

Hypnosis and Cognitive Behavioral Therapies for the Management of Gastrointestinal Disorders

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Abstract

Purpose of Review To review the nature, current evidence of efficacy, recent developments, and future prospects for cognitive behavioral therapy (CBT) and gut-directed hypnotherapy, the two best established psychological interventions for managing gastrointestinal (GI) disorders.

Recent Findings New large randomized controlled trials are showing that cost-effective therapy delivery formats (telephone-based, Internet-based, fewer therapist sessions, or group therapy) are effective for treating GI disorders.

Summary CBT and hypnotherapy can produce substantial improvement in the digestive tract symptoms, psychological well-being, and quality of life of GI patients. However, they have long been hampered by limited scalability and significant cost, and only been sufficiently tested for a few GI health problems. Through adoption of more cost-effective therapy formats and teletherapy, and by expanding the scope of efficacy testing to additional GI treatment targets, these interventions have the potential to become widely available options for improving clinical outcomes for patients with hard-to-treat GI disorders.

Keywords Cognitive behavioral therapy · Hypnotherapy · Brain-gut axis · Functional gastrointestinal disorders

Introduction

Psychological therapies have more than three decades of history as empirically tested interventions for gastrointestinal (GI) disorders. The principal reason for this is long-standing recognition of substantial involvement of various psychosocial influences in gastrointestinal health problems. This is best established for the functional GI disorders (which are now also called disorders of gut-brain interaction), a group of more than thirty conditions that have in common that they have no identifiable structural, biochemical, or infectious causes, whereas intestinal functioning and visceral perception are disturbed [1]. A large literature has documented association of a

range of psychological factors with symptom severity, poorer outcomes, and quality of life impairment in these disorders. They include elevated life stress, anxiety and depression, sexual and physical trauma history, maladaptive psychological and behavioral coping styles, and somatization [2–4]. These psychosocial factors have also been reported to affect symptoms and well-being in organic GI disorders such as inflammatory bowel disease [3, 5, 6].

In recent years, the means by which these psychological and social factors affect the gut are gradually becoming clearer, as appreciation has rapidly grown of the important role of the brain-gut axis—a complex two-way communication pathway between the central nervous system and the enteric nervous system consisting of neural, endocrine, and immune signals. The central nervous system not only perceives what is happening in the gut, but actively and continually exerts tuning influences to help maintain homeostasis and adapt gut functions to the shifting demands of daily activity. Stress-related disruption of that regulating activity, and especially when stress becomes chronic, can either lead to or exacerbate GI symptoms. High levels of stress or intensely upsetting emotional experiences can alter brain-gut regulation in a number of ways, as brain regions involved with threat appraisal and negative emotions become more involved in

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cortical interpretation and reactions to signals from the gut. This can amplify visceral perception, disturb GI motility, alter intestinal secretion, increase intestinal permeability, and impair blood flow and self-healing processes of the intestinal mucosa. [3•, 7, 8] Additionally, it is now recognized that the microbiome is an active player in brain-gut dysfunction. Prolonged stress can contribute to dysbiosis that may affect various gut functions directly and also have deleterious effects on mood and stress reactions in the brain, which in turn can undermine the brain's normal regulation of gut perception and gut functioning. [9, 10]

Supportive evidence for dysfunction in the brain's regulation of gut perception and gut activity in functional GI disorders has been documented in multiple brain imaging studies. This body of research has demonstrated [8, 11] that patients with IBS tend to have elevated neural activity compared to control subjects in brain regions involved in emotional arousal (the amygdala and parts of the anterior cingulate cortex) and pain perception (the midbrain cluster), but also reduced activity in other parts of the brain that handle cognitive modulation of perception of intestinal stimuli. Furthermore, deficits in the brain's descending inhibition of pain signals have been reported in substantial proportions of patient samples with IBS and functional dyspepsia [8].

The compelling and growing evidence that dysfunction of the brain-gut axis plays a major role in many GI disorders makes targeted psychological interventions logical methods to help restore normal brain processing of signals from the viscera and to facilitate resumption of healthy central nervous system regulation of gut functions such as secretion and motility. Consequently, psychological treatments for GI problems are now viewed as brain-gut therapies, and they have proven useful for that purpose in a substantial body of empirical literature. These treatments can also be used to improve coping with chronic symptoms, enhance effective self-management of illness, and address stigma related to gastrointestinal symptoms.

