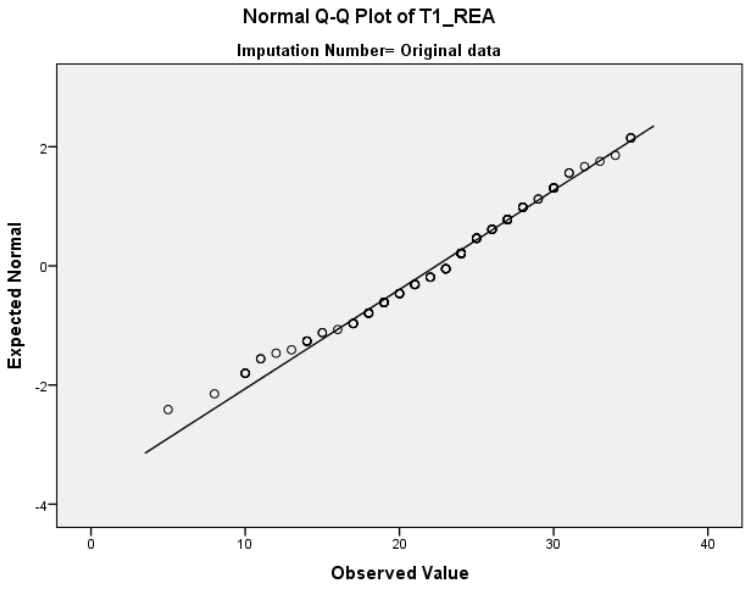
IBDSTRESS



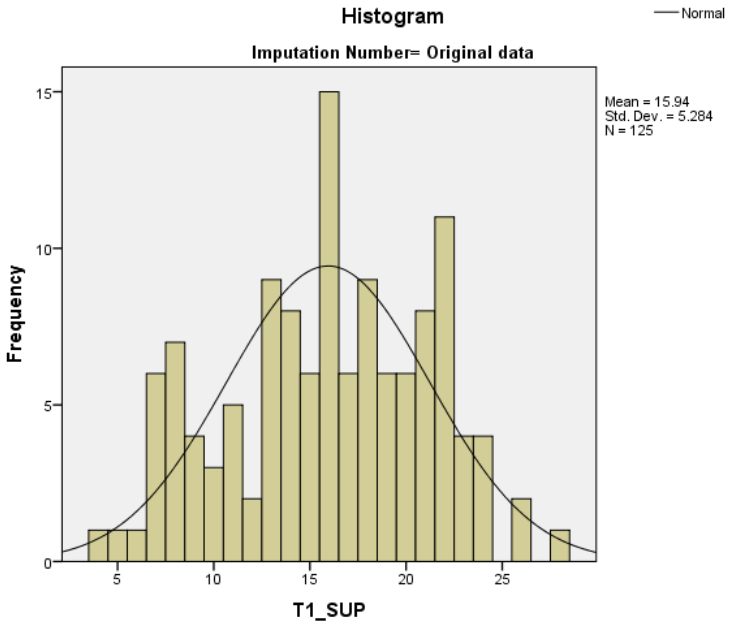



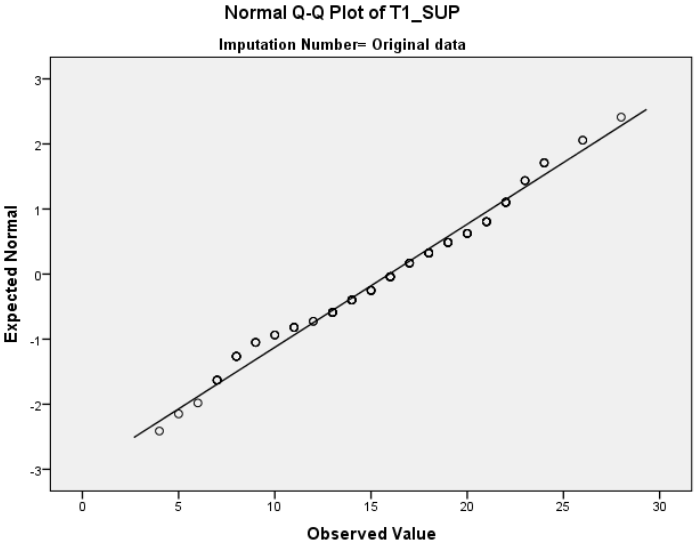

Reappraisal



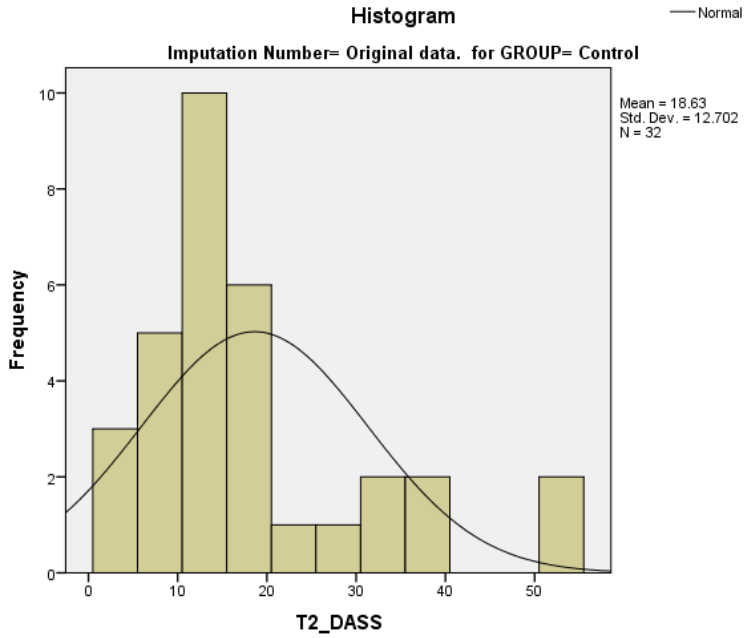



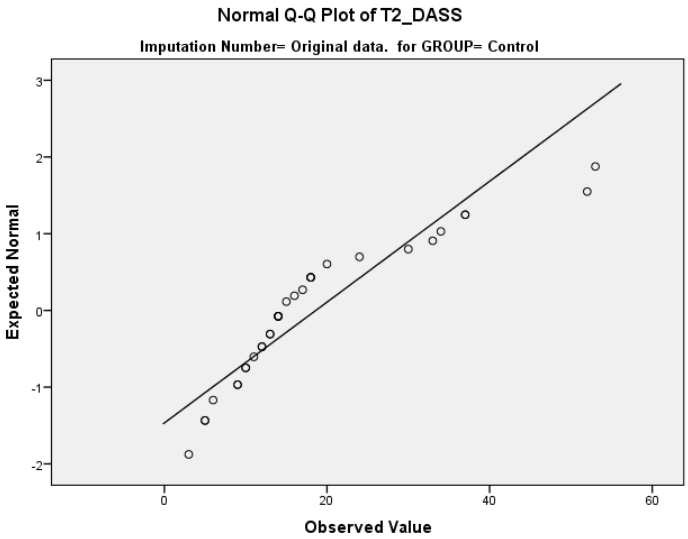

Suppression

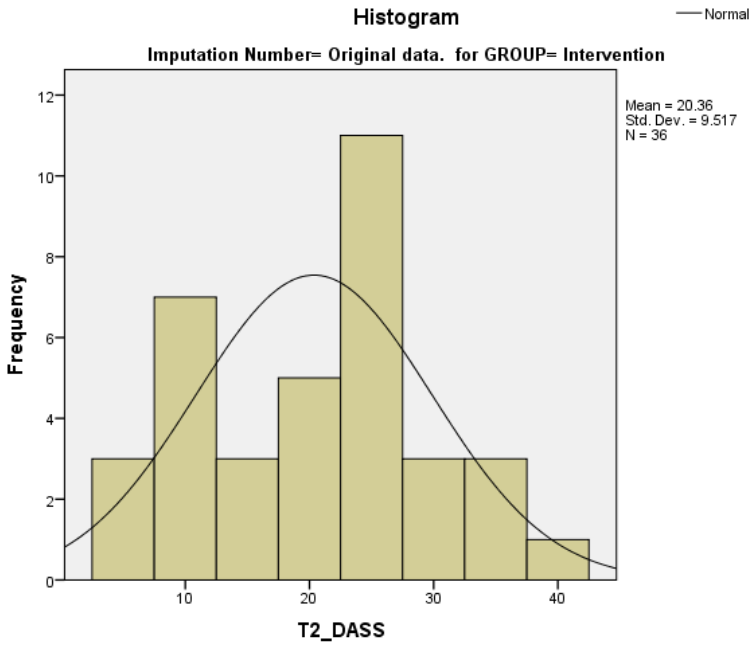

Histogram
Normal
Imputation Number= Original data
Mean = 15.94
Std. Dev. = 5.284
N = 125
Frequency
T1_SUP

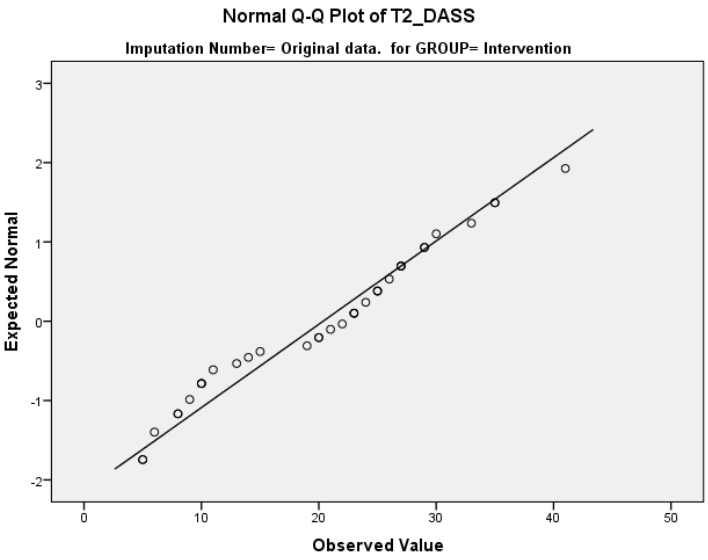

Normal Q-Q Plot of T1_SUP
Imputation Number= Original data
Expected Normal
Observed Value

## Histogram and Q-Q plot for DASS by group at T2 and T3

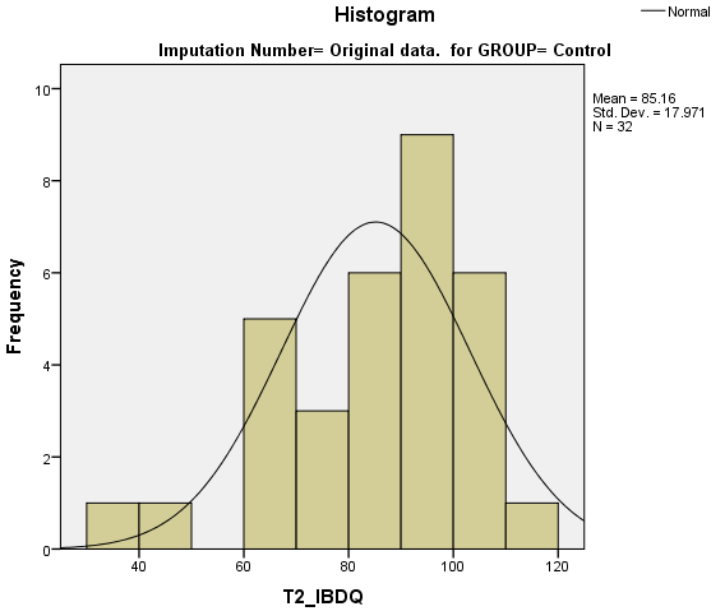


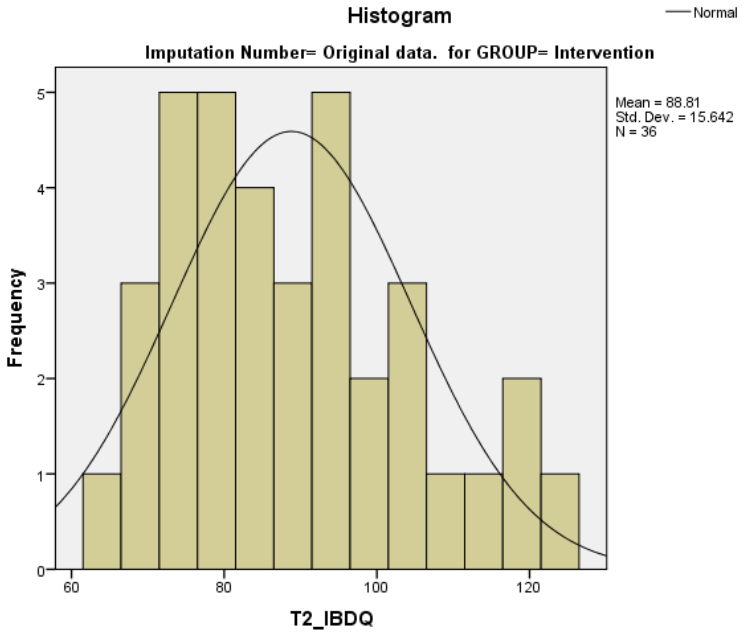



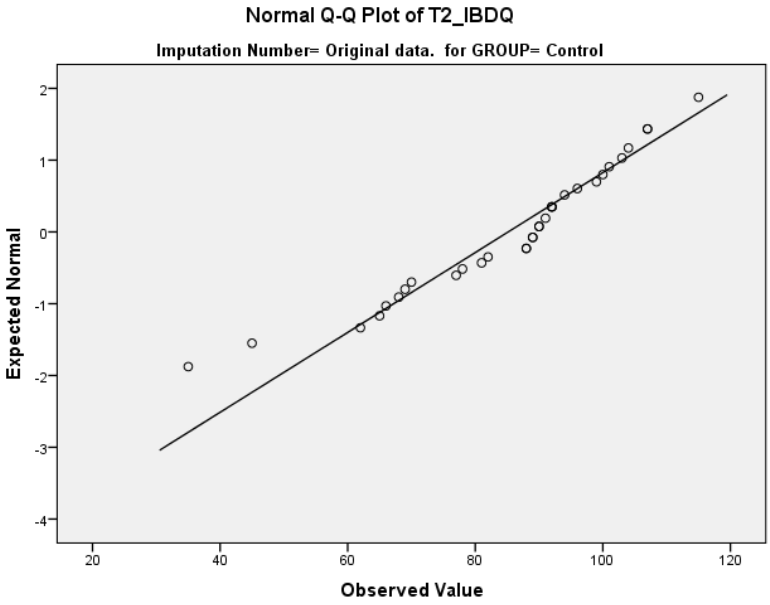

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 20.36
Std. Dev. = 9.517
N = 36
Frequency
T2_DASS

