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Positive psychological well-being and clinical characteristics in IBS: A systematic review

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Abstract

Objective: Psychological factors (e.g., depression, anxiety) are known to contribute to the development and maintenance of irritable bowel syndrome (IBS). Less is known, however, about the role of positive psychological well-being (PPWB) in IBS. Accordingly, we completed a systematic review of the literature examining relationships between PPWB and clinical characteristics in IBS.

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Registration: Prospective Register of Systematic Reviews CRD42022304767.

Method: A systematic review using search terms related to PPWB and IBS from inception through July 28, 2022, was completed. Quality was assessed with the NIH Quality Assessment Tool. A narrative synthesis of findings, rather than meta-analysis, was completed due to study heterogeneity.

Results: 22 articles with a total of 4,285 participants with IBS met inclusion criteria. Individuals with IBS had lower levels of PPWB (e.g., resilience, positive affect, self-efficacy, emotion regulation) compared to healthy populations, which in turn was associated with reduced physical and mental health and health-related quality of life (HRQoL). Limited exploration of potential biological mechanisms underlying these relationships has been described.

Conclusions: PPWB is diminished in individuals with IBS compared to other populations, and greater PPWB is linked to superior physical, psychological, and HRQoL outcomes. Interventions to increase PPWB may have the potential to improve IBS-related outcomes.

Keywords

Psychology, Positive; Irritable Bowel Syndrome; Functional Gastrointestinal Disorders; Psychosomatic medicine

1. Introduction

Irritable bowel syndrome (IBS), characterized by abdominal pain and altered bowel habits, is the most common¹ and widely studied² disorder of gut-brain interaction (DGBI; also known as functional gastrointestinal (GI) disorder), and is thought to arise from complex interactions between biological, psychological, and social factors.³ Relationships between IBS and psychological disorders have been extensively examined.⁴ It is estimated that at least half of all patients with IBS have at least one comorbid psychiatric condition.⁵ Of these, anxiety disorders are the most common, with prevalence estimates ranging from approximately 30-50%,^{3,6} followed by depressive disorders, with rates ranging from 25-30%.^{3,6} Not only do self-reported anxiety and depression appear to confer a two-fold increased risk for IBS onset,⁷ but early research suggests that DGBI and anxiety/mood disorders have shared genetic susceptibilities.⁸ There is also evidence that comorbid psychiatric symptoms intensify GI symptomatology, heighten visceral hypersensitivity, and worsen quality of life.^{6,9,10} Additionally, negative psychological constructs and other personality factors – distinct from depressive and anxiety symptoms – such as catastrophizing, symptom hypervigilance, avoidance, perceived stress, pessimism, neuroticism, and alexithymia, have also been extensively studied and shown to exacerbate and maintain IBS symptomatology.^{3,4,11}

Less is known, however, about the role of positive psychological well-being (PPWB) in IBS. PPWB is comprised of a variety of positive psychological (PP) constructs, such as purpose in life, resilience, positive affect, optimism, and happiness, among others.¹² PP constructs have been linked to better health, including lower levels of pain, fewer physical symptoms, and longer survival, in both healthy individuals and those suffering from chronic medical conditions, such as coronary artery disease and chronic pain syndromes.¹³⁻¹⁶ Importantly, PPWB is not simply the absence of psychopathology; correlations between PP constructs

and symptoms of depression and anxiety are typically small to moderate.¹⁷ Additionally, PP constructs are significantly associated with both health behavior adherence and health outcomes, independent of negative psychological constructs.^{16,18,19} Early research also demonstrates that interventions comprised of simple exercises to cultivate PP constructs show promise in their ability to improve well-being,^{17,20} reduce distress/depressive symptoms,^{17,20} promote health behaviors,^{21,22} and improve targeted health outcomes, such as pain.²³ Based on these findings, as well as an emerging literature suggesting that PP constructs may also be important in IBS symptom management,²⁴ experts in the field of psychogastroenterology²⁵ have suggested ways in which PP interventions might be integrated into routine IBS clinical care.^{24,26}

Accordingly, in this systematic review, we aim to summarize the existing literature examining PP constructs in participant samples with IBS to identify: (1) relationships between PP constructs and presence of IBS, including comparisons to other populations; (2) whether PP constructs relate to physical health, mental health, and/or quality of life in patients with IBS; and (3) if any biological mechanisms might explain or contribute to these observed relationships.

2. Methods

2.1. Guidance and registration

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.²⁷ It was registered on the Prospective Register of Systematic Reviews (PROSPERO) on March 22, 2022 (CRD42022304767).

2.2. Study eligibility

Peer-reviewed observational cohort, cross-sectional, and case-control studies assessing PP constructs in individuals with IBS were eligible for inclusion. Study protocols, pre-published or incomplete data (e.g., conference abstracts), unpublished dissertations or theses, non-empirical publications (e.g., editorials, commentaries), reviews, and texts unavailable in the English language were excluded.

2.3. Search strategy

This review included searches within the following databases: Embase; PsycINFO; PubMed; MEDLINE; Web of Science; Google Scholar (first 200 references). This combination of databases was selected to support an optimal literature search.²⁸ Studies published from inception through July 28, 2022, were included. References of included studies were also reviewed. The search strategy aimed to identify the targeted studies by requiring at least one positive psychology-related term and one IBS-related term (Table 1).

2.4. Study Selection Process

Eligible studies were imported into Covidence online software (Veritas Health Innovation, Melbourne, Australia; <https://www.covidence.org>) and duplicates were removed. All titles and abstracts (n=888) and all full texts (n=73) were each screened twice by two independent

reviewers (E.N.M., H.B.M., M.S., L.E.H., R.M.L., H.L.A., J.J.). Disagreements were adjudicated by an independent reviewer (C.M.C.).

2.5. Data extraction

Data were extracted twice by two independent reviewers (E.N.M., M.S., L.E.H., R.M.L., H.L.A., J.Z., E.H.F., R.A.M., H.B.M.) with disagreements resolved through discussion to achieve consensus. Data extracted from each study included: sample size, study design, participant characteristics and demographics (age, gender, race/ethnicity, population type/medical diagnosis), IBS diagnostic criteria, PP construct examined and measurement type, statistical analysis, and PP-related findings and study results.