A broad range of different psychological treatments have been evaluated in published research as brain-gut therapies for various GI disorders. Among the ones that have been tested and shown promise for improving GI symptoms in multiple randomized controlled trials are relaxation training, psychodynamic therapy, mindfulness training, cognitive behavioral therapy and gut-directed hypnotherapy, as well as multimodal combinations of these interventions.

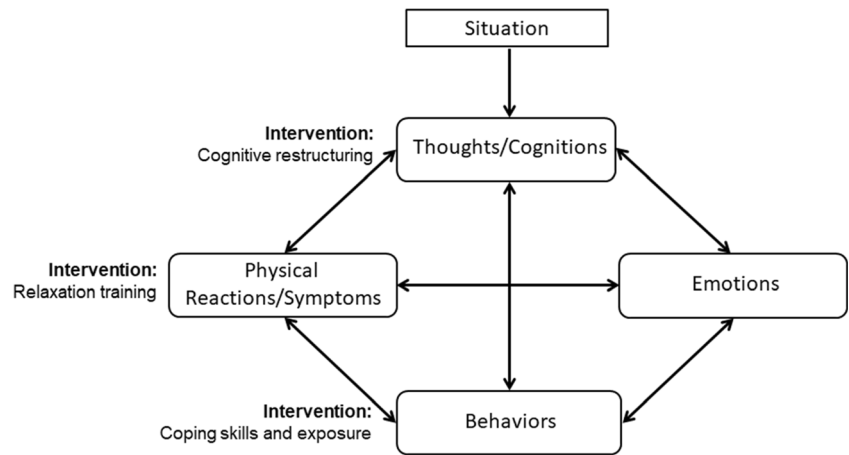
There is no clear evidence that any particular type of brain-gut psychotherapy is more effective than others. They have rarely been tested side by side in the same trials, and when they are compared in meta-analyses, they tend to exhibit similar effect sizes [12••, 13•, 14•]. However, two particular therapy modalities, cognitive behavioral therapy (CBT) and hypnotherapy, have emerged as the leading psychological therapies in GI treatment overall, in terms of both the amount of

empirical research that supports their effectiveness and the extent to which they have been applied in practice by GI-specialized mental health professionals. Those two therapy modalities continue to be very actively researched, with new and often parallel developments emerging year by year. They have become the two key tools in the intervention toolbox of empirically informed practice of psychogastroenterology [15]. Therefore, these two therapies will be the focus of this review. We will discuss their nature as applied to GI disorders, the current status of their empirical support in regard to different GI disorders, recent developments in research on them, and their future prospects and needed priorities. We will limit the scope of our review to applications of these two therapies in adults, as the pediatric gastrointestinal disorders have been recently reviewed in this journal [16].

The Nature of the Therapies

Cognitive behavioral therapy is among the most widely used of all forms of psychological treatment in the current practice of clinical psychology, and also the one that has been investigated most as an intervention for GI disorders. CBT is not a single type of treatment but a class of multi-component therapies that may include different constellations of treatment elements based on the cognitive behavioral theoretical model. The foundation of all CBT interventions focuses on the relationship between thoughts, emotions, behaviors, and physical symptoms (see Fig. 1). CBT treatment, therefore, focuses on identifying and changing unhelpful thoughts and/or behavior to achieve improvement in symptoms, mood, and life functioning. Typical components of this therapy as applied to GI disorders include (a) education about the empirical basis and rationale for CBT, the bi-directional role of stress in GI disorders, and the brain-gut axis; (b) relaxation training, where patients learn and practice methods such as diaphragmatic breathing or progressive muscle relaxation to lower autonomic arousal and neutralize stress; (c) cognitive restructuring, which involves learning to adopt a more balanced and realistic perspective through systematic monitoring, analysis, and correction of biased thinking that exacerbates symptoms and maintains distress and discomfort; (d) coping skills training, which aims to replace maladaptive or counter-productive ways of handling challenges with more productive psychological strategies and behavioral responses; and (e) exposure techniques to help patients to deliberately engage what is feared to overcome fear-based avoidance that often produces life impairment and worsens emotional distress associated with the GI disease. A key aspect of the therapy process is homework assignments, where patients practice skills and systematically write down observations and make analyses as taught in the sessions with the therapist. The therapy course

Fig. 1 The Five Areas model of CBT. CBT focuses on the relationship between four interactive areas of a person's functioning (rounded boxes), and these are also influenced by the current life situation. As indicated in the figure, GI applications of CBT commonly address three of these areas of functioning directly by means of specific intervention techniques, and this in turn often leads to improvements in the fourth one (emotions) as well



is commonly limited to 6–12 sessions, with additional “booster” sessions as needed after completing therapy.