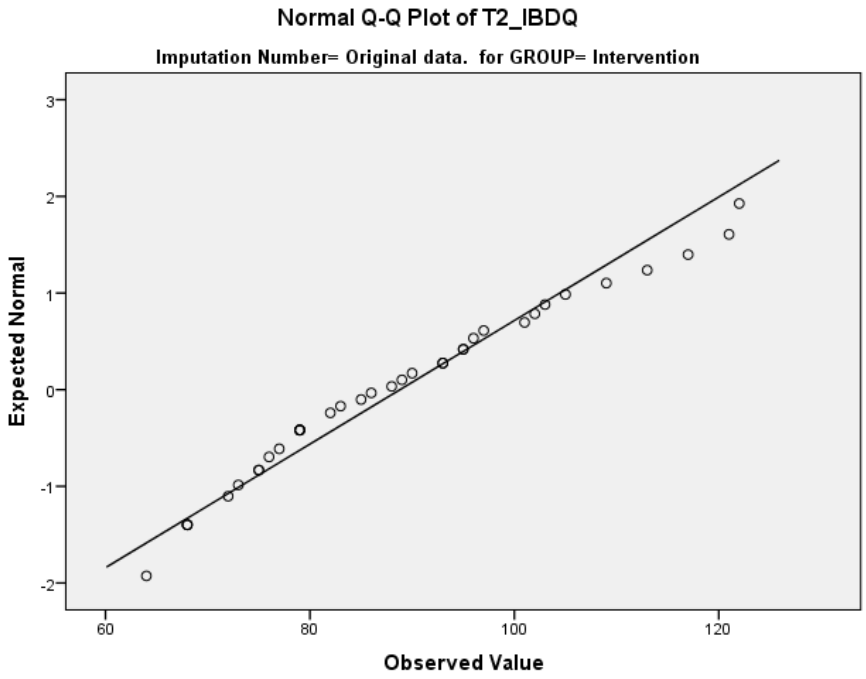

Normal Q-Q Plot of T2_DASS
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value

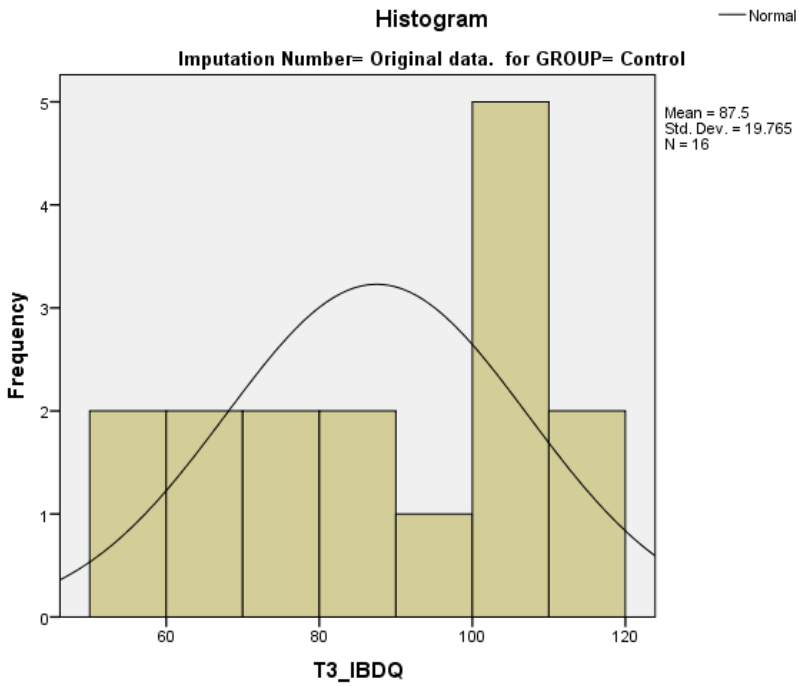
IBDQ

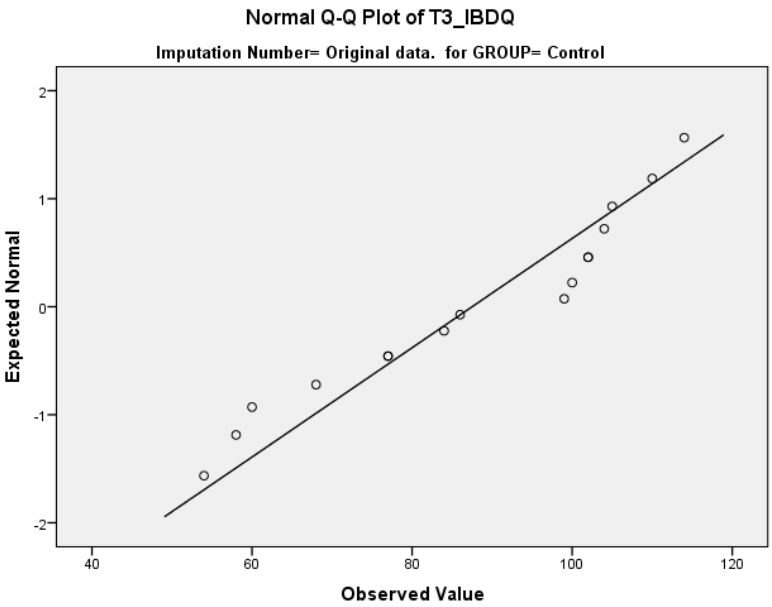

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 85.16
Std. Dev. = 17.971
N = 32
Frequency
T2_IBDQ

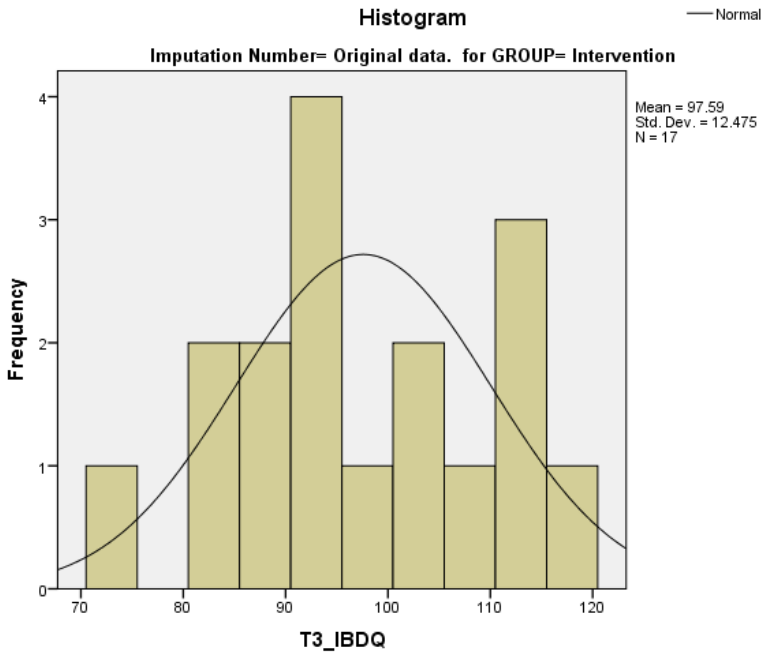

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 88.81
Std. Dev. = 15.642
N = 36
Frequency
T2_IBDQ

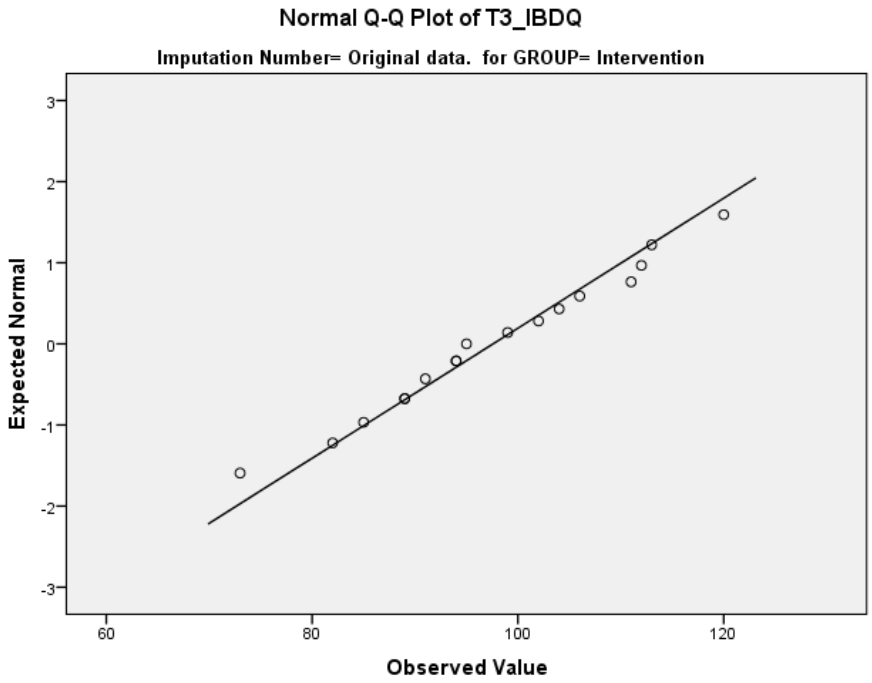

Normal Q-Q Plot of T2_IBDQ
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value
2
1
0
-1
-2
-3
-4
20
40
60
80
100
120


Normal Q-Q Plot of T2_IBDQ
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value
3
2
1
0
-1
-2
60
80
100
120

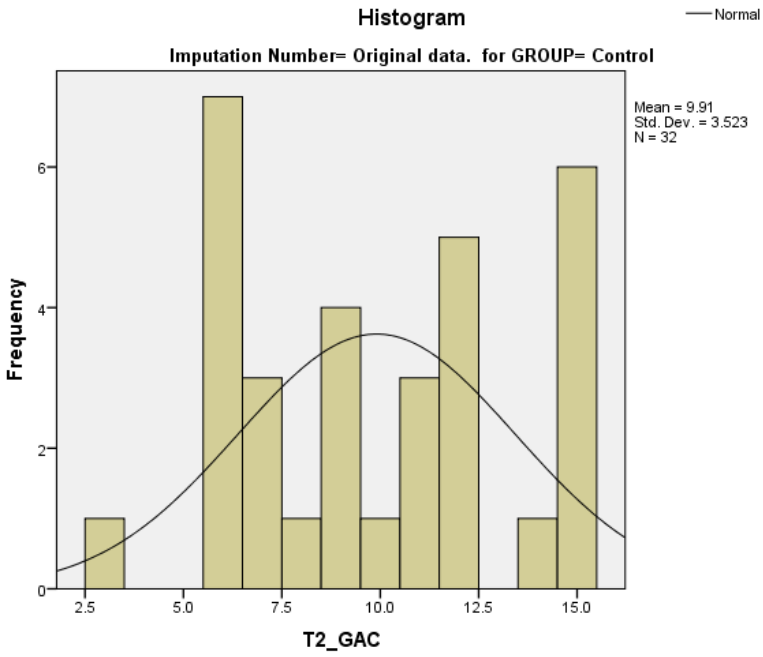

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 87.5
Std. Dev. = 19.765
N = 16
Frequency
T3_IBDQ

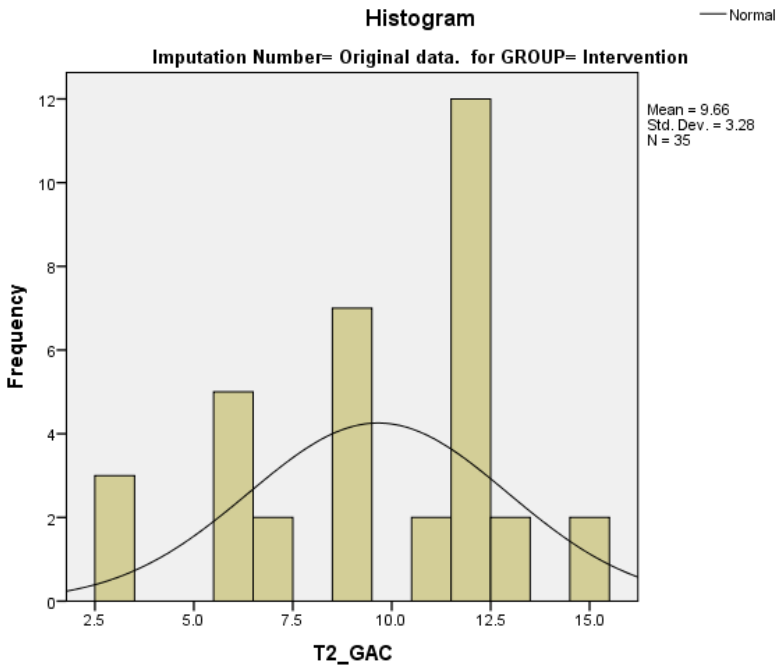

Normal Q-Q Plot of T3_IBDQ
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value