2.6. Risk of bias and quality assessment

Risk of bias was independently judged for each article by two reviewers (E.N.M., M.S., L.E.H., R.M.L., H.L.A., J.Z., E.H.F., R.A.M., H.B.M.) using the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.²⁹ This tool assesses risk of bias based on 14 questions examining: clarity of research question; study population definition; uniform use of inclusion/exclusion criteria; sample size justification; timing of exposure assessment (i.e., prior to outcome measurement); sufficient timeframe to see an effect; different levels of the exposure of interest; exposure measures and assessment; repeated exposure assessment; outcome measures; blinding of outcome assessors; follow-up rate; and statistical analyses. A summarized quality rating (good, fair, or poor) was then generated, consistent with prior studies.³⁰ Disagreements were resolved by the first author (E.N.M.) with assistance from the senior author (C.M.C.) as needed.

2.7. Data analysis and synthesis

The heterogeneity of studies (in terms of study design, outcome, and measurement) and the limited number of studies in each category precluded a meta-analysis. As such, a narrative synthesis of the findings of the systematic review was performed, following the Synthesis Without Meta-analysis (SWiM) guideline to improve transparency.³¹

3. Results

3.1. Participant and study characteristics

Figure 1 displays the PRISMA flow diagram for study inclusion. A total of 22 studies, published between 2008 and 2022, fulfilled the inclusion criteria for narrative synthesis (Table 2). Of the 22 studies included, all had a cross-sectional (n=21) or observational cohort (n=1) study design. Across included studies, the total number of participants was 8,837; sample sizes for IBS participants ranged from 50 to 820, and the total number of participants with IBS was 4,285. Twenty-one studies included adult participants aged 18 years or older, and one included adolescent participants between the ages of 14 and 15 years. Seventy-four percent of included participants were women, consistent with the roughly 2.5:1 female-to-male ratio among individuals with IBS.³² Among included studies, resilience was the most common PP construct examined (n=7), followed by self-efficacy (n=4), positive coping skills (n=4), positive psychological well-being (n=3), positive affect (n=2), emotion

regulation (n=2), sense of coherence (n=2), optimism (n=1), self-compassion (n=1), positive cognitions regarding one's illness (n=1), interpersonal forgiveness (n=1), humor (n=1), self-esteem (n=1), and hardiness (n=1). Most studies (n=16) utilized a version of the Rome criteria² to confirm IBS diagnosis; the remaining studies used clinician diagnosis (n=3), self-report (n=2), or did not specify (n=1).

3.2. Risk of bias assessment

Summarized quality ratings generated by the NIH Quality Assessment tool for Observational Cohort and Cross-Sectional Studies²⁹ are displayed in Table 2. Seventeen studies were rated as having good quality, five studies were rated as having fair quality, and no studies were rated as having poor quality. The most common concerns identified were: only a single exposure assessment (n=21); lack of sample size justification (n=18); unclear reporting of eligible person participation rate (n=14); lack of blinding of participants' exposure status (n=12); lack of statistical adjustment for potential confounding variables (n=7).

3.3. Outcomes of included studies

Included study findings can be summarized into the following categories: (1) comparison of PP constructs between IBS and other populations; (2) relationships between PP constructs and outcomes of interest including physical health, mental health, and quality of life in individuals with IBS; and (3) biological mechanisms that might underlie or contribute to these observed relationships.

3.3.1. Comparison of PP constructs between IBS and other populations—

Thirteen studies compared PP constructs between patients with IBS and other populations. Five studies compared resilience between individuals with IBS and other populations. Of these, four found that resilience was significantly lower in patients with IBS compared to healthy controls,³³⁻³⁶ and one found that average resilience scores were lower, but the difference was not significant.³⁷ To measure resilience, four studies utilized the validated Connor-Davidson Resilience Scale (CD-RISC),³⁸ and of these, two additionally utilized the validated Brief Resilience Scale (BRS)³⁹ The fifth study utilized the 25-item Resilience Coping Scale.⁴⁰

Three studies compared self-efficacy between individuals with IBS and other populations. Two studies found that individuals with IBS scored significantly lower on measures of self-efficacy than healthy controls^{35,41} Notably, one of these studies was in adults³⁵ and the other study looked at adolescents aged 14 and 15 years in two separate studies reported within the same paper, additionally finding no sex-related differences in self-efficacy among adolescents.⁴¹ The third study found no significant differences in self-efficacy between individuals with IBS and inflammatory bowel disease (IBD), but did not compare individuals with IBS to healthy controls.⁴² All three studies measured self-efficacy with the validated Generalized Self-Efficacy Scale (GSES).⁴³

Three studies compared levels of well-being between IBS and other populations. The first found that the average subjective well-being score, as well as several other well-being

attributes, including having adequate pleasure in life, feeling accepted by others, living in peace, believing in fairness in life, being successful, and overall happiness, were significantly lower in individuals with IBS compared to both individuals with GI symptoms but without IBS and compared to healthy controls (without any GI symptoms)⁴⁴ The second study found that mean scores for some components of well-being – including positive relations with others, environmental mastery, purpose in life, and acceptance – were significantly lower in women with IBS compared to healthy women³⁴ Lastly, the third study found that individuals with self-reported IBS had significantly worse psychological, emotional, and social well-being compared to individuals without IBS in response to the COVID-19 pandemic.⁴⁵

The three final studies comparing PP constructs to other populations examined positive affect, emotion regulation, and self-esteem, respectively. The study examining levels of positive affect (measured by the Positive and Negative Affect Schedule (PANAS)⁴⁶) found that levels of positive affect were significantly lower and levels of negative affect were significantly higher among IBS individuals than in normative samples.⁴⁷ The study examining emotion regulation (measured by the Difficulties in Emotion Regulation scale⁴⁸) found that participants with IBS reported significantly greater difficulty in emotion regulation than healthy controls.⁴⁹ And lastly, the study examining self-esteem found that patients with IBS reported higher levels of self-esteem than patients with IBD; the self-esteem scores, however, were not compared to healthy controls.⁴²

3.3.2. Relationships between PP constructs and other aspects of physical health, mental health, and health-related quality of life.