Gut-directed hypnotherapy is a form of treatment that relies on a special mental state, hypnosis, which is induced with the help of verbal guidance from the therapist in order to facilitate receptivity to therapeutic suggestions. The hypnotic state can be induced in a variety of ways, but typically this includes guided physical relaxation, narrowing of the focus of attention, activation of vivid mental imagery, encouraging the patient to let things happen by themselves, and promoting mental dissociation from the here-and-now. Once the patient is in this state of heightened receptivity, the therapist first proceeds with deepening techniques to further enhance this receptive state and then delivers post-hypnotic suggestions to facilitate specific changes in emotions, thoughts, and physical symptoms that will take place after the hypnotic state is terminated. These suggestions are commonly accompanied by imagery and metaphors that illustrate and reinforce the desired therapeutic changes. The post-hypnotic suggestions used in GI

treatment commonly aim to reduce frequency and intensity of pain and discomfort, normalize bowel activity, decrease the reactivity of the gastrointestinal tract to life stress, and increase the patient's overall sense of physical well-being. Home practice with hypnosis audio recordings in between sessions with the therapist is a common practice. As with CBT, hypnotherapy for GI disorders is typically delivered in a course of 6 to 12 sessions with a therapist.

Although CBT and hypnosis may seem very different, they have many commonalities in the way they are utilized for gastrointestinal disorders. As described above, they both involve a brief and time-limited course of therapy, and employ home practice in between therapist visits (see Table 1). They are both structured interventions which are empirically grounded in large bodies of research, and in many cases closely follow empirically tested intervention protocols. Both interventions are suited for patients with a similar general set of characteristics (see Table 2). Moreover, both therapies aim at addressing the GI disorders they target in holistic ways by

Table 1 Examples of typical therapy formats for CBT and hypnotherapy in the treatment of GI disorders

Typical CBT format	Typical gut-directed hypnotherapy format
<p>Session 1:</p> <ul style="list-style-type: none"> • Education and rationale of the treatment • Introduction to the role of the brain-gut axis in symptom experience <p>Sessions 2–9:</p> <ul style="list-style-type: none"> • Initial skill: Building insight into maladaptive or unhelpful cognitions related to symptoms • Advanced skill: Learning cognitive reframing • Initial skill: Identifying unhelpful behaviors • Advanced skills: Exposure techniques and coping skills • Initial skill: Learning relaxation techniques • Advanced skill: Practicing relaxation exercises at home and in stressful moments <p>Session 10:</p> <ul style="list-style-type: none"> – Review of strengths/skills learned – Plan for handling future symptom flares <p>Follow-up or “booster” sessions as needed</p>	<p>Session 1:</p> <ul style="list-style-type: none"> • Education and rationale of the treatment • Introduction to the role of the brain-gut axis in symptom experience <p>Sessions 2–8:</p> <ul style="list-style-type: none"> • Hypnotic induction • Extended physical relaxation and guided deepening of the hypnotic state • Hypnotic verbal suggestions and therapeutic imagery/metaphors • Re-alerting/waking from hypnosis <p>Home practice with a short hypnosis audio recording 5 days a week in between therapy visits</p> <p>Follow-up or “booster” session about 3 months after end of the therapy course</p>

Table 2 Patient characteristics indicative of good suitability for psychological brain-gut therapies

Has moderate or severe gastrointestinal symptoms that have not responded adequately to usual medical interventions
Is accepting the idea of using psychological methods to improve GI symptoms via the brain-gut axis
Reports that the GI symptoms are adversely affected by life stress
Has GI symptoms that interfere significantly with important areas of life functioning
Has been conclusively diagnosed by a physician with a GI disorder for which brain-gut psychotherapy is applicable
Does not have current untreated psychiatric conditions causing high levels of emotional distress (e.g., major depression, bipolar disorder, PTSD, substance abuse)
Will be able to attend weekly or bi-weekly therapy visits for 2–3 months
Willingness to complete practice or “homework” between visits with the therapist

changing thoughts, emotions, and the patients’ subjective appraisal of, and reactivity to, the physical symptoms. Both of them have shown evidence in brain imaging studies of normalizing cortical reactions to visceral stimuli induced experimentally in balloon inflation tests [17, 18].