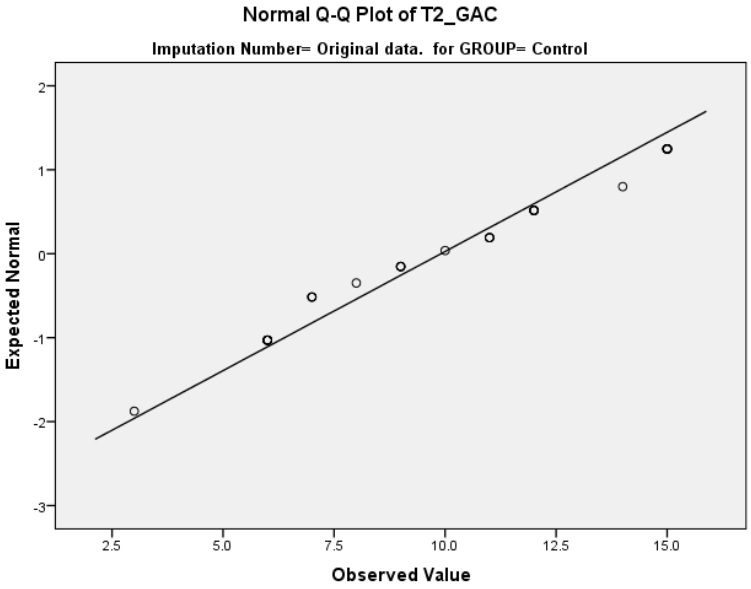

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 97.59
Std. Dev. = 12.475
N = 17
Frequency
T3_IBDQ

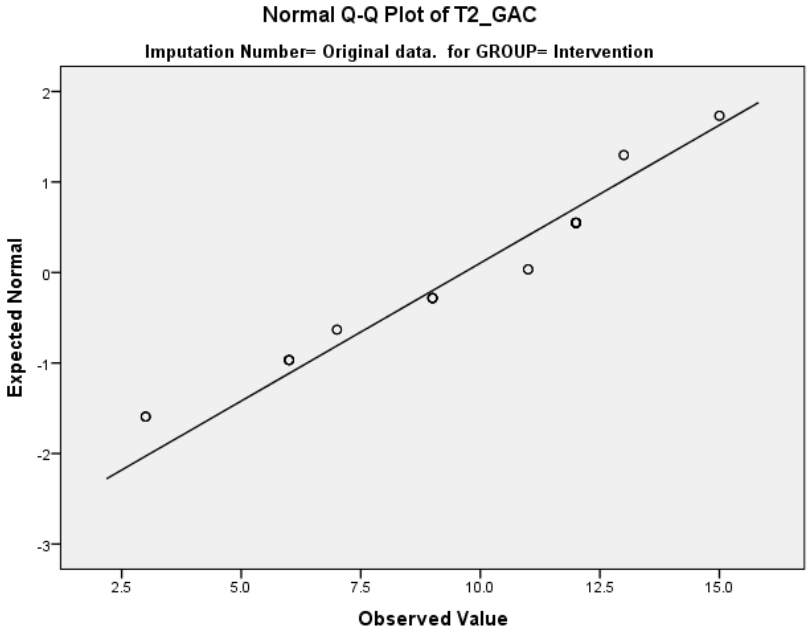

Normal Q-Q Plot of T3_IBDQ
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value

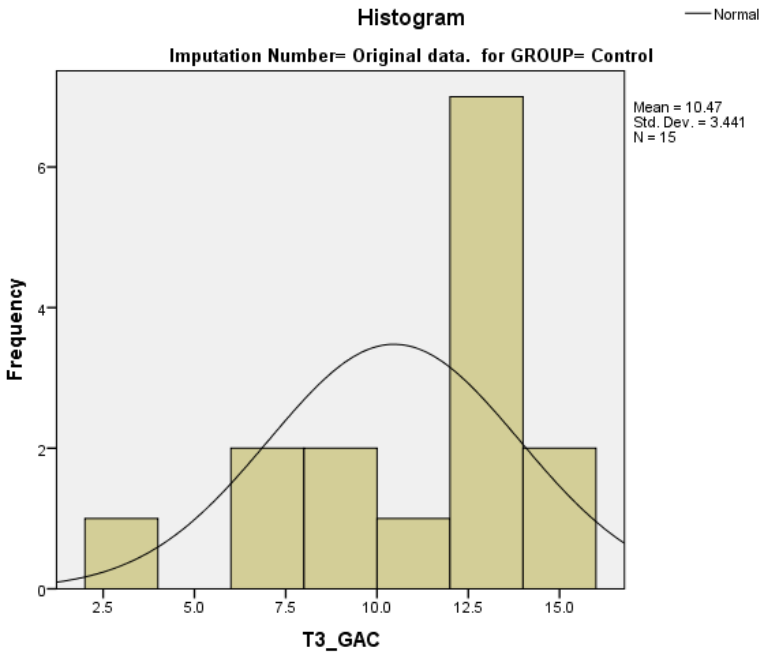
GAC

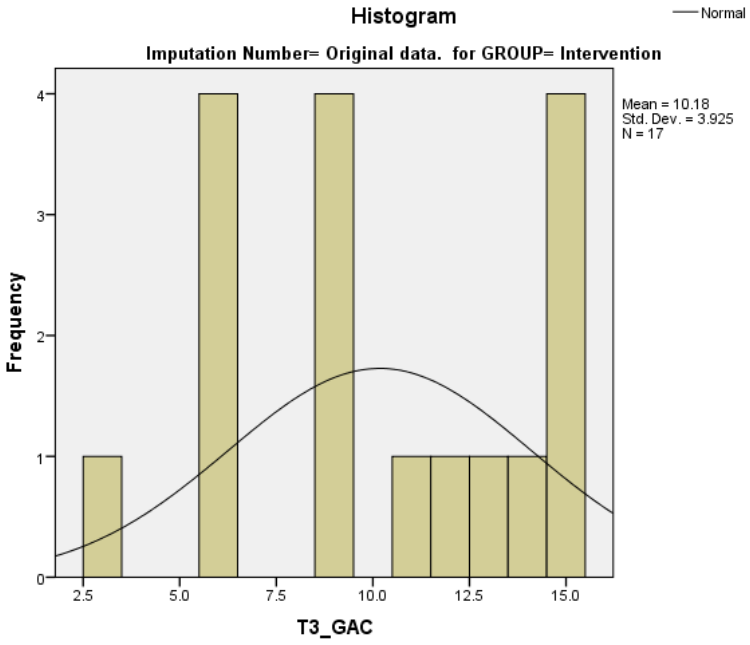

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 9.91
Std. Dev. = 3.523
N = 32
Frequency
0
2
4
6
2.5
5.0
7.5
10.0
12.5
15.0
T2_GAC

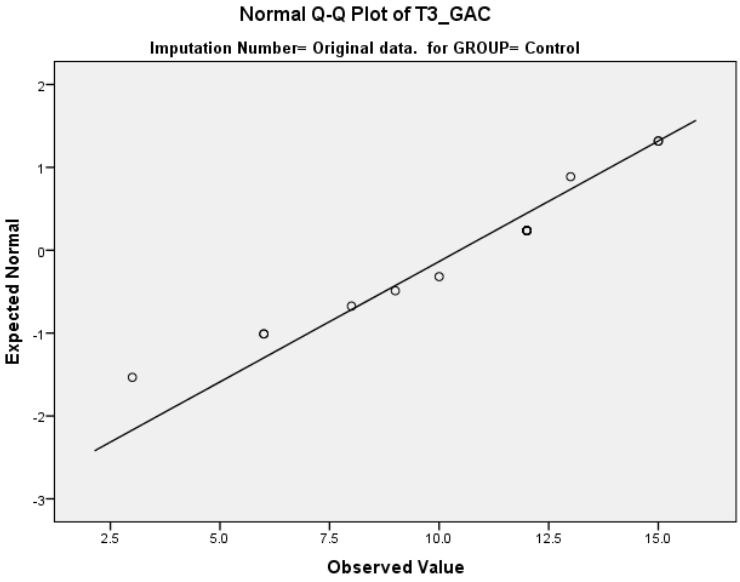

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 9.66
Std. Dev. = 3.28
N = 35
Frequency
0
2
4
6
8
10
12
2.5
5.0
7.5
10.0
12.5
15.0
T2_GAC

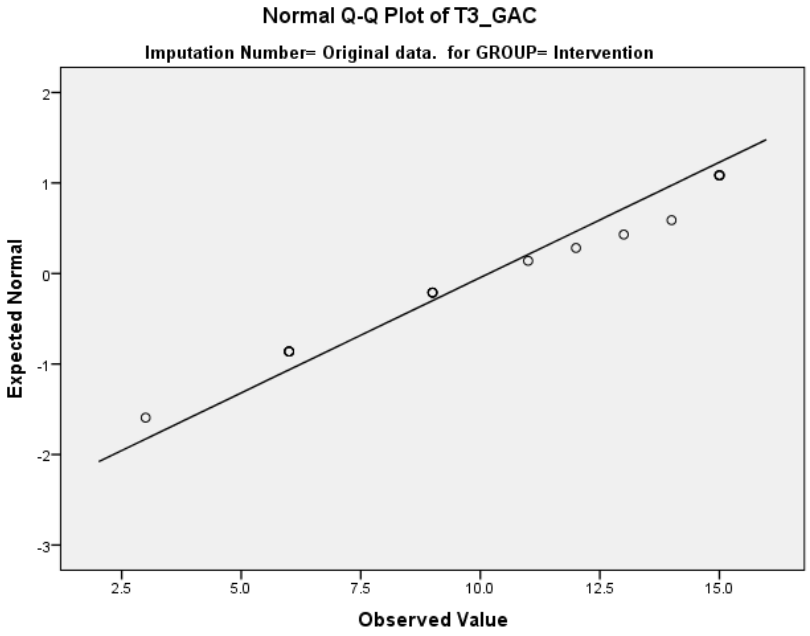

Normal Q-Q Plot of T2_GAC
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value
2
1
0
-1
-2
-3
2.5
5.0
7.5
10.0
12.5
15.0


Normal Q-Q Plot of T2_GAC
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value
2
1
0
-1
-2
-3
2.5
5.0
7.5
10.0
12.5
15.0

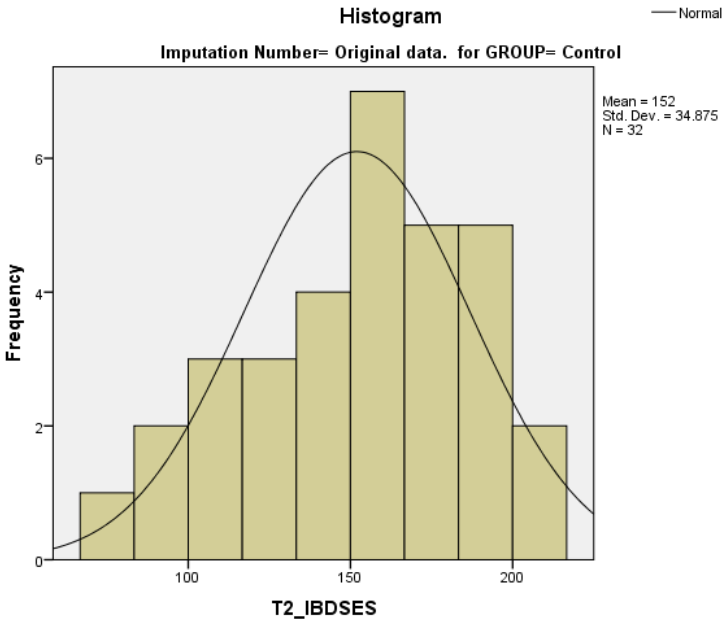

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 10.47
Std. Dev. = 3.441
N = 15
Frequency
0
2
4
6
2.5
5.0
7.5
10.0
12.5
15.0
T3_GAC

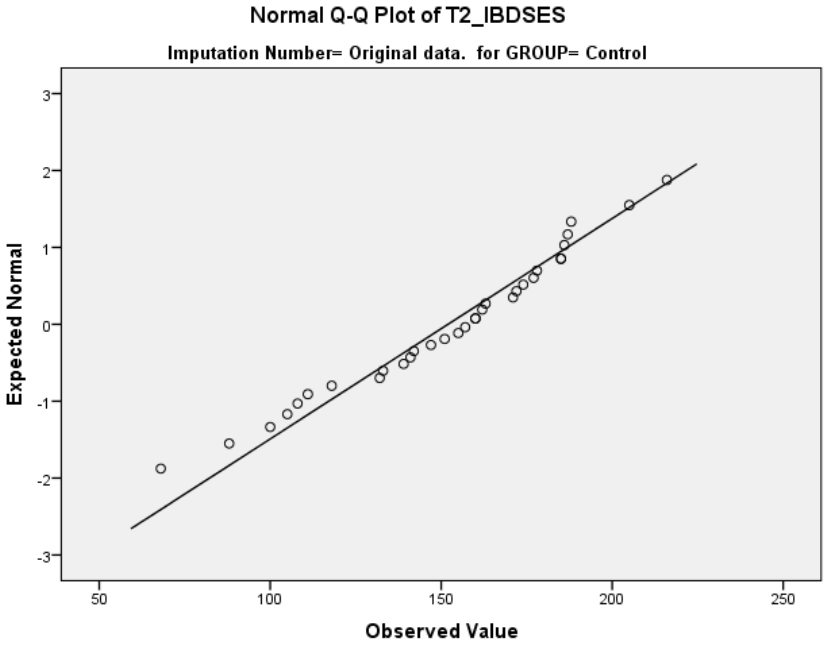

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 10.18
Std. Dev. = 3.925
N = 17
Frequency
0
1
2
3
4
2.5
5.0
7.5
10.0
12.5
15.0
T3_GAC