Physical health.: Seven studies identified relationships between PP constructs and aspects of physical health. Six studies identified relationships between PP constructs and IBS symptom severity. Of these, two studies found that lower levels of resilience (as measured by the BRS and CD-RISC), were associated with significantly higher IBS symptom severity.^{33,36} A third study found that patients whose IBS symptoms (e.g., abdominal pain) did not improve at 3 months had higher scores on the CD-RISC persistence subscale, while patients whose IBS symptoms improved at 3 months had higher scores on the CD-RISC adaptability subscale.⁵⁰ A fourth study found that lower levels of positive affect correlated with worse IBS symptom severity, and that positive affect mediated the relationship between other negative or adverse psychological traits/conditions (i.e., negative beliefs about emotions, an impoverished emotional experience) and IBS symptom severity.⁵¹ The fifth study found that greater optimistic coping was correlated with lower IBS symptom severity in unadjusted, but not adjusted analyses, accounting for sociodemographic factors and other factors associated with IBS symptom severity (e.g., anxiety, depression, other coping strategies).⁵² The sixth study found that improved emotional well-being was associated with a lower likelihood of worsening IBS symptom severity (based on a single-item question) during the COVID-19 pandemic in multivariable analyses.⁴⁵ Lastly, another study examined the relationship between self-efficacy and pain severity and interference, finding that reduced self-efficacy was significantly associated with greater pain interference (as measured by the Brief Pain Inventory⁵³).⁵⁴ No other measures of physical health, other than IBS symptom severity or pain severity/interference, were examined among included studies.

Mental health and other psychological characteristics.: Ten studies identified relationships between PP constructs and other aspects of mental health among individuals with IBS. Five of these studies examined relationships between different PP constructs, and seven of these studies examined relationships between PP constructs and psychopathology or maladaptive traits/conditions.

Of the five studies examining relationships between different PP constructs among individuals with IBS, there were a few key findings. First, hardiness (i.e., assessing unpleasant conditions as challenging rather than threatening) and interpersonal forgiveness were predictors of greater emotion regulation.⁵⁵ Second, greater agency (i.e., a positive focus on the self, greater confidence) significantly predicted reduced negative affect and greater positive affect, while a lack of agency predicted reduced positive affect among individuals with IBS.⁴⁷ Third, perceived self-efficacy and resilience were both positively correlated with task-oriented coping, and both negatively correlated with emotion-oriented coping.³⁵ Fourth, self-esteem and self-efficacy were positively correlated with each other.⁴² And lastly, greater self-compassion was predicted by greater mindfulness.⁵⁶

Key maladaptive or negative psychological factors examined in relationship to PP constructs included depression, anxiety, somatization, and psychological distress. Greater resilience,⁵⁷ positive illness cognition,⁵⁷ positive affect,⁵¹ optimistic coping,⁵² self-esteem,⁴² and self-efficacy,⁴² were each associated with fewer depressive symptoms. Greater positive affect,⁵¹ optimistic coping,⁵² self-esteem,⁴² and self-efficacy⁴² each negatively correlated with anxiety, in addition to depression. Positive affect was further found to partially mediate the relationship between both negative beliefs about emotions and impoverished emotional experience (i.e., alexithymia) and IBS interference (i.e., the extent to which IBS interferes with life roles).⁵¹ Self-esteem and self-efficacy also negatively correlated with somatization, in addition to depression and anxiety.⁴² Conversely, lower levels of psychological coping⁵⁸ correlated with more severe somatization and greater depression, overall anxiety, and GI-specific anxiety,⁵⁸ and greater use of avoidant and suppressive coping strategies was similarly associated with more depressive symptoms and reduced positive affect.⁵⁹ Further, greater self-compassion was found to predict less psychological distress.⁵⁶ In contrast, one study did not find any significant relationships between optimism (when measured with a single item question) and depressive symptoms or psychological distress.⁵⁷

Health-related quality of life.: Five studies identified relationships between PP constructs and HRQoL among individuals with IBS. First, lower resilience (as measured by the BRS) was associated with worse HRQoL (as measured by the IBS-Quality of Life (QOL)⁶⁰ survey).³³ Second, self-esteem was positively correlated with physical quality of life (as measured by the Short-Form-12 (SF-12)⁶¹), but not mental quality of life.⁴² Third, self-efficacy was positively correlated with both physical and mental quality of life (as measured by the SF-12)⁴² and improved global HRQoL (as measured by the IBS-QOL).⁵⁴ Fourth, positive affect was found to negatively correlate with the degree of IBS interference on life roles and the ability to work or function (as measured by The Work and Social Adjustment Scale (WSAS)).⁵¹ Lastly, a greater sense of coherence was significantly associated with improved HRQoL (as measured by the IBS-QOL) in bivariate analyses, but only the emotional functioning and mental health dimensions of the IBS-QOL remained significant

in a linear regression accounting for gender, average stool frequency, GI symptom severity, psychological distress, GI-specific anxiety, somatic symptom severity, and rectal pain threshold.⁶²

3.3.3. Biological mechanisms—Three studies investigated potential biological mechanisms underlying relationships between PP constructs and IBS. Park and colleagues (2018) identified a significant interaction between BRS-measured resilience and IBS status for adrenocorticotrophic hormone (ACTH)-stimulated cortisol response, such that less resilient controls had a lower cortisol response to ACTH stimulation, while less resilient participants with IBS had an enhanced cortisol response.³³ Eriksson and colleagues (2008) found that patients with IBS-Diarrhea (IBS-D) had significantly higher C-peptide values compared to healthy controls, as well as a greater sense of coherence compared to patients with IBS-Constipation (IBS-C) and IBS-Alternating (IBS-A). Patients with IBS-C had significantly higher prolactin levels than both healthy controls and patients with IBS-D. All three subtypes (IBS-D, IBS-C, and IBS-Mixed) had significantly higher triglycerides than healthy controls. No significant differences, however, were identified between individuals with IBS and healthy controls in morning or afternoon cortisol levels.⁶³ Lastly, Bhatt and colleagues (2022) found that patients whose IBS symptoms did not improve at three months had higher scores on the CD-RISC persistence subscale (a measure of resilience), which was associated with lower anatomical connectivity within the dorsolateral prefrontal cortex, as well as greater resting-state functional connectivity in circuits related to sustained attention. They postulated this might reflect a tendency toward increased perseveration on painful stimuli. They also found that patients whose IBS symptoms improved after three months had greater scores on the CD-RISC adaptability subscale, which was associated with greater default mode resting-state connectivity and corticospinal tract integrity. They postulated this latter finding might reflect improved pain-relieving modulatory mechanisms. Bhatt and colleagues (2022) note in their limitations, however, that they did not include a control group of healthy volunteers, other GI conditions (e.g., IBD), or other chronic pain conditions, which might have provided additional insight into whether these findings are unique to IBS.⁵⁰

4. Discussion

To our knowledge, this is the first systematic review investigating PPWB in individuals with IBS. This review identified key differences in PP constructs among individuals with IBS compared to healthy populations; namely, individuals with IBS have lower levels of resilience, self-efficacy, well-being, and positive affect, and greater difficulty with emotion regulation. Furthermore, among individuals with IBS, greater PPWB (as measured by specific PP constructs) correlates with improved physical health, mental health, and HRQoL. Currently, limited research has been conducted to examine potential biological mechanisms that might explain or underlie these observed relationships.