A further similarity between these two chief brain-gut psychotherapies is that they have generally been tested for the same few GI disorders—at least where the level of inquiry has extended to randomized controlled trials—and they seem to have broadly comparable effects on those disorders. However, for all GI disorders except IBS, the amount of evidence that has accumulated from RCTs is greater for CBT than for hypnosis.

Empirically Supported Areas of Application

Irritable Bowel Syndrome IBS is a common functional GI disorder, affecting 4–5% of the adult population when defined with Rome IV criteria [19]. This chronic condition of recurrent abdominal pain associated with abnormalities in bowel functioning is a major focus of GI healthcare in gastroenterology and primary care. Present pharmacotherapy options offer relatively modest benefits in IBS [20], leaving many patients dissatisfied [21•] and in need of alternative treatment options. IBS is the GI disorder where prominent involvement of psychosocial factors and brain-gut dysfunction is most firmly established, and also the one where psychological brain-gut interventions have been tested most by far. Consequently, enough evidence has accumulated to allow authoritative reviews with firm conclusions about the therapeutic impact. A pair of recent systematic reviews and meta-analyses of RCTs in this domain by Laird and colleagues [13•, 14•] concluded that psychological treatments overall have a therapeutic effect of medium size on IBS symptoms that lasts at

least a year post-treatment, and that besides improvement in bowel symptoms, the therapies afford patients significant improvement in mental health and daily life functioning. A separate systematic review and meta-analysis by Ford et al. [12••] similarly found psychological treatments to be effective for improving IBS, with a collective number needed to treat of 4 (indicating how many patients must be treated in order for one patient to receive benefit).

CBT has been tested in more than 20 randomized controlled trials for IBS [13•, 22, 23••] and hypnotherapy in a dozen such RCTs [24, 25]. In addition, there are numerous other published research studies of each therapy in IBS, such as uncontrolled or non-randomized pilot studies, mechanistic research, and large consecutive case series documenting outcomes systematically. Both interventions have exhibited superior outcomes in the majority of controlled trials compared to a variety of control conditions against which they have been tested, including usual medical care, education, waiting-list for treatment, placebo pills, antidepressant and antispasmodic medications, and supportive talk therapy. Success rates have varied greatly, but the majority of treated patients improve on the primary outcomes in most studies testing either of these therapy modalities. This is impressive considering that many of the studies have been conducted specifically on groups of patients who have already proven refractory to typical medical treatments. Benefits of both the therapies are generally well maintained 6 and 12 months after end of treatment in IBS treatment without further intervention, and the few studies that have tracked outcomes longer indicate that the therapeutic effects last much longer than those for many patients: for 18 months [26, 27], 2 years [28], or even up to 5 years [29] post-treatment.

Functional Dyspepsia Functional dyspepsia (FD), an upper GI disorder involving epigastric pain or burning sensations, uncomfortable fullness, and early satiety, is an even more common functional gastrointestinal disorder than IBS, with a population prevalence of 8–12% according to the Rome IV criteria [30]. It has many similarities to IBS, as it has been found to involve visceral hypersensitivity, is characterized by both GI pain or discomfort and disturbed motility, and is associated with multiple psychosocial factors in much the same way as IBS [31]. Also like IBS, treatment is challenging and leaves large proportions of patients without satisfactory relief. No medication is approved specifically for this disorder, and no medications exhibit high rates of success [32]. For all of these reasons, it would seem that FD would be a natural major target of investigations of psychological brain-gut therapies. However, it has been neglected in such research. Only two randomized controlled trials of FD treatment with CBT have been published, 20 years apart, as well as a single hypnotherapy trial. The largest of these studies was a Spanish study [33•] of 158 consecutive FD patients that found that a 10-session course of coping-focused CBT sessions, delivered

largely in group format, resulted in improved dyspepsia symptoms and quality of life compared to medical care alone. The improvements in the CBT group were well-maintained at 6-month follow-up. The other CBT trial was conducted on 100 FD patients in Sweden [34] receiving either 10 sessions of CBT or no treatment, and reported significant improvement in FD symptoms and psychological well-being from CBT that remained after 1 year.