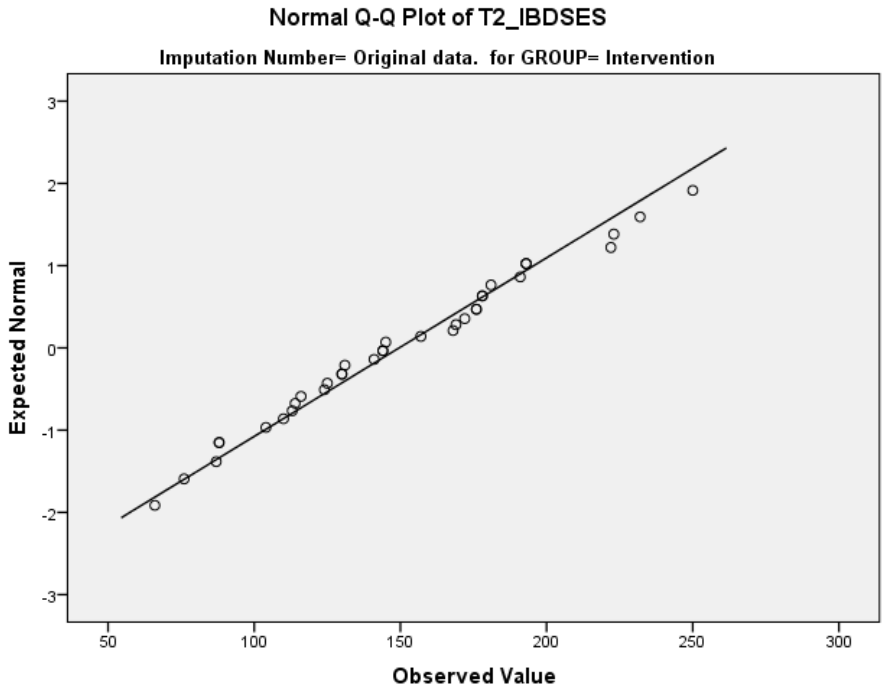

Normal Q-Q Plot of T3_GAC
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value
2
1
0
-1
-2
-3
2.5
5.0
7.5
10.0
12.5
15.0

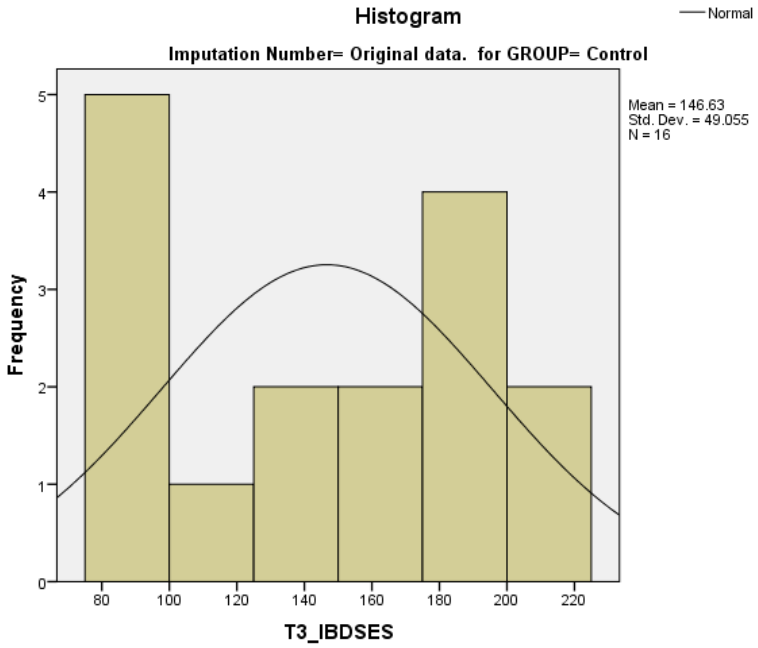

Normal Q-Q Plot of T3_GAC
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value
2
1
0
-1
-2
-3
2.5
5.0
7.5
10.0
12.5
15.0

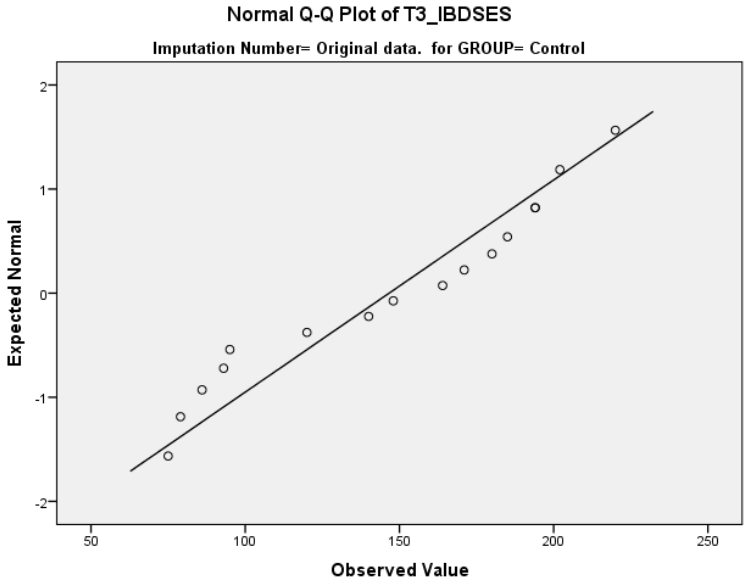
IBDSES

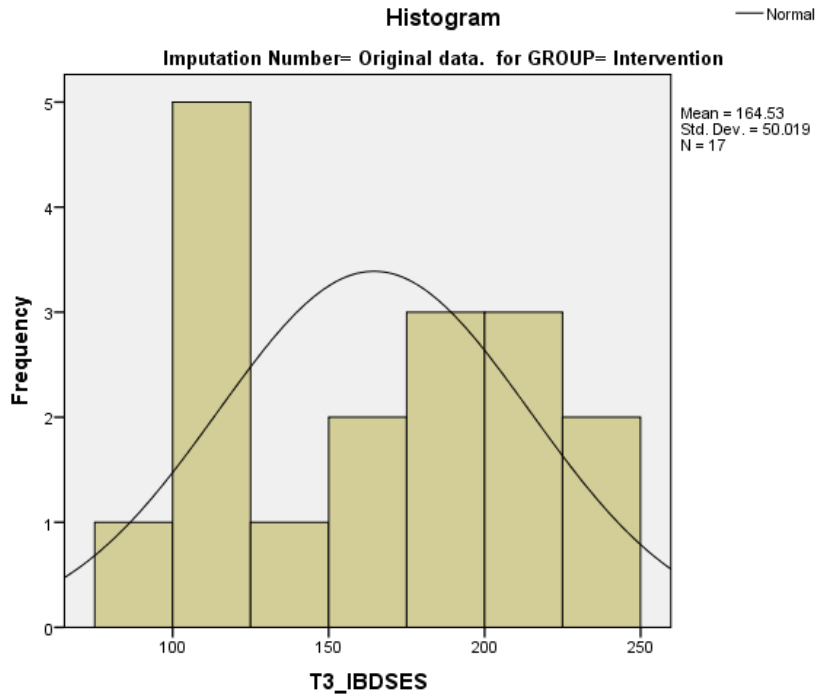

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 152
Std. Dev. = 34.875
N = 32
Frequency
0
2
4
6
100
150
200
T2_IBDSES

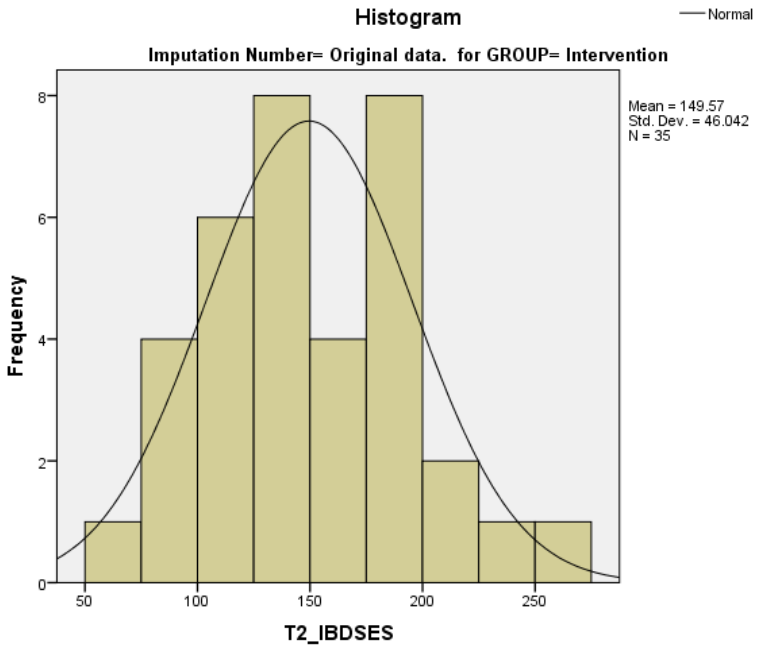

Normal Q-Q Plot of T2_IBDSES
Imputation Number= Original data. for GROUP= Control
Expected Normal
3
2
1
0
-1
-2
-3
50
100
150
200
250
Observed Value

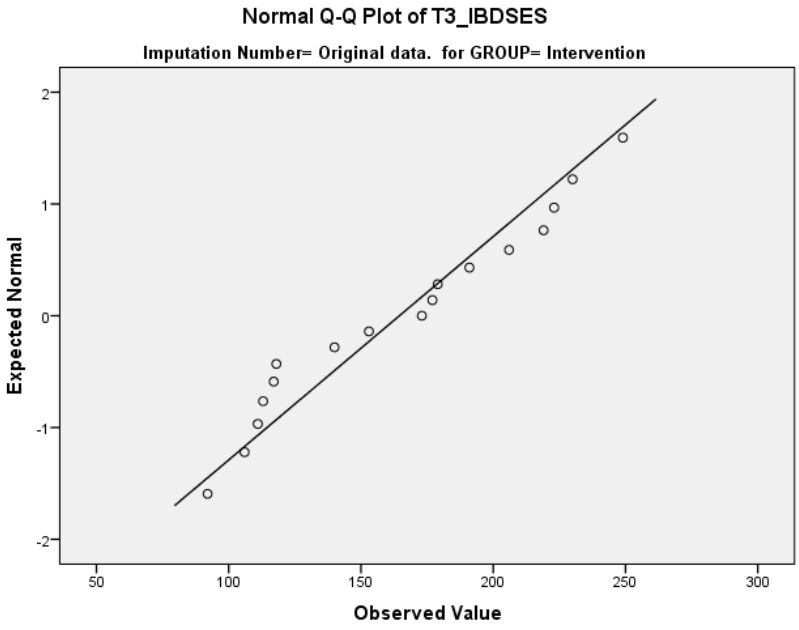

Normal Q-Q Plot of T2_IBDSES
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value
3
2
1
0
-1
-2
-3
50
100
150
200
250
300


Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 146.63
Std. Dev. = 49.055
N = 16
Frequency
T3_IBDSES
5
4
3
2
1
0
80
100
120
140
160
180
200
220

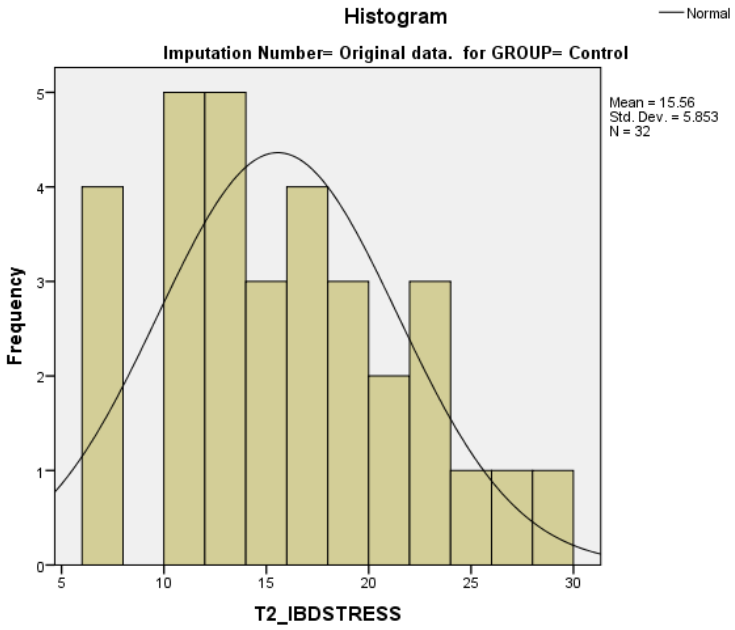

Normal Q-Q Plot of T3_IBDSES
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value
2
1
0
-1
-2
50
100
150
200
250

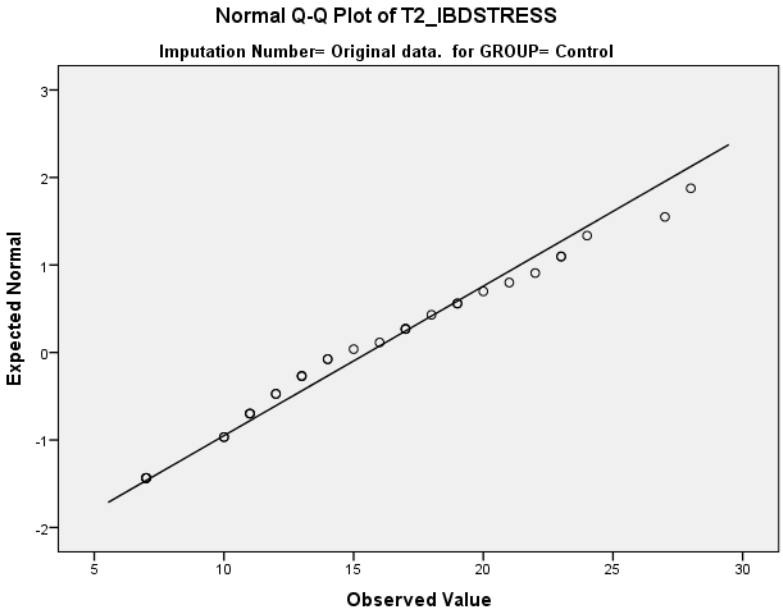

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 164.53
Std. Dev. = 50.019
N = 17
Frequency
T3_IBDSES
5
4
3
2
1
0
100
150
200
250