These findings extend the existing literature of what is known about PPWB in healthy populations and other chronic medical conditions.¹³⁻¹⁶ As previously noted, in both healthy individuals and those suffering from other chronic medical conditions, PP constructs have been linked to many different aspects of improved health, including reduced pain and

fewer physical symptoms.¹³⁻¹⁶ We similarly found that greater resilience, positive affect, optimistic coping, and improved emotional well-being may be associated with reduced severity of IBS symptoms, and greater self-efficacy may be associated with less interference from pain in IBS individuals.

The findings of this systematic review also highlight, however, areas in need of further investigation. Optimism, for example, is the PP construct that has been most strongly associated with improved health outcomes across different populations,^{64,65} yet very limited examination of optimism has been conducted in the IBS population. This systematic review, for example, identified only one study that examined optimism directly (using a single item yes/no question),⁵⁷ and two studies that examined optimistic coping;^{52,58} no studies utilized standard measures of optimism such as the Life Orientation Test.⁶⁶ Similarly, few studies in this systematic review adjusted for negative psychological constructs (e.g., catastrophizing) or psychiatric conditions (e.g., depression) when examining the impact of PP constructs on outcomes of interest (e.g., physical health, mental health, HRQoL); further investigation in this area is needed to help disentangle the relative effects of positive versus negative psychological constructs on these outcomes. Additionally, most studies in this review compared PP constructs between individuals with IBS and healthy controls; greater comparison of PP constructs between individuals with IBS and other chronic medical conditions could provide improved insight into the IBS experience. Furthermore, potential underlying mechanisms such as inflammation, autonomic dysfunction, and health behavior change, among others, have been examined in other populations,⁶⁴ yet very little research to date (only three studies per this systematic review) has investigated either behavioral or biological pathways that might underlie the observed relationships between PPWB and IBS. Lastly, while there is a strong prospective literature around PPWB and physical health in other chronic conditions (e.g., heart disease),^{18,67} this does not appear to exist yet for IBS.

Collectively, the findings of this systematic review, combined with the demonstrated prospective relationships between PP constructs and health outcomes in other populations, suggest that PP constructs have the potential to be a clinically important target in IBS. There are existing brain-gut behavior therapies (e.g., cognitive-behavioral therapy) for DGBI that effectively target some of the maladaptive psychological factors that contribute to IBS symptomatology.¹¹ Though highly effective, implementation of these brain-gut behavior therapies is limited by issues of scalability (i.e., these therapies typically require behavioral health providers with specialized training)⁶⁸ and acceptability (e.g., many patients with IBS resist participation in interventions focused on psychopathology, due to stigma or perceived lack of relevance to their symptoms).^{26,69} Additionally, existing brain-gut behavior therapies may not adequately target the aspects of PPWB (e.g., resilience, positive affect) which are linked to improved physical health, mental health, and HRQoL.²⁶ Comprised of simple, easy-to-perform exercises to boost PP constructs, PP interventions have the potential to address limitations of other brain-gut behavior therapies in that their administration does not require specialized training,^{26,70} and they are typically well-accepted and perceived as non-stigmatizing.^{26,70} Though leaders in the field of psychogastroenterology have suggested that there may be a role for PP interventions to be integrated early into the clinical care of IBS,^{24,26} the use of PP interventions in individuals with IBS remains to be studied. If the early introduction of PP interventions, perhaps even by the treating gastroenterologist as part

of routine care, were found to be effective for individuals with IBS, the hope is that other brain-gut behavior therapies (e.g., cognitive behavioral therapy), which require specialized providers, could then be reserved for more complex or severe cases in a stepped-care approach.²⁶ The use of PP interventions in IBS represents an area of much needed future investigation.

Potential limitations to this systematic review should be noted. First, different instruments were used to assess IBS; the vast majority (n=16), however, used a version of the Rome criteria.² Second, different PP constructs and associated measures, measurement parameters, and methods limit the comparability of results across studies. Third, despite the rigorousness of the approach to this systematic review (i.e., PRISMA-compliant, registered in PROSPERO, following the SWiM guideline³¹), a meta-analysis could not be completed due to the heterogeneity of studies and limited number of studies in each category. Lastly, it should be noted that this systematic review examined primarily cross-sectional studies, which limits the ability to determine directionality of the described relationships.

In summary, PPWB represents an important future area of investigation in IBS. PP constructs are lower among individuals with IBS compared to healthy populations, and greater PPWB is associated with improved physical health, mental health, and HRQoL. Future studies are needed to evaluate the directionality of these relationships using longitudinal study design, and to evaluate whether PP interventions might be effective in building PPWB and improving health outcomes in the complex and high-comorbidity IBS population.