The only hypnotherapy RCT in this patient population [35] involved 126 patients and similarly demonstrated strong advantages of brain-gut therapy. FD patients assigned to 12 sessions of hypnotherapy showed significantly greater dyspepsia symptom reduction and more improvement in quality of life than those in two comparison groups treated with supportive talk therapy or with antacid medication (ranitidine). These group differences were even more pronounced at 8-month follow-up.

Based on the universally positive findings in this small set of studies, it seems almost certain that these two brain-gut therapies can make a substantial difference in FD care and provide much needed improvement in clinical outcomes. However, additional trials should be conducted to establish their efficacy more firmly.

Non-cardiac Chest Pain Non-cardiac chest pain is a recurrent retrosternal angina-like pain of presumed esophageal origin, which is sometimes associated with gastroesophageal reflux [36]. It is a very common health problem—experienced according to some estimates by one in every four adults at some point. It is challenging to treat with conventional medical approaches and is commonly distressing to patients and costly to evaluate due to the cardiac-like and ambiguous nature of the symptoms. Clinical efficacy of CBT has been evaluated in six RCTs in this disorder [37–42]. Five of them achieved significantly superior symptom improvement over control groups, which were most commonly patients assigned to usual medical care, but otherwise waiting-list controls (one study) or patients given anxiety medication or placebo pills (one study). Four of those studies found the CBT intervention to improve both chest pain and psychological symptoms [37–40], whereas one improved only fear of body sensations and quality of life [41]. These predominantly positive results strongly indicate that this form of therapy can be of value in this difficult and costly disorder.

Hypnotherapy has only been tested in a single, small, randomized trial [43] of 28 patients as therapy for non-cardiac chest pain, where the control group received supportive talk therapy and placebo medication. Hypnotherapy proved more efficacious than the control intervention in terms of pain and general well-being, with 80% of patients in the hypnosis group vs. 23% in the control group showing at least moderate improvement in pain. Those outcome differences were fully maintained at a 2-year follow-up [44].

Inflammatory Bowel Disease Inflammatory bowel disease (IBD), which encompasses both Crohn's disease and ulcerative colitis, is a health problem with less than 1% prevalence in the population [45, 46]. It is characterized by inflammation in the lining of the intestines, with symptoms that can include abdominal pain, diarrhea, weight loss, and fatigue. It is the only type of organic GI disorders for which psychological treatments have been tested to a significant extent. Here, CBT has been the principal therapy investigated. A recent systematic review and meta-analysis [47•] identified seven randomized controlled CBT trials in this domain. Five of the trials tested interventions in mixed groups of patients with Crohn's disease and ulcerative colitis, while one included only Crohn's patients and one only ulcerative colitis patients. The reviewers concluded based on their meta-analysis that CBT improves quality of life in IBD, whereas there is no evidence that the therapy has an effect on disease activity. However, it should be noted that there is growing awareness of IBS and IBD overlap, in which IBD patients in remission experience symptoms of IBS (e.g., abdominal pain and diarrhea in the absence of active inflammation). It would be reasonable to assume that brain-gut therapies for IBS can improve GI symptoms in those patients, though this has not yet been tested.

Hypnosis treatment has hardly been applied at all in IBD so far in published work. The only controlled trial of that therapy for IBD to date was remarkable, however, for being the first study to demonstrate that a psychological intervention might be able to influence disease activity in IBD. In that study [48••], 54 ulcerative colitis patients in remission were randomized to either seven-session scripted hypnosis treatment specifically designed to prevent future disease flares, or equal-length education intervention. The relapse rate after 12 months, which was the primary outcome, was significantly lower in the hypnotherapy group: On average, the patients in that group extended their remission periods by 78 days compared to those in the education control group.

Recent Developments in Psychological Brain-Gut Therapy Research

The two major developments apparent in the field of research on psychological therapies for GI disorders in the last few years are larger and better designed randomized controlled trials than ever before, and steadily increasing efforts to develop and test more efficient delivery formats. The latter is a response to broad recognition that the psychological brain-gut therapies are facing formidable practical obstacles that prevent their wide use: They are hampered by limited scalability and significant cost, because they require patients to complete a series of individual treatment sessions delivered by highly specialized mental health professionals who are mostly found at specialty gastroenterology treatment centers. The great

majority of GI patients who could benefit from brain-gut therapies do not have access to qualified therapists within a reasonable commuting reach. And even where such services are available, referrals for them are often reserved for unusually severe patients or those who have proven unresponsive to usual medical care approaches, due to the added cost of these therapies and limited therapist manpower.