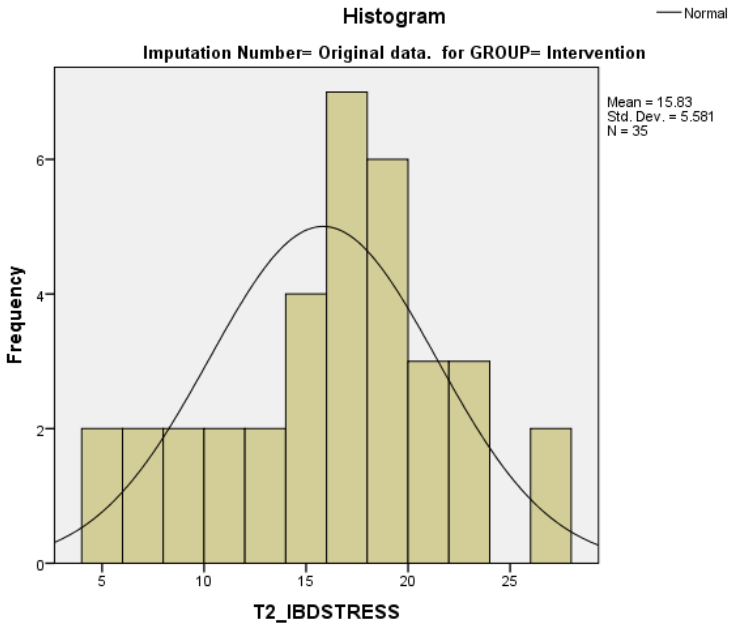

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 149.57
Std. Dev. = 46.042
N = 35
Frequency
T2_IBDSES

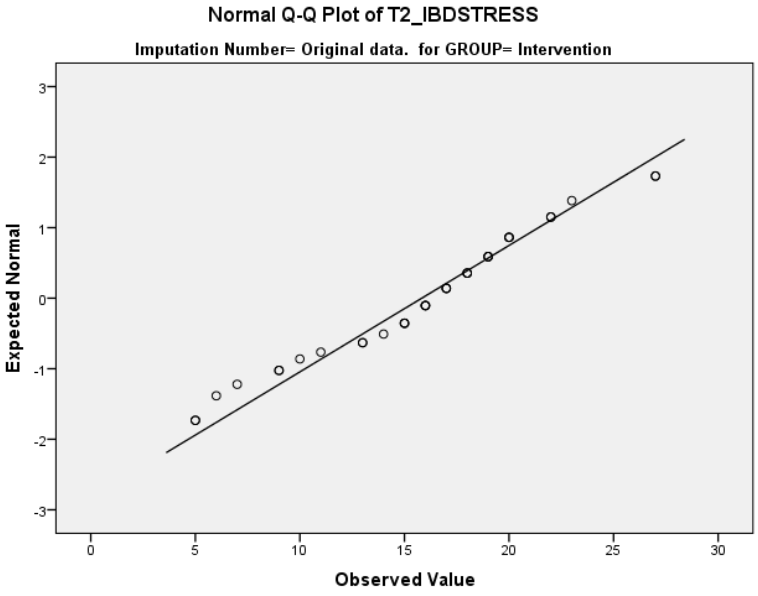

Normal Q-Q Plot of T3_IBDSES
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value

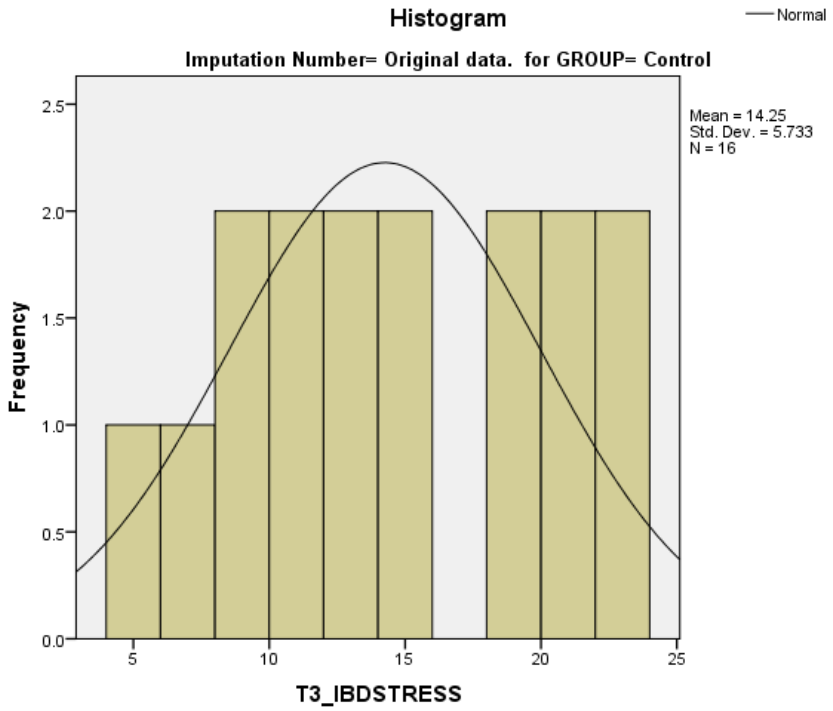
IBDSTRESS

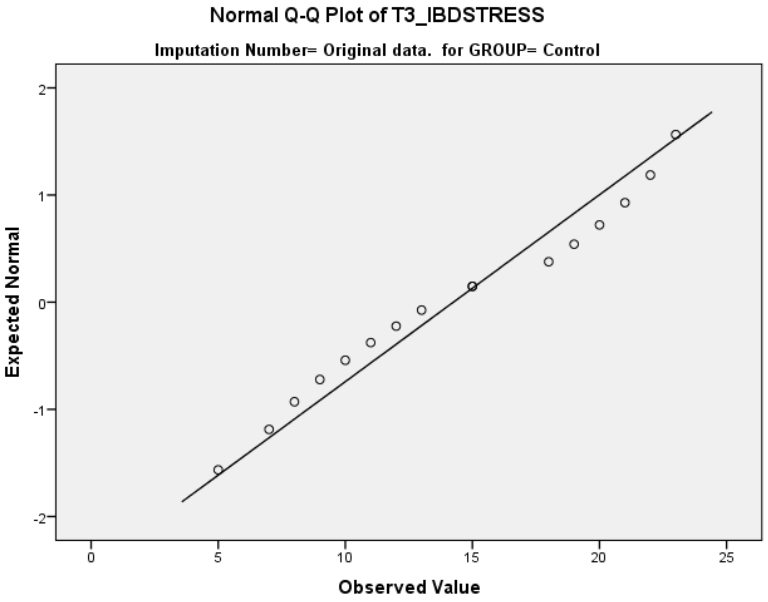

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 15.56
Std. Dev. = 5.853
N = 32
Frequency
T2_IBDSTRESS

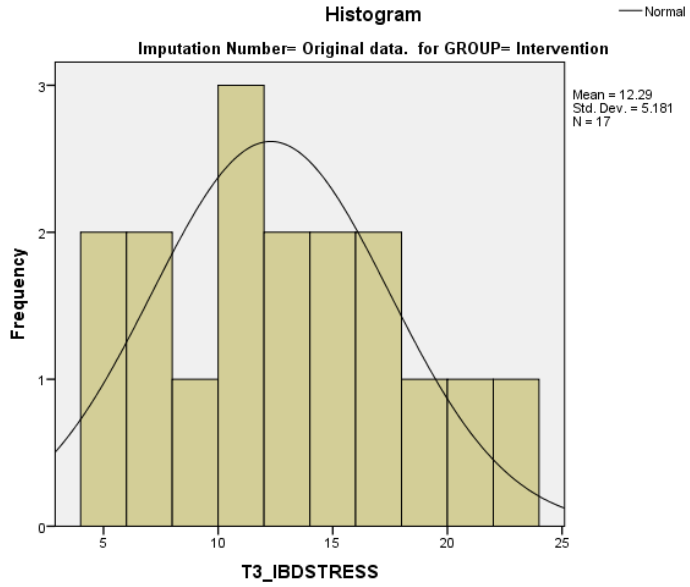

Normal Q-Q Plot of T2_IBDSTRESS
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value

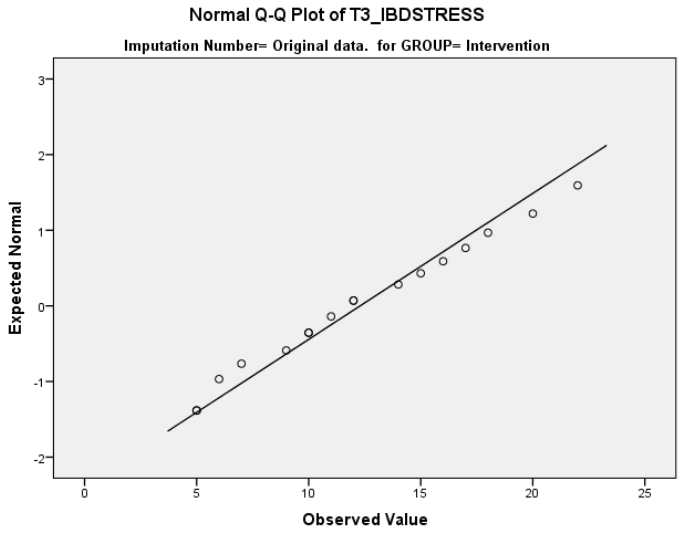

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 15.83
Std. Dev. = 5.581
N = 35
Frequency
T2_IBDSTRESS


Normal Q-Q Plot of T2_IBDSTRESS
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value

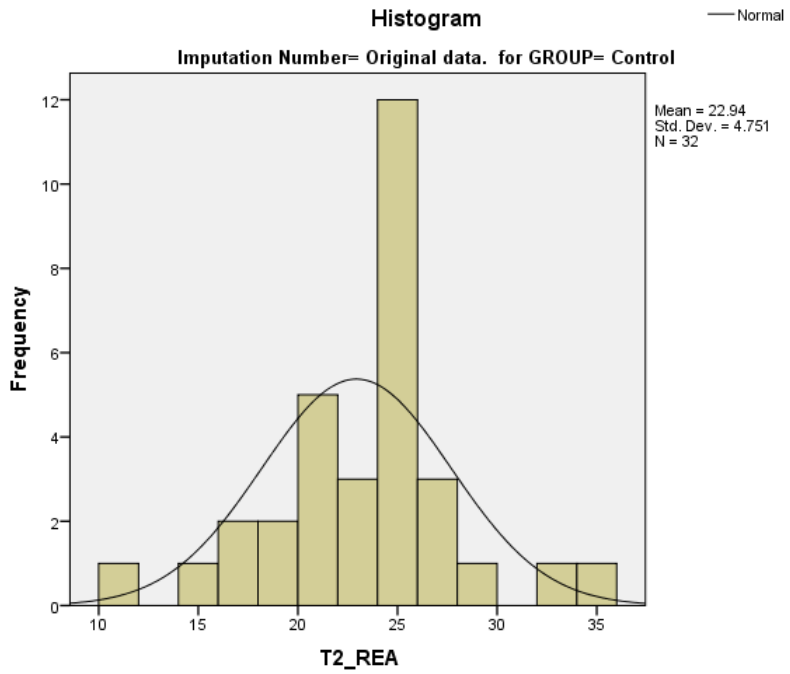

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 14.25
Std. Dev. = 5.733
N = 16
Frequency
T3_IBDSTRESS

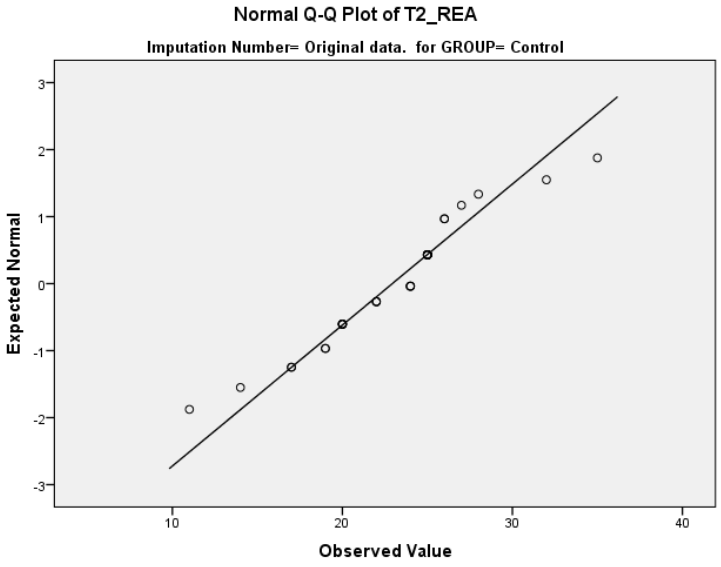

Normal Q-Q Plot of T3_IBDSTRESS
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value