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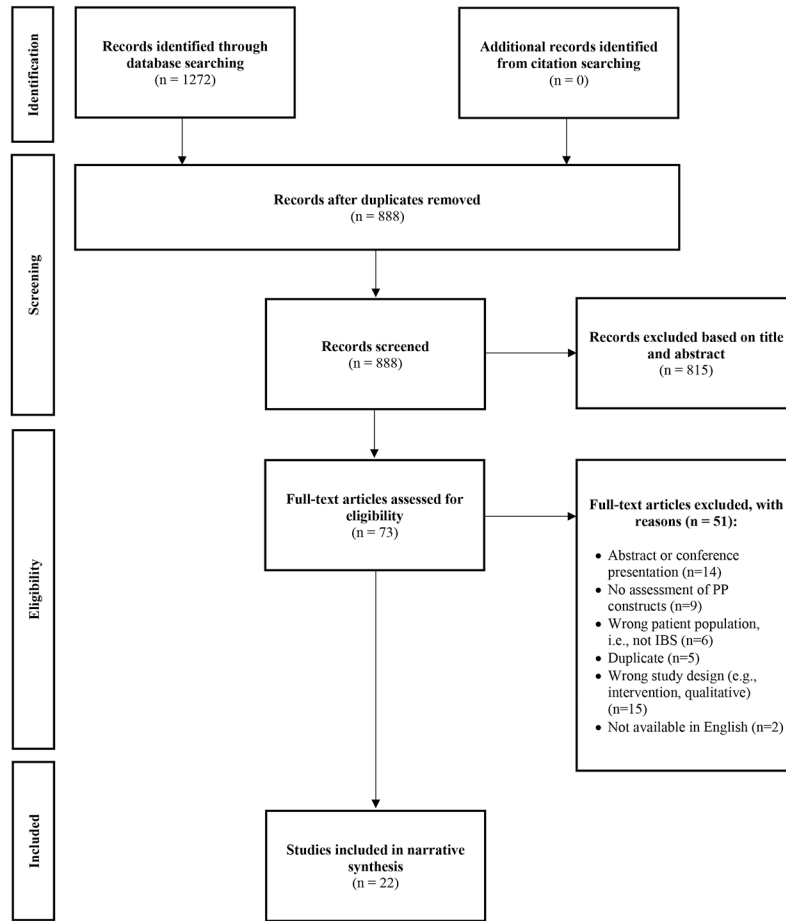


Figure 1.
Flow diagram of the literature search

Table 1.

Search terms

Databases	Positive psychology terms	IBS-related terms
Embase	"Positive-psycho*," OR "joy," OR "resilience," OR "positive-affect," OR "optimism," OR "happiness," OR "happy," OR "gratitude," OR "kindness," OR "forgive*," OR "psychology, positive," "self-regulat*," OR "grit," OR "self-compassion," OR "self-efficacy," OR "mastery"	"Irritable bowel syndrome" OR "IBS"
Google Scholar (first 200 references)		
MEDLINE		
PsycINFO		
PubMed		
Web of Science		

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Table 2.

Summary of studies examining relationships between PP constructs and IBS.

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Ben Ezra et al., 2015 ⁵⁷	Cross-sectional	IBS: 103	<ul style="list-style-type: none"> IBS (all subtypes): Age (mean, yrs): 24.5 +/- 6.2 Female: 33% 	GI clinician diagnosis	<ul style="list-style-type: none"> Resilience (Connor-Davidson Resilience Scale [CD-RISC]) Positive cognitions regarding one's illness (Illness Cognition Questionnaire [ICQ]) Optimism (single item yes/no question) 	<ul style="list-style-type: none"> Resilience was associated with fewer depressive symptoms ($\beta = -0.44, p < 0.001$) and psychological distress ($\beta = -0.47, p < 0.001$) controlling for age, gender, marital status, and optimism. Optimism was not associated with depressive symptoms or psychological distress when controlling for the same variables. Positive illness cognition was associated with fewer depressive symptoms ($\beta = -0.41, p < 0.001$) and lower psychological distress ($\beta = -0.51, p < 0.001$) controlling for age, gender, marital status, resilience, and optimism. 	Good
Bhatt et al., 2022 ⁵⁰	Observational cohort	IBS: 60	<ul style="list-style-type: none"> IBS (all subtypes): Age (mean, yrs): 29.1 +/- 11.5 Female: 100% 	Rome III criteria	Resilience (CD-RISC)	<ul style="list-style-type: none"> Patients whose IBS symptoms did not improve (as measured by the IBS-Symptom Severity Scale [IBS-SSS]) at 3 months had higher scores on the CD-RISC persistence subscale, which was associated with lower anatomical connectivity within the dorsolateral prefrontal cortex, as well as greater resting-state functional connectivity in circuits related to sustained attention, 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Chen et al, 2022 ⁵⁴	Cross-sectional	IBS: 80 Note: participants with other chronic pain conditions (e.g., fibromyalgia) were excluded.	IBS (all subtypes): <ul style="list-style-type: none"> Age (mean, yrs): 21.4 +/- 2.6 Female: 76% 	Healthcare provider diagnosis of IBS	<ul style="list-style-type: none"> Self-Efficacy for Managing Chronic Disease [SEMCD] and Index of Self-Regulation [ISR]) Positive coping response to pain and perceived control over pain (The Coping Strategies Questionnaire-Revised [CSQR]) 	<p>postulated to reflect increase perseveration on painful stimuli.</p> <ul style="list-style-type: none"> Patients whose IBS symptoms improved (per IBS-SSS) at 3 months had greater scores on the CD-RISC adaptability subscale, which was also associated with greater default mode resting-state connectivity and corticospinal tract integrity. This was postulated to relate to reflect pain-relieving modulatory mechanisms, though requires further investigation. 	Good
						<ul style="list-style-type: none"> Reduced self-efficacy (as measured by SEMCD) was significantly associated with greater pain interference (as measured by the Brief Pain Inventory [BPI]) ($p=.006$) on multivariable logistic regression. Greater self-efficacy was positively correlated with improved quality of life (as measured by IBS-QOL) ($p=.018$) on multivariable logistic regression. On mediation analyses, the indirect effect of fatigue on IBS-QOL passing through self-efficacy was statistically significant. 	