Efforts have been made on and off in recent years to test alternative delivery modes that can help overcome these accessibility and cost hurdles. Those have most typically been trials of either Internet-based therapy that requires little therapist involvement [49–52], or of group therapy format [53, 54]. Several of these studies have shown very good promise, but they have generally been relatively small and have not compared those alternative methods directly to more traditional therapist-delivered formats. That is now changing.

The three randomized controlled clinical trials that have been published on CBT and hypnotherapy for GI disorders in the last couple of years demonstrate both of these major recent trends in the field: They were rigorously conducted trials that constitute the largest ever RCTs for those respective therapies and they each had direct comparison of alternative therapy delivery modes to more traditional therapist-delivered intervention as a main focus.

Everitt and colleagues in England just reported the findings of the largest clinical trial [23••] ever conducted of CBT for GI disorders. They randomly assigned 558 IBS patients to either telephone-delivered CBT with a total of 8 h of therapist time, or web-based CBT with 2.5 h of therapist support, or usual medical treatment. Both CBT treatment delivery modes proved significantly superior to usual medical treatment in terms of improvements in IBS severity, life impairment, and psychological symptoms, and these benefits were well maintained at 12-month follow-up. The authors also reported in a separate paper [28] that 24-month follow-up assessment showed continuing maintenance of the therapeutic gains of CBT patients, with some attenuation, but it should be noted that only 58% of the patients reported their symptom status at that time point.

In another substantial trial conducted in the USA [22], Lackner et al. randomized 436 treatment-refractory IBS patients to either 10 sessions or 4 sessions of CBT with a therapist, with the latter treatment mode involving a more self-administered intervention. They reported that the shorter therapy was as efficacious as the more traditional 10-session format, and in fact it resulted in numerically higher responder rate post-treatment (61% vs. 55%). Therapeutic effects of the CBT were generally well maintained up to 12-month follow-up [55].

The largest controlled trial of hypnotherapy for GI disorders to date [25], involving 354 primary and secondary care IBS patients treated at 11 hospitals in the Netherlands, compared outcomes for patients randomized to six-session courses of either group hypnotherapy, individual hypnotherapy, or group education about IBS. The treatment responder rate

was statistically superior for both hypnotherapy formats compared to the control intervention: 40.8% in the individual hypnotherapy patients, 33.2% in those who received group hypnotherapy, and 16.7% in the control group. At 12 months, those numbers were 40.8%, 49.5%, and 22.6% for the three groups, and there was no significant difference between individual and group therapy response rates at either time point.

Collectively, these three trials demonstrate clearly that there are multiple viable methods to provide psychological treatments for GI disorders in ways that require fewer therapist hours per patient, while still having substantial and long-lasting therapeutic impact.

Future Prospects and Priorities

In the last few years, the practice of psychological brain-gut therapies and related GI-specialized psychological services has come into its own as a health psychology sub-specialty and is now increasingly referred to as psychogastroenterology [15]. Consensus is growing in this international group of practitioners on effective clinical methods and best practices. It is a clinical discipline that is highly empirically informed, relying on thoroughly tested methods developed by experts in the field. Due to the large body of research on CBT and hypnosis, those treatment modalities feature prominently in the clinical practice of psychogastroenterology. These GI-specialized psychologists are steadily growing in numbers, becoming integrated into gastrointestinal specialty care settings, and demonstrating the value they can add in those environments [56–58].

It seems vital, however, in order for clinical psychogastroenterology to grow into a major force that can make an overall difference in outcomes for GI patients in society, that the research on ways to overcome cost and accessibility barriers continue as a top priority, and that those lessons be promptly implemented in clinical practice. Shortened therapy courses with limited therapist involvement and more self-administered therapy tasks, remote therapy via phone or video conferencing, and group treatment might become the standard ways of treating most GI patients with brain-gut therapies, but more research is needed to document the efficacy and best implementations of these approaches. Additionally, there are emerging options that have barely been investigated yet in this research domain: In particular, the possibility that entirely self-administered therapy might work for some clinical applications or for certain patients, which could make brain-gut therapies far more widely available. A number of digital apps with cognitive behavioral and hypnotherapy content for treating GI problems are now in development or undergoing clinical testing, and a wave of published research on these is likely in the near future. Additionally, training of psychologists in the community outside specialty medical centers in applications of brain-gut therapies, thousands of who are already experienced in CBT and clinical hypnosis for other purposes, is also

an important practical way to broaden access for GI patients to the benefits of these interventions.