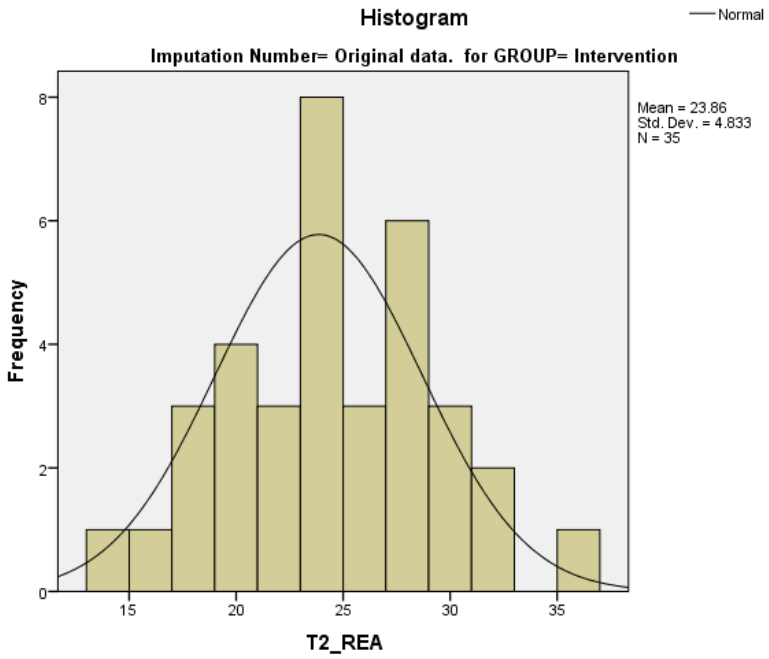


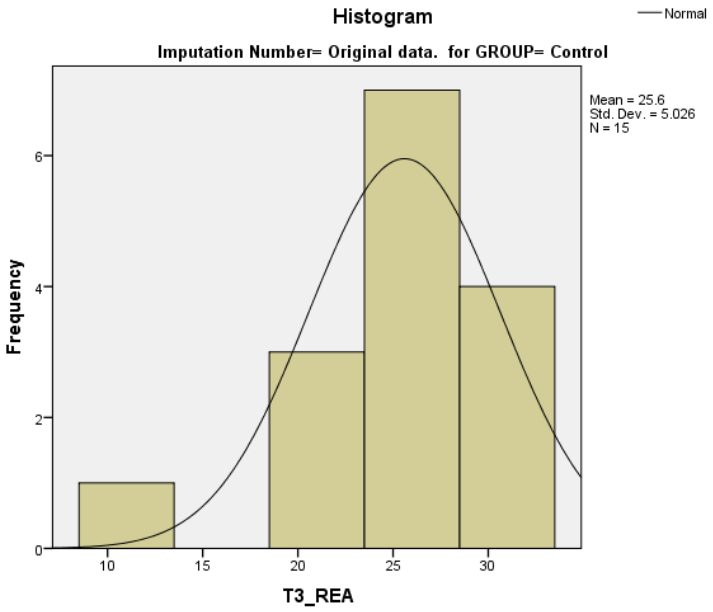



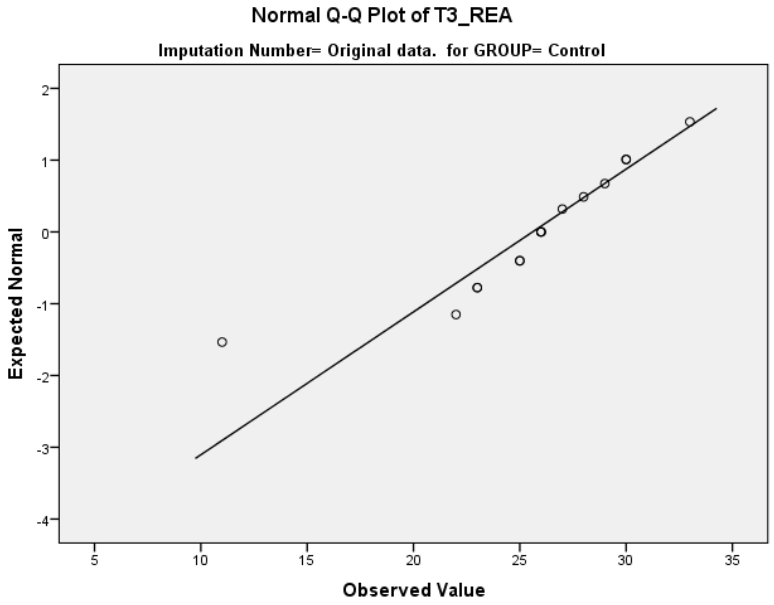

Reappraisal

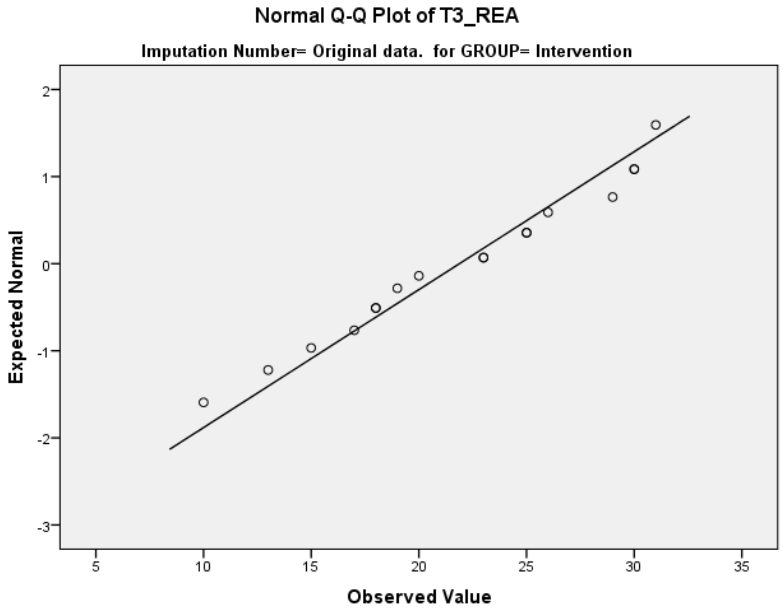

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 22.94
Std. Dev. = 4.751
N = 32
Frequency
T2_REA

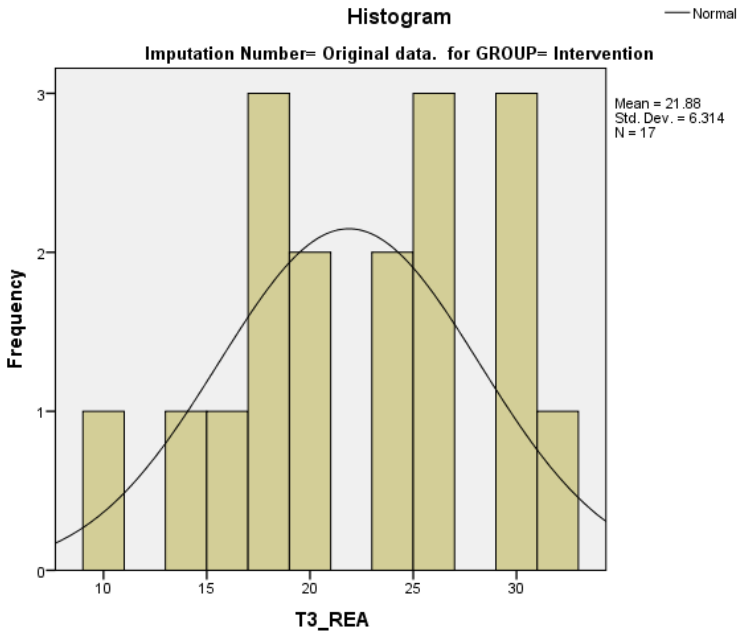

Normal Q-Q Plot of T2_REA
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value

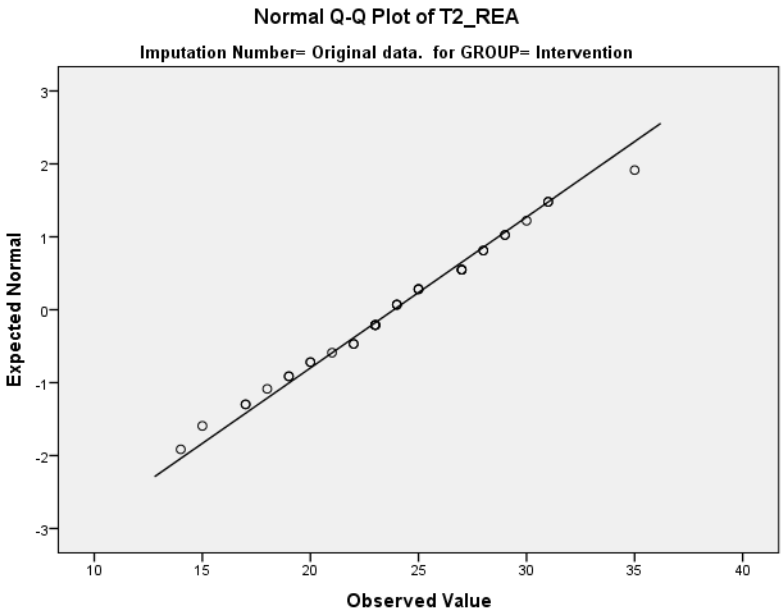

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 23.86
Std. Dev. = 4.833
N = 35
Frequency
T2_REA


Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 25.6
Std. Dev. = 5.026
N = 15
Frequency
T3_REA

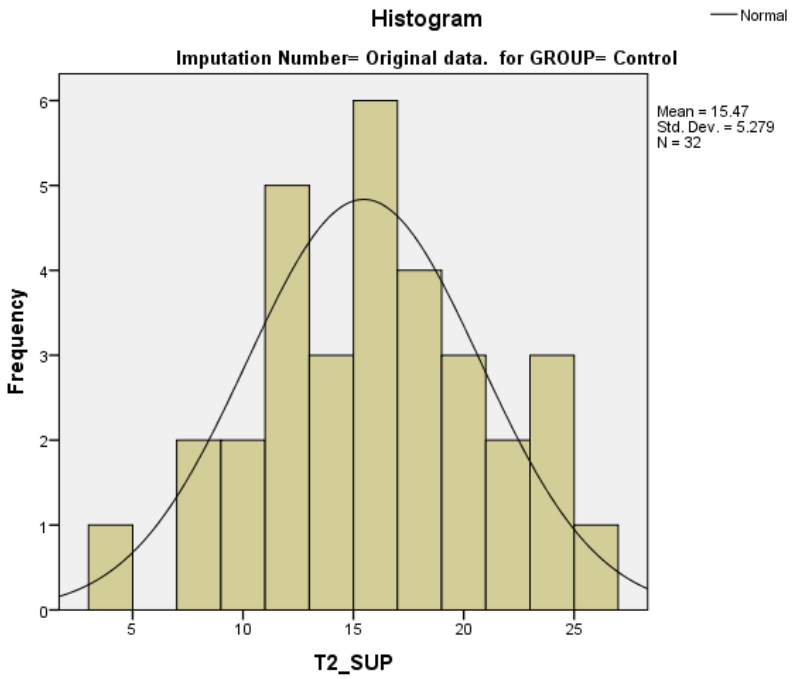

Normal Q-Q Plot of T3_REA
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value
2
1
0
-1
-2
-3
-4
5
10
15
20
25
30
35

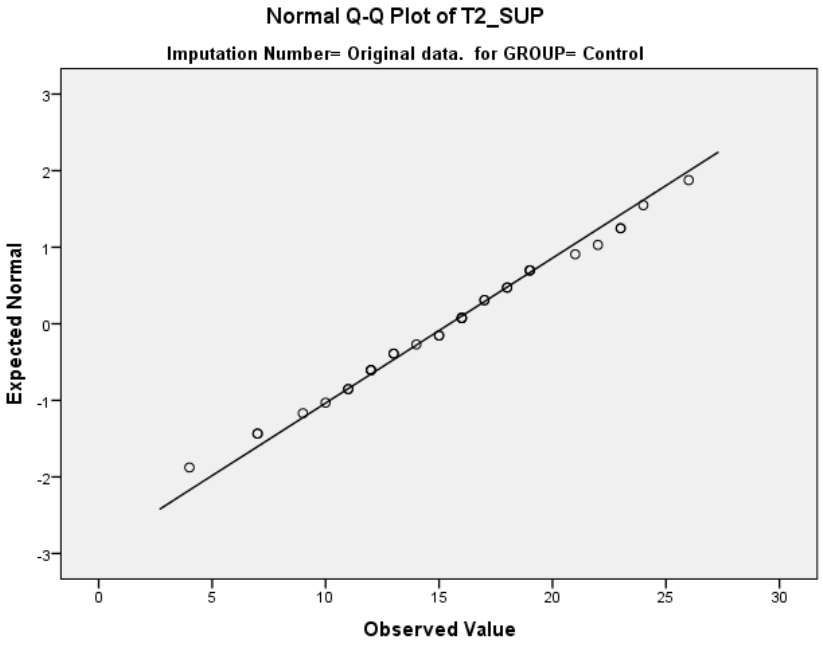

Normal Q-Q Plot of T3_REA
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value
2
1
0
-1
-2
-3
5
10
15
20
25
30
35