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Dabek-Drobny et al., 2020 ³⁵	Cross-sectional	IBS: 94 Controls (healthy): 35	Overall age (mean, yrs): 30.7 +/- 8.3 IBS (all subtypes): • Female: 75% Controls: • Female: 60%	Rome IV criteria	<ul style="list-style-type: none"> Self-efficacy (Generalized Self-Efficacy Scale [GSES]) Resilience (25-item Resilience Coping Scale [SPP-25]) 	<ul style="list-style-type: none"> IBS patients had significantly lower levels of perceived self-efficacy ($p<0.05$) and resilience ($p<0.05$) compared to controls. Perceived self-efficacy was positively correlated with task-oriented coping and negatively correlated with emotion-oriented coping ($p<0.01$). Resilience was also significantly correlated with task-oriented coping ($p<0.01$) and negatively correlated with emotion-oriented coping ($p<0.01$). 	Fair
Endo et al., 2011 ⁴¹	Cross-sectional	IBS: • Study 1: 251 • Study 2: 111 Controls (healthy): • Study 1: 362 • Study 2: 171	IBS (all subtypes): Study 1: • Age (mean, yrs): 15 • Female: 58% Study 2: • Age (mean, yrs): 4 • Female: 62% Controls: Study 1: • Age (mean, yrs): 15 • Female: 59% Study 2: • Age (mean, yrs): 14 • Female: 52%	Rome II criteria	<ul style="list-style-type: none"> Self-efficacy (GSES) 	<ul style="list-style-type: none"> There were no significant differences in self-efficacy (scores on GSES) between boys and girls with IBS in either Study 1 or Study 2. Individuals with IBS scored significantly lower on the GSES than healthy controls ($p<0.0001$) in Study 2. 	Good
Eriksson et al., 2008 ⁶³	Cross-sectional	IBS: 80 • IBS-D: 30	IBS (all subtypes): • Age: range 21-65 (no mean provided)	Rome II criteria and clinician diagnosis	<ul style="list-style-type: none"> Sense of coherence, including meaningfulness as a 	<ul style="list-style-type: none"> Sense of coherence was significantly lower in the IBS-C ($p<0.001$; $p<0.001$) and IBS-A ($p<0.001$; $p<0.001$). 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Farhadi et al., 2018 ⁴⁴	Cross-sectional	<ul style="list-style-type: none"> IBS-C: 16 IBS-A: 34 Controls (healthy): 21	<ul style="list-style-type: none"> IBS-D: 30% female IBS-C: 94% female IBS-A: 100% female Controls: <ul style="list-style-type: none"> Age: range 21-61 yrs (no mean provided) Female: 86% 	Rome IV criteria	<ul style="list-style-type: none"> subcomponent (Sense of Coherence Scale [SOC]) 	<p>groups compared to healthy control and IBS-D groups, respectively. There were no significant differences in sense of coherence between IBS-D and healthy controls.</p> <ul style="list-style-type: none"> Meaningfulness specifically was significantly lower in the IBS-C (p<0.001; p<0.05) and IBS-A (p<0.001; p<0.001) groups compared to healthy control and IBS-D groups, respectively. There were no significant differences in meaningfulness between IBS-D and healthy controls. IBS-D patients had significantly higher C-peptide values (p<0.05) compared to healthy controls. IBS-C patients had significantly higher prolactin levels than healthy controls (p<0.05) and IBS-D patients (p<0.01) All three subtypes had significantly higher triglycerides than healthy controls. No significant differences were identified between groups in morning or afternoon cortisol levels. 	Good
		IBS: 91 Other GI symptoms: 134	IBS (all subtypes): <ul style="list-style-type: none"> Age (range, %): 		<ul style="list-style-type: none"> Subjective well-being characterized by several attributes 	<ul style="list-style-type: none"> The average subjective well-being score was significantly lower in those with IBS 	

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
		Controls (no GI symptoms): 191	<ul style="list-style-type: none"> 18-24: 3% 25-34: 12% 35-44: 14% 45-54: 27% 55-64: 29% 65-74: 6% 75: 0% Female: 90% 		including having adequate pleasure in life, living in peace, feeling accepted by others, and a general sense of optimism (measured by a Positive Psychology Questionnaire generated by the study authors).	<ul style="list-style-type: none"> compared to those with GI symptoms without IBS ($p=0.001$) and compared to controls ($p<0.001$). Individuals with IBS scored significantly lower on several well-being attributes compared to individuals with GI symptoms without IBS and compared to controls without GI symptoms including adequate pleasure in life ($p=0.007$, $p<0.001$), feeling accepted by others ($p=0.046$, $p<0.001$), living in peace ($p=0.042$, $p<0.001$), believing in fairness in life ($p=0.017$, $p=0.003$), being successful ($p=0.006$, $p<0.001$), and overall happiness in life ($p=0.001$, $p<0.001$), respectively. 	
			<ul style="list-style-type: none"> GI symptoms: <ul style="list-style-type: none"> Age (range, %): <ul style="list-style-type: none"> 18-24: 7% 25-34: 9% 35-44: 22% 45-54: 46% 55-64: 34% 65-74: 18% 75: 2% Female: 85% Controls: <ul style="list-style-type: none"> Age (range, %): <ul style="list-style-type: none"> 18-24: 17% 				