Another essential task that psychogastroenterology research must focus on to enable CBT and hypnotherapy to fully realize their value as brain-gut therapies is to formally test their application for more GI disorders. As seen from the summary above, sufficient efficacy evidence only exists at present for both of those therapies for IBS treatment and for CBT as treatment for non-cardiac chest pain and for improving quality of life in IBD. In clinical practice, on the other hand, GI-specialized psychologists are frequently using these therapies with good success for a much wider range of GI presenting problems. To enable evidence-based practice, empirical validation and tested protocols for more GI health problems are needed. Furthermore, it is important to develop and validate patient-reported outcome measures to be used as primary endpoints in psychogastroenterology research with these disorders. Some of the additional treatment targets where these brain-gut therapies are likely to prove of value are globus and functional heartburn (hypnotherapy has already demonstrated promising initial pilot results for both of these [59, 60]), chronic constipation and diarrhea, functional bloating/distention, and the functional nausea and vomiting disorders.

With sufficient attention to these two priorities—improving access and reducing cost, and empirical validation of efficacy for more GI disorders—CBT and gut-directed hypnotherapy are poised to become increasingly valuable and more widely available options for enhancing outcomes for patients with the most challenging and common GI disorders in the coming years.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Human and Animal Rights and Informed Consent All reported studies/experiments with human or animal subjects performed by the authors have been previously published and complied with all applicable ethical standards (including the Helsinki declaration and its amendments, institutional/national research committee standards, and international/national/institutional guidelines).

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Drossman DA. Functional gastrointestinal disorders: history, pathophysiology, clinical features and Rome IV. *Gastroenterology*. 2016.

2. Surdea-Blaga T, Baban A, Dumitrascu DL. Psychosocial determinants of irritable bowel syndrome. *World J Gastroenterol*. 2012;18(7):616–26.
3. Labanski A, Langhorst J, Engler H, Elsenbruch S. Stress and the brain-gut axis in functional and chronic-inflammatory gastrointestinal diseases: a transdisciplinary challenge. *Psychoneuroendocrinology*. 2020;111:104501. **An up-to-date review detailing the relevance of the brain-gut axis in functional gastrointestinal disorders and IBD.**
4. Van Oudenhove L, Crowell MD, Drossman DA, et al. Biopsychosocial aspects of functional gastrointestinal disorders. *Gastroenterology* 2016.
5. Sun Y, Li L, Xie R, Wang B, Jiang K, Cao H. Stress triggers flare of inflammatory bowel disease in children and adults. *Front Pediatr*. 2019;7:432.
6. Gracie DJ, Hamlin PJ, Ford AC. The influence of the brain-gut axis in inflammatory bowel disease and possible implications for treatment. *Lancet Gastroenterol Hepatol*. 2019;4(8):632–42.
7. Konturek PC, Brzozowski T, Konturek SJ. Stress and the gut: pathophysiology, clinical consequences, diagnostic approach and treatment options. *J Physiol Pharmacol*. 2011;62(6):591–9.
8. Mayer EA, Tillisch K. The brain-gut axis in abdominal pain syndromes. *Annu Rev Med*. 2011;62:381–96.
9. Molina-Torres G, Rodriguez-Arrastia M, Roman P, Sanchez-Labraca N, Cardona D. Stress and the gut microbiota-brain axis. *Behav Pharmacol*. 2019;30(2 and 3-Spec Issue):187–200.
10. Dinan TG, Cryan JF. The microbiome-gut-brain axis in health and disease. *Gastroenterol Clin N Am*. 2017;46(1):77–89.
11. Tillisch K, Mayer EA, Labus JS. Quantitative meta-analysis identifies brain regions activated during rectal distension in irritable bowel syndrome. *Gastroenterology*. 2011;140(1):91–100.
12. Ford AC, Lacy BE, Harris LA, Quigley EMM, Moayyedi P. Effect of antidepressants and psychological therapies in irritable bowel syndrome: an updated systematic review and meta-analysis. *Am J Gastroenterol*. 2019;114(1):21–39. **This is the latest systematic review and meta-analysis of psychological therapies for IBS, concluding that they are effective for IBS treatment, with a collective number needed to treat of 4.**
13. Laird KT, Tanner-Smith EE, Russell AC, Hollon SD, Walker LS. Short-term and long-term efficacy of psychological therapies for irritable bowel syndrome: a systematic review and meta-analysis. *Clin Gastroenterol Hepatol*. 2016;14(7):937–47 e4. **A recent systematic review and meta-analysis concluding that psychological therapies reduce bowel symptoms in IBS with a medium size effect that lasts at least 1 year after treatment.**
14. Laird KT, Tanner-Smith EE, Russell AC, Hollon SD, Walker LS. Comparative efficacy of psychological therapies for improving mental health and daily functioning in irritable bowel syndrome: a systematic review and meta-analysis. *Clin Psychol Rev*. 2017;51:142–52. **A companion review to the reference by the same authors above, finding that psychological therapies are effective for improving psychological symptoms and life functioning of IBS patients.**
15. Keefer L, Palsson OS, Pandolfino JE. Best practice update: incorporating psychogastroenterology into management of digestive disorders. *Gastroenterology*. 2018;154(5):1249–57.
16. Person H, Keefer L. Brain-gut therapies for pediatric functional gastrointestinal disorders and inflammatory bowel disease. *Curr Gastroenterol Rep*. 2019;21(4):12.
17. Lackner JM, Lou Coad M, Mertz HR, Wack DS, Katz LA, Krasner SS, et al. Cognitive therapy for irritable bowel syndrome is associated with reduced limbic activity, GI symptoms, and anxiety. *Behav Res Ther*. 2006;44(5):621–38.
18. Lowen MB, Mayer EA, Sjöberg M, et al. Effect of hypnotherapy and educational intervention on brain response to visceral stimulus in the irritable bowel syndrome. *Aliment Pharmacol Ther*. 2013;37(12):1184–97.