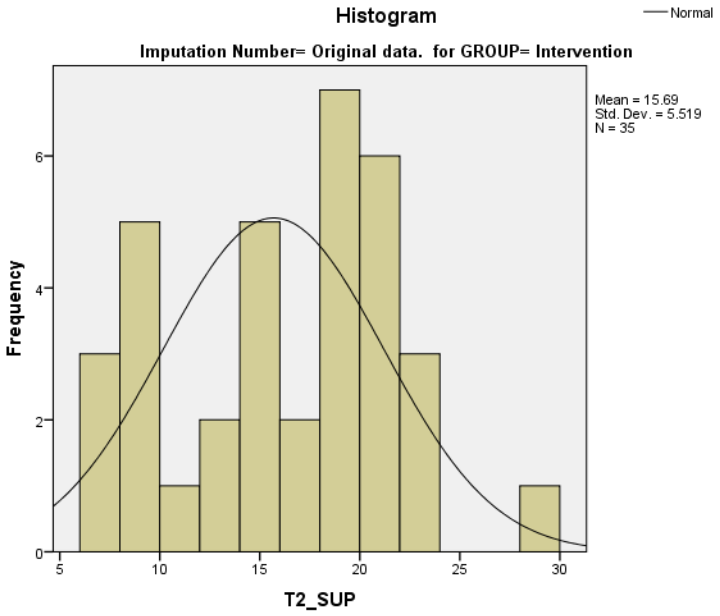


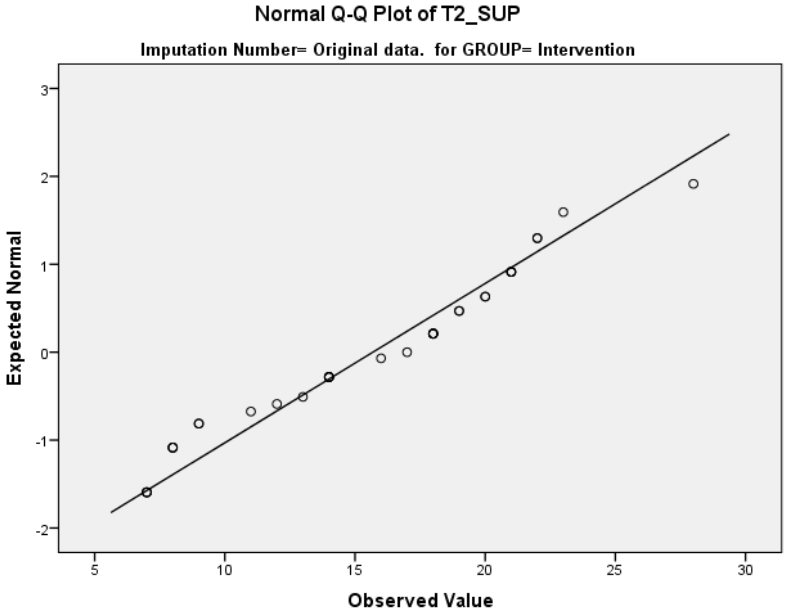



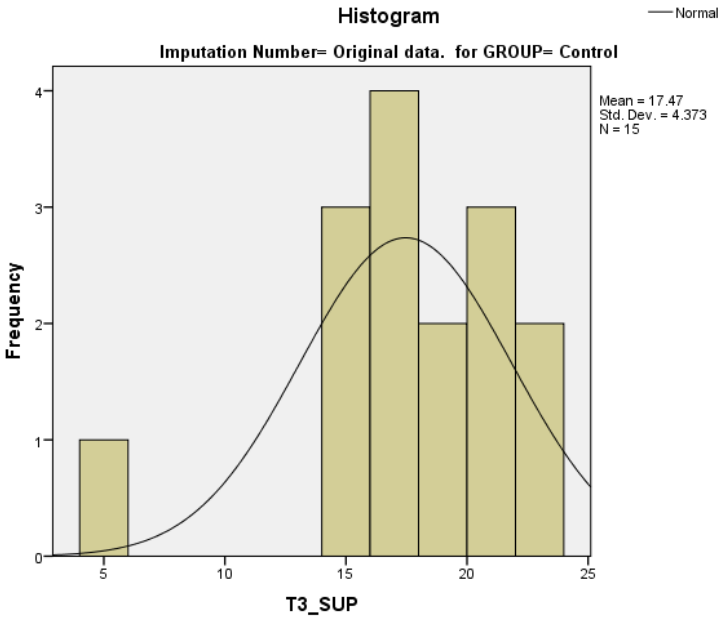

Suppression

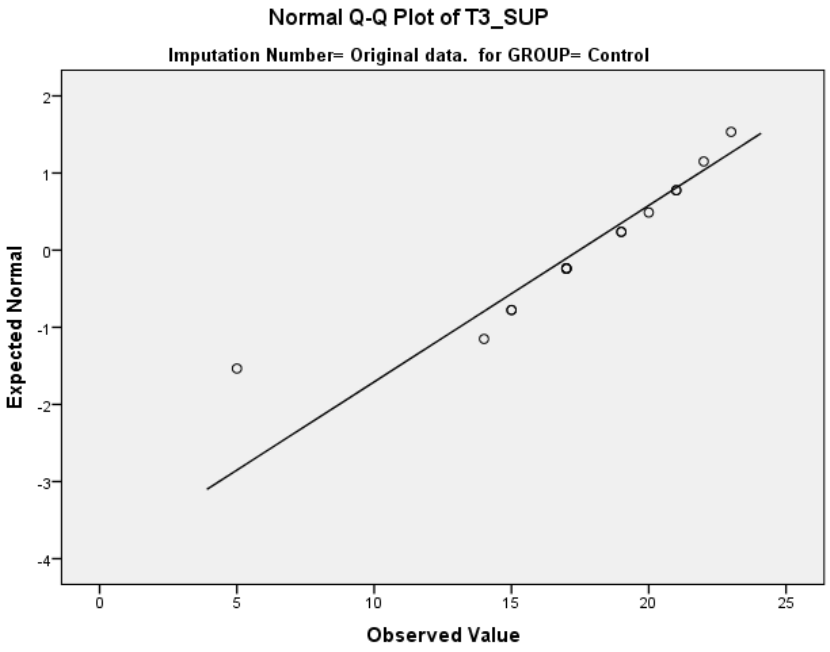

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 15.47
Std. Dev. = 5.279
N = 32
Frequency
T2_SUP

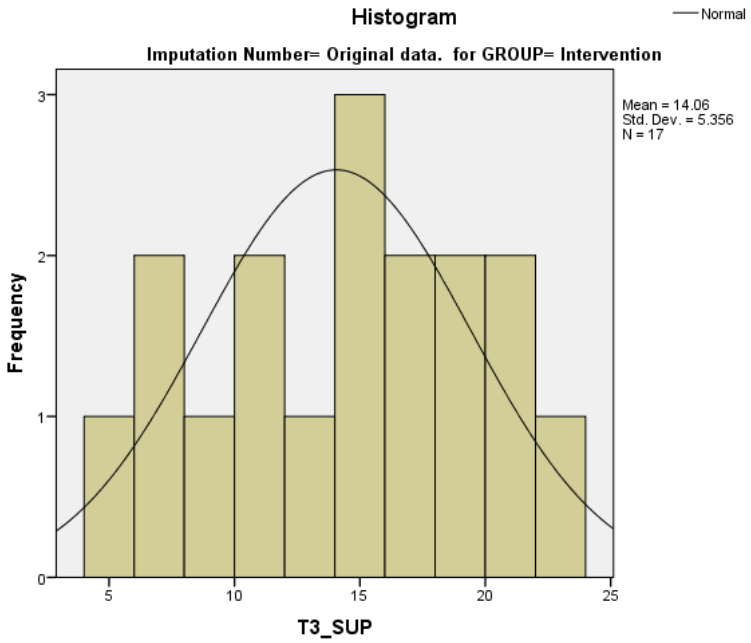

Normal Q-Q Plot of T2_SUP
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value

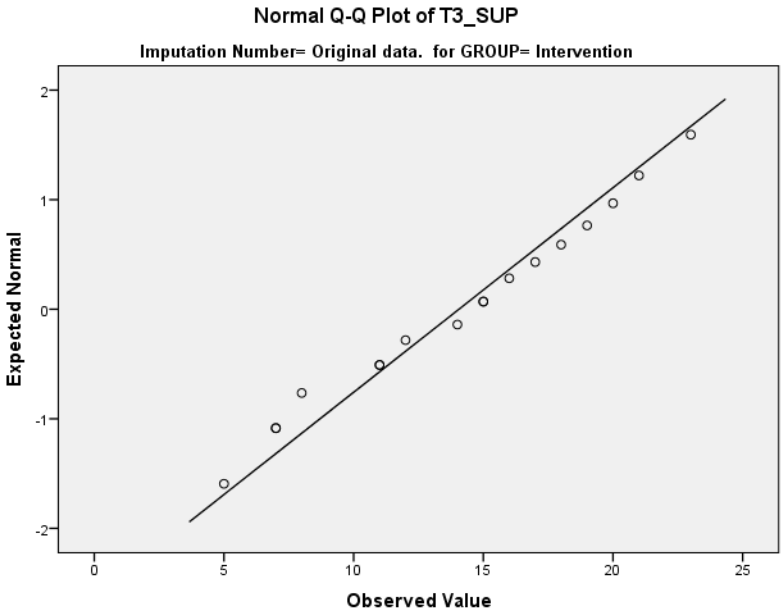

Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 15.69
Std. Dev. = 5.519
N = 35
Frequency
T2_SUP


Normal Q-Q Plot of T2_SUP
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value

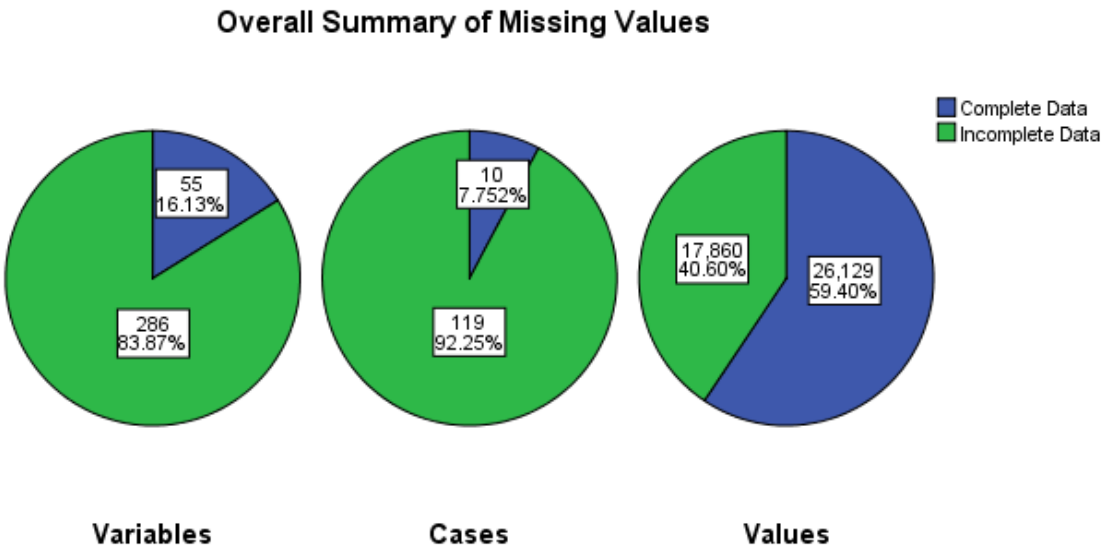

Histogram
Normal
Imputation Number= Original data. for GROUP= Control
Mean = 17.47
Std. Dev. = 4.373
N = 15
Frequency
T3_SUP

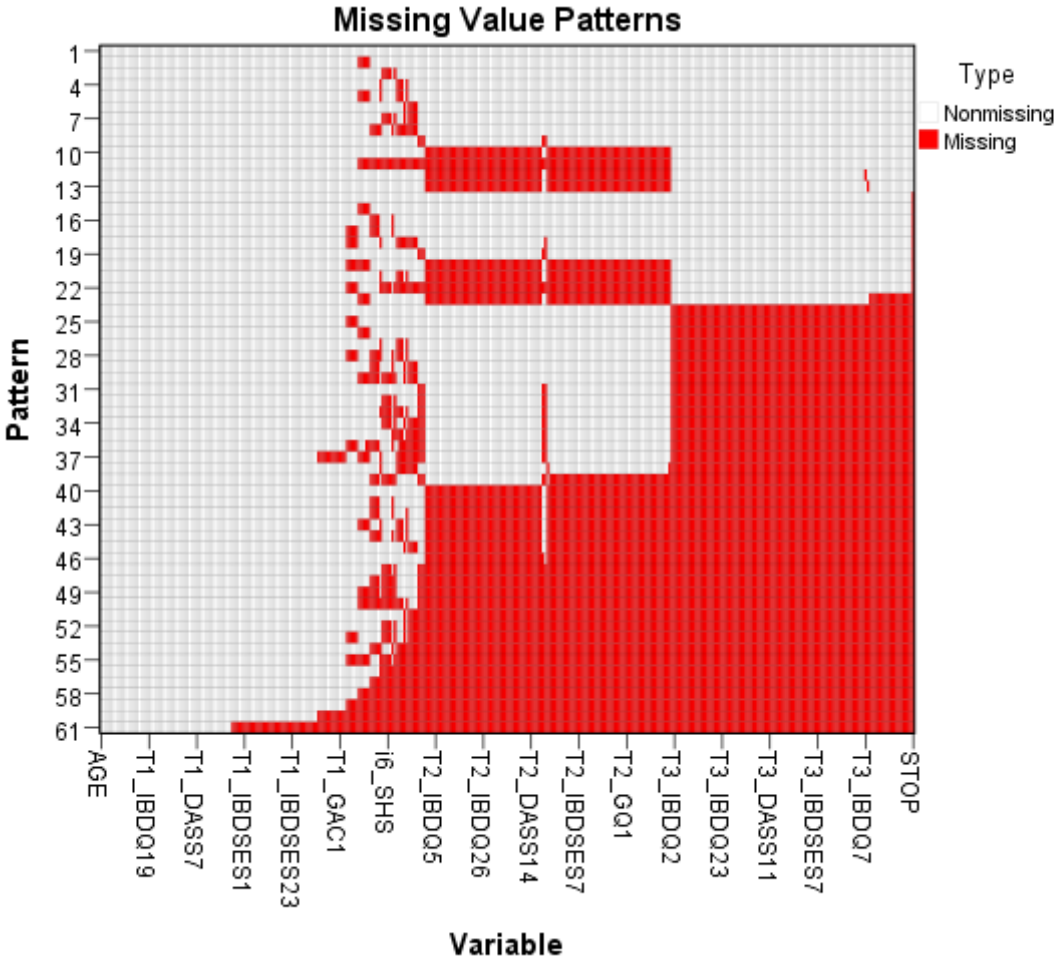

Normal Q-Q Plot of T3_SUP
Imputation Number= Original data. for GROUP= Control
Expected Normal
Observed Value