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Mazaheri et al., 2015 ⁵⁵	Cross-sectional	IBS: 123	<ul style="list-style-type: none"> • IBS (all subtypes): <ul style="list-style-type: none"> • Age (mean, yrs): 33.8 +/- 10.5 • Female: 83% • Female: 25% 	Rome III criteria	<ul style="list-style-type: none"> • Hardiness (Lang and Goulet Hardiness Scale [LGHS]) • Interpersonal forgiveness (Interpersonal Forgiveness Inventory [IFI-25]) • Difficulties in Emotion Regulation [DERS] 	<ul style="list-style-type: none"> • Hardiness (OR 0.94 [0.90-0.98]) was a predictor of emotional regulation. • Forgiveness (OR 0.96 [0.93-0.98]) was a predictor of emotional regulation. 	Good
Melchior et al., 2022 ⁶²	Cross-sectional	IBS: 314	<ul style="list-style-type: none"> • IBS-D: 132 • IBS-C: 69 • IBS-M: 38 • IBS-U: 75 	Rome II or III criteria	<ul style="list-style-type: none"> • Sense of coherence (SOC) 	<ul style="list-style-type: none"> • Greater sense of coherence was significantly associated with improved overall disease specific QOL (as measured by IBS-QOL) ($p < 0.001$) in bivariate analyses, but not in the general linear regression accounting for gender, average stool frequency, GI symptom severity, psychological distress, GI-specific anxiety, overall somatic symptom severity, and rectal pain threshold. 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Park et al., 2018 ³³	Cross-sectional	IBS: 154 Controls (healthy): 102	IBS (all subtypes): <ul style="list-style-type: none"> Age (mean, yrs): 29.4 +/- 9.7 Female: 71% Controls: <ul style="list-style-type: none"> Age (mean, yrs): 28.6 +/- 9.8 Female: 61% 	Rome III criteria	<ul style="list-style-type: none"> Resilience ((CD-RISC) and Brief Resilience Scale (BRS)) 	<ul style="list-style-type: none"> Significance remained when looking at emotional functioning (p=0.001) and mental health (p=0.034) dimensions only of the IBS-QOL. Resilience was significantly lower in IBS compared to healthy controls (CD-RISC: 72.16 +/- 14.97 vs. 77.32 +/- 12.73, p=0.003; BRS: 3.29 +/- 0.87 vs. 3.93 +/- 0.69, p<0.001), independent of exposure to early adverse life events (p=0.019 for CD-RISC and p<0.001 for BRS). Lower resilience as measured by both the CD-RISC (p=0.008) and BRS (p=0.002) was associated with greater IBS symptom severity and worse IBS-QOL (p<0.001), independent of levels of perceived stress. A significant interaction was observed between BRS resilience and IBS status for ACTH stimulated cortisol response (p=0.031). 	Good
Parker et al., 2021 ³⁶	Cross-sectional	IBS: 820 Controls (general population, including 95 individuals with other chronic GI conditions): 1026	IBS (all subtypes): <ul style="list-style-type: none"> Age (mean, yrs): 45.1 +/- 15.1 Female: 85% Controls (general population):	Rome III or IV criteria or physician-made diagnosis	<ul style="list-style-type: none"> Resilience (CD-RISC and BRS) 	<ul style="list-style-type: none"> Respondents with IBS had significantly lower mean resilience scores compared with the general population group as measured by BRS ($\beta=-0.23$; 95% confidence interval [CI], -0.32 to -0.15; p< .001) and CD-RISC ($\beta=-3.84$; 95% CI, 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Potter et al., 2020 ⁵⁶	Cross-sectional	IBS: 144	<ul style="list-style-type: none"> Age (mean, yrs): 40.4 +/- 13.8 Female: 67% 	Rome III criteria	<ul style="list-style-type: none"> Self-compassion (Self-Compassion Scale [SCS]) 	<ul style="list-style-type: none"> Resilience (as measured by CD-RISC and BRS) was not significantly different between individuals with IBS and other chronic GI conditions. Decreased resilience as measured by BRS ($\beta=-0.002$; 95% CI, -0.002 to -0.0008; $p<.001$) and CD-RISC ($\beta=-0.015$; 95% CI, -0.03 to -0.001; $p=.032$) was associated with worse IBS symptom severity as measured by the IBS-SSS. Greater self-compassion predicted less psychological distress (measured by the Depression Anxiety Stress Scale-21 (DASS-21) ($\beta=-.17$, $p<.05$). Greater mindfulness (measured by a modified Five Facet Mindfulness Questionnaire (FEMQ-M)) predicted greater self-compassion ($\beta=-.76$, $p<.001$). 	Good
Quek et al., 2021 ⁴⁵	Cross-sectional	IBS: 305 Controls (without IBS): 2024	<ul style="list-style-type: none"> Age (mean, yrs): 40.1 +/- 13.0 Female: 61% <p>Controls:</p>	Self-report	<ul style="list-style-type: none"> Mental Health Continuum-Short Form [MCH-SF], which assesses psychological, emotional, and social well-being, and 	<ul style="list-style-type: none"> Participants with self-reported IBS reported significantly worse psychological, emotional, and social well-being compared to participants without IBS ($p<.001$) in response to the COVID-19 pandemic. 	Fair

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Selvi & Bozo, 2022 ⁴⁹	Cross-sectional	IBS: 105 Controls (without IBS): 105, randomly selected from 687	<ul style="list-style-type: none"> Age (mean, yrs): 39.7 +/- 12.9 Female: 64% 	Rome III criteria	degree of flourishing	<ul style="list-style-type: none"> Improved emotional well-being was associated with lower odds of worsening IBS severity on both univariate (OR 0.9, 95% CI[0.8-1.0]) and multivariate (OR 0.9, 95% CI [0.8-1.0]) analyses. A higher proportion of respondents who reported no change in IBS severity were flourishing and had significantly greater emotional well-being (p=0.014) compared to those with worsened IBS severity. 	Good
Shahdadi et al., 2017 ³⁴	Cross-sectional	IBS: 50 Controls (healthy): 50	<p>IBS (all subtypes):</p> <ul style="list-style-type: none"> Age (mean, yrs): 22.8 +/- 5.1 Female: 77% <p>Controls:</p> <ul style="list-style-type: none"> Age (mean, yrs): 22.1 +/- 3.9 Female: 39% 	Rome III criteria	<ul style="list-style-type: none"> Difficulties in Emotion Regulation [DEERS] 	<ul style="list-style-type: none"> Participants with IBS reported significantly greater difficulties in emotion regulation in both multivariate (p<0.001) and univariate analyses compared to participants without IBS. In univariate analyses, only the strategy (p=0.001) and impulse (p=0.002) components of emotion regulation were significantly more difficult for individuals with IBS. 	Good
		IBS: 50 Controls (healthy): 50	<p>IBS (all subtypes):</p> <ul style="list-style-type: none"> Age (mean, yrs): 34.8 +/- 21.8 Female: 100% <p>Controls:</p>	Undergoing medical treatment for IBS	<ul style="list-style-type: none"> Resilience (CD-RISC) Psychological well-being (Ryff's Scale of Psychological Well-being) 	<ul style="list-style-type: none"> Mean scores for resilience (p=0.001) and some components of positive psychological well-being (positive relations with others (p=0.002), environmental mastery (p=0.001), purpose in life (p=0.0001), and 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Sibelli et al., 2018 ⁵¹	Cross-sectional	IBS: 558	<ul style="list-style-type: none"> Age (mean, yrs): 35.5 +/- 6.4 Female: 100% <p>IBS (all subtypes):</p> <ul style="list-style-type: none"> Age (mean, yrs): 42.5 +/- Female: 76% <p>Note: Participants had refractory IBS, defined by IBS-SSS score of 75 or more despite being offered first-line therapies and a symptom duration of at least 12 months.</p>	Rome III criteria	<ul style="list-style-type: none"> Positive affect (PANAS) 	<ul style="list-style-type: none"> acceptance ($p=0.001$) were significantly lower in women with IBS than healthy controls. Positive affect negatively correlated with IBS symptom severity (measured by IBS-SSS) (-0.21; $p<0.01$), IBS interference with life roles and ability to work/function (as measured by The Work and Social Adjustment Scale (WSAS) (-0.31; $p<0.01$)), anxiety (as measured by the Hospital Anxiety and Depression Scale (HADS-A) (-0.43; $p<0.01$), and depression (HADS-D) (-0.68; $p<0.01$)). Positive affect partially mediated the relationship between negative beliefs about emotions and IBS interference ($\beta=0.09$, $p<0.001$), and the relationship between impoverished emotional experience and IBS interference ($\beta=0.10$, $p<0.001$). Positive affect mediated the relationship between negative beliefs about emotions and IBS symptom severity ($\beta=0.07$, $p<0.001$). Positive affect mediated the relationship between impoverished emotional experience and IBS symptom 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Sugawara et al., 2017 ⁵⁹	Cross-sectional	IBS: 58	<p>IBS (all subtypes):</p> <ul style="list-style-type: none"> Age (mean, yrs): 49.9 +/- 17.5 Female: 67% 	Rome III criteria	<ul style="list-style-type: none"> Ability to cope in response to daily stressful circumstances (Brief Scale for Coping Profile [BSCP]) 	<ul style="list-style-type: none"> Multiple regression analysis showed that "active solution" coping behaviors were significantly associated with somatic symptoms ($\beta=0.42$; $p<0.05$), one of four underlying factors measured by the Center for Epidemiologic Studies Depression Scale (CES-D). "Avoidance and suppression" coping behaviors were associated with total CES-D score ($p<0.001$), as well as three of the CES-D underlying factors including depressed affect ($p<0.01$), somatic symptoms ($p<0.001$), and lack of positive affect ($p<0.01$). 	Good
Taft et al., 2011 ⁴²	Cross-sectional	IBS: 269 IBD: 227	<p>IBS (all subtypes)</p> <ul style="list-style-type: none"> Age (range, %): <ul style="list-style-type: none"> 18-29: 31% 30-45: 35% 46-55: 19% >55: 15% Female: 86% <p>IBD:</p> <ul style="list-style-type: none"> Age (range, %): <ul style="list-style-type: none"> 18-29: 31% 	Self-report	<ul style="list-style-type: none"> Self-efficacy (GSES) Self-esteem (Rosenberg self-esteem scale [RSES]) 	<ul style="list-style-type: none"> Self-esteem was positively correlated with physical quality of life (as measured by the Short-Form-12 (SF-12)) ($r=-.42$), mental quality of life ($r=-.65$), and self-efficacy ($r=.72$), and negatively correlated with depression (Brief symptom inventory-18 (BSI-18) ($r=-.56$), anxiety (BS-18) ($r=-.62$), and somatization (BS-18) ($r=-.50$)). Self-efficacy was positively correlated with physical quality of life ($r=-.48$), 	Good

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Torkzadeh et al., 2019 ⁵²	Cross-sectional	IBS: 95	<ul style="list-style-type: none"> • 30-45: 43% • 46-55: 19% • >55: 8% • Female: 78% 	Rome III criteria applied by a GI or internal medicine physician	<ul style="list-style-type: none"> • Eight situation-specific coping behaviors including optimistic coping (Jalowiec Coping Scale [JCS]) 	<ul style="list-style-type: none"> • and self-esteem ($r=-.72$), and negatively correlated with depression (BSI-18) ($r=-.44$), anxiety (BS-18) ($r=-.47$), and somatization (BS-18) ($r=-.39$). • There were no significant differences between IBS and IBD patients in self-efficacy ($p=0.19$). • IBS patients reported higher levels of self-esteem than IBD patients ($p=.002$). 	Good
Voci et al., 2009 ⁴⁷	Cross-sectional	IBS: 144	<ul style="list-style-type: none"> • IBS-D: 43 • IBS-C: 10 • IBS-M: 90 • IBS-U: 1 	Rome III criteria	<ul style="list-style-type: none"> • Positive Affect (Positive and Negative Affect Schedule [PANAS]) 	<ul style="list-style-type: none"> • Greater agency (i.e., a focus on the self, greater confidence significantly predicted lower negative affect ($\beta=-.30$, $p<0.01$) and higher positive affect ($\beta=0.21$, $p<0.05$). • Lack of agency predicted lower levels of positive affect ($\beta=-.30$, $p<0.01$). 	Fair

Study	Study Design	Sample size (N)	Sample characteristics	Assessment of IBS	Assessment of PP construct	Findings	Quality Assessment
Wilpart et al., 2017 ⁵⁸	Cross-sectional	IBS: 216	IBS (all subtypes): <ul style="list-style-type: none"> Age (mean, yrs): 40.4 Female: 70% 	Rome II Criteria	<ul style="list-style-type: none"> Coping strategies for managing stress and ability to recover from stressful situations, including cognitive coping which includes use of optimism (Coping Resources Scale [CRS]) 	<ul style="list-style-type: none"> Levels of positive affect were significantly lower ($p<0.001$) and levels of negative affect were significantly higher ($p<0.001$) than in normative samples. Lower levels of psychological coping (incorporating cognitive coping scores) were correlated with more severe somatization (as measured by the Symptom Check List-90 Revised) ($r=-0.24$, $p=0.0004$) and greater anxiety (as measured by the HADS-A) ($r=-0.32$, $p<0.001$), depression (as measured by the HADS-D) ($r=-0.53$, $p<0.001$), and GI-specific anxiety (as measured by the Visceral Sensitivity Index) ($r=-0.22$, $p<0.01$). 	Fair
Zarpour & Besharat, 2010 ³⁷	Cross-sectional	IBS: 60 Controls (healthy): 104	IBS (all subtypes): <ul style="list-style-type: none"> Age (mean, yrs; range): 27.9; 17-50 Female: 57% Controls: <ul style="list-style-type: none"> Age (mean, yrs; range): 27.5; 17-50 Female: 63% 	Not specified	<ul style="list-style-type: none"> Resilience (CD-RISC) 	<ul style="list-style-type: none"> The average resilience score was lower among individuals with IBS compared to healthy controls (90.61 +/-13.3 vs. 96.35 +/- 16.9) but the difference was not significant. There was similarly no significant difference in resilience between IBS and controls on multivariate analysis ($F=1.40$, $p=0.23$). 	Fair

Note: PP=positive psychological. IBS=Irritable bowel syndrome. IBS-D=diarrhea subtype. IBS-C=constipation subtype. IBS-U=unspecified subtype. IBS-A=alternating subtype (Rome II). GI=gastrointestinal. IBS-QOL=IBS-Quality of Life. ACTH=adrenocorticotropic hormone.