Histogram
Normal
Imputation Number= Original data. for GROUP= Intervention
Mean = 14.06
Std. Dev. = 5.356
N = 17
Frequency
T3_SUP


Normal Q-Q Plot of T3_SUP
Imputation Number= Original data. for GROUP= Intervention
Expected Normal
Observed Value

**Appendices K: Missing data analysis**



## Appendix L: Imputed data estimates

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| Original data | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 68 | 87.09 | 16.752 |
| | T3_IBDQ | 33 | 92.70 | 16.946 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 68 | 19.54 | 11.078 |
| | T3_DASS | 33 | 18.55 | 13.973 |
| | T1_IBDSTRESS | 128 | 15.91 | 5.999 |
| | T2_IBDSTRESS | 67 | 15.70 | 5.670 |
| | T3_IBDSTRESS | 33 | 13.24 | 5.460 |
| | T1_IBDSES | 128 | 143.40 | 48.210 |
| | T2_IBDSES | 67 | 150.73 | 40.802 |
| | T3_IBDSES | 33 | 155.85 | 49.614 |
| | T1_GQ | 128 | 32.43 | 6.400 |
| | T2_GQ | 67 | 31.82 | 6.891 |
| | T3_GQ | 32 | 32.38 | 6.709 |
| | T1_GAC | 125 | 10.20 | 3.228 |
| | T2_GAC | 67 | 9.78 | 3.375 |
| | T3_GAC | 32 | 10.31 | 3.649 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 1 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 87.16 | 12.445 |
| | T3_IBDQ | 129 | 91.38 | 9.491 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 19.96 | 8.395 |
| | T3_DASS | 129 | 19.75 | 7.652 |
| | T1_IBDSTRESS | 129 | 15.90 | 5.976 |
| | T2_IBDSTRESS | 129 | 15.69 | 4.498 |
| | T3_IBDSTRESS | 129 | 13.47 | 3.580 |
| | T1_IBDSES | 129 | 143.31 | 48.031 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T2_IBDSES | 129 | 150.54 | 29.771 |
| | T3_IBDSES | 129 | 156.62 | 25.899 |
| | T1_GQ | 129 | 32.43 | 6.375 |
| | T2_GQ | 129 | 31.60 | 5.351 |
| | T3_GQ | 129 | 32.16 | 4.020 |
| | T1_GAC | 129 | 10.15 | 3.212 |
| | T2_GAC | 129 | 9.76 | 2.727 |
| | T3_GAC | 129 | 10.14 | 2.490 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 2 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 86.33 | 12.649 |
| | T3_IBDQ | 129 | 91.74 | 9.196 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.62 | 8.448 |
| | T3_DASS | 129 | 20.31 | 7.979 |
| | T1_IBDSTRESS | 129 | 15.94 | 5.987 |
| | T2_IBDSTRESS | 129 | 16.27 | 4.494 |
| | T3_IBDSTRESS | 129 | 13.48 | 3.746 |
| | T1_IBDSES | 129 | 143.36 | 48.023 |
| | T2_IBDSES | 129 | 149.81 | 29.676 |
| | T3_IBDSES | 129 | 155.16 | 25.665 |
| | T1_GQ | 129 | 32.43 | 6.375 |
| | T2_GQ | 129 | 31.50 | 5.237 |
| | T3_GQ | 129 | 32.08 | 4.098 |
| | T1_GAC | 129 | 10.19 | 3.194 |
| | T2_GAC | 129 | 9.88 | 2.814 |
| | T3_GAC | 129 | 10.12 | 2.370 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 3 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 86.32 | 12.618 |
| | T3_IBDQ | 129 | 91.59 | 9.550 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.29 | 8.372 |
| | T3_DASS | 129 | 20.10 | 7.836 |
| | T1_IBDSTRESS | 129 | 15.93 | 5.982 |
| | T2_IBDSTRESS | 129 | 15.48 | 4.495 |
| | T3_IBDSTRESS | 129 | 13.84 | 3.559 |
| | T1_IBDSES | 129 | 143.34 | 48.025 |
| | T2_IBDSES | 129 | 150.21 | 29.703 |
| | T3_IBDSES | 129 | 154.53 | 25.934 |
| | T1_GQ | 129 | 32.40 | 6.382 |
| | T2_GQ | 129 | 31.62 | 5.256 |
| | T3_GQ | 129 | 32.50 | 4.170 |
| | T1_GAC | 129 | 10.19 | 3.189 |
| | T2_GAC | 129 | 9.92 | 2.677 |
| | T3_GAC | 129 | 10.32 | 2.408 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 4 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 86.37 | 12.549 |
| | T3_IBDQ | 129 | 91.39 | 9.414 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.22 | 8.420 |
| | T3_DASS | 129 | 19.47 | 7.813 |
| | T1_IBDSTRESS | 129 | 15.90 | 5.976 |
| | T2_IBDSTRESS | 129 | 15.85 | 4.586 |
| | T3_IBDSTRESS | 129 | 13.65 | 3.661 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T1_IBDSES | 129 | 143.40 | 48.021 |
| | T2_IBDSES | 129 | 149.93 | 29.788 |
| | T3_IBDSES | 129 | 154.76 | 25.926 |
| | T1_GQ | 129 | 32.43 | 6.375 |
| | T2_GQ | 129 | 31.64 | 5.309 |
| | T3_GQ | 129 | 32.67 | 4.120 |
| | T1_GAC | 129 | 10.23 | 3.200 |
| | T2_GAC | 129 | 9.82 | 2.682 |
| | T3_GAC | 129 | 10.29 | 2.402 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 5 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 87.25 | 12.540 |
| | T3_IBDQ | 129 | 91.54 | 9.413 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.67 | 8.558 |
| | T3_DASS | 129 | 19.78 | 7.749 |
| | T1_IBDSTRESS | 129 | 15.92 | 5.979 |
| | T2_IBDSTRESS | 129 | 15.91 | 4.391 |
| | T3_IBDSTRESS | 129 | 13.60 | 3.682 |
| | T1_IBDSES | 129 | 143.34 | 48.025 |
| | T2_IBDSES | 129 | 150.70 | 29.894 |
| | T3_IBDSES | 129 | 154.84 | 25.997 |
| | T1_GQ | 129 | 32.43 | 6.375 |
| | T2_GQ | 129 | 31.67 | 5.336 |
| | T3_GQ | 129 | 32.10 | 4.098 |
| | T1_GAC | 129 | 10.22 | 3.192 |
| | T2_GAC | 129 | 9.76 | 2.778 |
| | T3_GAC | 129 | 10.33 | 2.541 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 6 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 87.02 | 12.469 |
| | T3_IBDQ | 129 | 91.43 | 9.340 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.61 | 8.404 |
| | T3_DASS | 129 | 19.89 | 7.864 |
| | T1_IBDSTRESS | 129 | 15.90 | 5.976 |
| | T2_IBDSTRESS | 129 | 15.71 | 4.523 |
| | T3_IBDSTRESS | 129 | 13.70 | 3.441 |
| | T1_IBDSES | 129 | 143.31 | 48.031 |
| | T2_IBDSES | 129 | 149.86 | 29.892 |
| | T3_IBDSES | 129 | 156.38 | 25.889 |
| | T1_GQ | 129 | 32.43 | 6.375 |
| | T2_GQ | 129 | 31.59 | 5.217 |
| | T3_GQ | 129 | 32.40 | 4.009 |
| | T1_GAC | 129 | 10.23 | 3.198 |
| | T2_GAC | 129 | 9.74 | 2.708 |
| | T3_GAC | 129 | 10.37 | 2.382 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 7 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 85.95 | 12.622 |
| | T3_IBDQ | 129 | 91.81 | 9.443 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.41 | 8.330 |
| | T3_DASS | 129 | 19.84 | 7.641 |
| | T1_IBDSTRESS | 129 | 15.90 | 5.976 |
| | T2_IBDSTRESS | 129 | 16.02 | 4.480 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T3_IBDSTRESS | 129 | 13.65 | 3.766 |
| | T1_IBDSES | 129 | 143.57 | 48.059 |
| | T2_IBDSES | 129 | 150.22 | 29.664 |
| | T3_IBDSES | 129 | 155.48 | 25.708 |
| | T1_GQ | 129 | 32.41 | 6.378 |
| | T2_GQ | 129 | 31.93 | 5.302 |
| | T3_GQ | 129 | 32.34 | 3.960 |
| | T1_GAC | 129 | 10.16 | 3.212 |
| | T2_GAC | 129 | 9.71 | 2.768 |
| | T3_GAC | 129 | 10.31 | 2.512 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 8 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 86.59 | 12.631 |
| | T3_IBDQ | 129 | 91.23 | 9.617 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.57 | 8.467 |
| | T3_DASS | 129 | 19.80 | 7.851 |
| | T1_IBDSTRESS | 129 | 15.89 | 5.978 |
| | T2_IBDSTRESS | 129 | 15.82 | 4.475 |
| | T3_IBDSTRESS | 129 | 13.33 | 3.438 |
| | T1_IBDSES | 129 | 143.48 | 48.030 |
| | T2_IBDSES | 129 | 150.14 | 29.722 |
| | T3_IBDSES | 129 | 156.30 | 25.739 |
| | T1_GQ | 129 | 32.42 | 6.376 |
| | T2_GQ | 129 | 31.60 | 5.370 |
| | T3_GQ | 129 | 32.26 | 4.007 |
| | T1_GAC | 129 | 10.20 | 3.193 |
| | T2_GAC | 129 | 9.71 | 2.754 |
| | T3_GAC | 129 | 10.40 | 2.340 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 9 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 86.47 | 12.690 |
| | T3_IBDQ | 129 | 92.15 | 9.289 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.35 | 8.474 |
| | T3_DASS | 129 | 19.53 | 7.710 |
| | T1_IBDSTRESS | 129 | 15.92 | 5.979 |
| | T2_IBDSTRESS | 129 | 15.93 | 4.453 |
| | T3_IBDSTRESS | 129 | 13.45 | 3.566 |
| | T1_IBDSES | 129 | 143.43 | 48.022 |
| | T2_IBDSES | 129 | 150.13 | 29.763 |
| | T3_IBDSES | 129 | 154.24 | 25.895 |
| | T1_GQ | 129 | 32.43 | 6.375 |
| | T2_GQ | 129 | 31.57 | 5.312 |
| | T3_GQ | 129 | 31.96 | 3.956 |
| | T1_GAC | 129 | 10.21 | 3.201 |
| | T2_GAC | 129 | 9.74 | 2.650 |
| | T3_GAC | 129 | 10.27 | 2.358 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| 10 | T1_IBDQ | 129 | 86.18 | 18.002 |
| | T2_IBDQ | 129 | 86.74 | 12.533 |
| | T3_IBDQ | 129 | 91.42 | 9.414 |
| | T1_DASS | 129 | 21.26 | 13.437 |
| | T2_DASS | 129 | 20.25 | 8.539 |
| | T3_DASS | 129 | 20.18 | 7.734 |
| | T1_IBDSTRESS | 129 | 15.88 | 5.986 |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| | T2_IBDSTRESS | 129 | 15.88 | 4.472 |
| | T3_IBDSTRESS | 129 | 13.59 | 3.568 |
| | T1_IBDSES | 129 | 143.33 | 48.027 |
| | T2_IBDSES | 129 | 150.53 | 29.806 |
| | T3_IBDSES | 129 | 155.15 | 25.901 |
| | T1_GQ | 129 | 32.39 | 6.393 |
| | T2_GQ | 129 | 32.05 | 5.263 |
| | T3_GQ | 129 | 32.25 | 4.163 |
| | T1_GAC | 129 | 10.23 | 3.183 |
| | T2_GAC | 129 | 9.70 | 2.720 |
| | T3_GAC | 129 | 10.26 | 2.380 |
| | T1_REA | 125 | 22.38 | 6.006 |
| | T2_REA | 67 | 23.42 | 4.780 |
| | T3_REA | 32 | 23.63 | 5.961 |
| | T1_SUP | 125 | 15.94 | 5.284 |
| | T2_SUP | 67 | 15.58 | 5.366 |
| | T3_SUP | 32 | 15.66 | 5.141 |
| | Valid N (listwise) | 25 | | |
| Pooled | T1_IBDQ | 129 | 86.18 | |
| | T2_IBDQ | 129 | 86.62 | |
| | T3_IBDQ | 129 | 91.57 | |
| | T1_DASS | 129 | 21.26 | |
| | T2_DASS | 129 | 20.39 | |
| | T3_DASS | 129 | 19.87 | |
| | T1_IBDSTRESS | 129 | 15.91 | |
| | T2_IBDSTRESS | 129 | 15.86 | |
| | T3_IBDSTRESS | 129 | 13.58 | |
| | T1_IBDSES | 129 | 143.39 | |
| | T2_IBDSES | 129 | 150.21 | |
| | T3_IBDSES | 129 | 155.35 | |
| | T1_GQ | 129 | 32.42 | |
| | T2_GQ | 129 | 31.68 | |
| | T3_GQ | 129 | 32.27 | |
| | T1_GAC | 129 | 10.20 | |
| | T2_GAC | 129 | 9.78 | |
| | T3_GAC | 129 | 10.28 | |
| | T1_REA | 125 | 22.38 | |

*Descriptive estimates of outcome variables using original data and imputed data (10 imputations)*

| Imputation Number | N | Mean | Std. Deviation |
|---|---|---|---|
| T2_REA | 67 | 23.42 | |
| T3_REA | 32 | 23.63 | |
| T1_SUP | 125 | 15.94 | |
| T2_SUP | 67 | 15.58 | |
| T3_SUP | 32 | 15.66 | |
| Valid N (listwise) | 25 | | |