19. Palssson OS, Whitehead W, Törnblom H, Sperber AD, Simren M. Prevalence of Rome IV functional bowel disorders among adults in the United States, Canada, and the United Kingdom. *Gastroenterology*. 2020;158(5):1262–73.
20. Camilleri M, Ford AC. Pharmacotherapy for irritable bowel syndrome. *J Clin Med*. 2017;6(11).
21. Rangan V, Ballou S, Shin A, Camilleri M, Lembo A, Beth Israel Deaconess Medical Center GIMWG. Use of treatments for irritable bowel syndrome and patient satisfaction based on the IBS in America Survey. *Gastroenterology*. 2019. **A recent large survey of IBS patients, demonstrating their low satisfaction with existing pharmacotherapies for IBS and the substantial need for alternative therapy options such as brain-gut psychotherapies.**
22. Lackner JM, Jaccard J, Keefer L, Brenner DM, Firth RS, Gudleski GD, et al. Improvement in gastrointestinal symptoms after cognitive behavior therapy for refractory irritable bowel syndrome. *Gastroenterology*. 2018;155(1):47–57.
23. Everitt HA, Landau S, O'Reilly G, et al. Assessing telephone-delivered cognitive-behavioural therapy (CBT) and web-delivered CBT versus treatment as usual in irritable bowel syndrome (ACTIB): a multicentre randomised trial. *Gut*. 2019;68(9):1613–23. **This is the largest of all RCTs of brain-gut psychological treatment for GI disorders to date and demonstrates the therapeutic power of telephone CBT and web-based CBT for IBS treatment, two delivery format that can help make CBT more widely available to GI patients.**
24. Palssson OS. Hypnosis treatment of gastrointestinal disorders: a comprehensive review of the empirical evidence. *Am J Clin Hypn*. 2015;58(2):134–58.
25. Flik CE, Laan W, Zuihoff NPA, van Rood YR, Smout AJPM, Weusten BLAM, et al. Efficacy of individual and group hypnotherapy in irritable bowel syndrome (IMAGINE): a multicentre randomised controlled trial. *Lancet Gastroenterol Hepatol*. 2019;4(1):20–31.
26. Ljotsson B, Hedman E, Lindfors P, et al. Long-term follow-up of internet-delivered exposure and mindfulness based treatment for irritable bowel syndrome. *Behav Res Ther*. 2011;49(1):58–61.
27. Whorwell PJ, Prior A, Colgan SM. Hypnotherapy in severe irritable bowel syndrome: further experience. *Gut*. 1987;28(4):423–5.
28. Everitt HA, Landau S, O'Reilly G, Sibelli A, Hughes S, Windgassen S, et al. Cognitive behavioural therapy for irritable bowel syndrome: 24-month follow-up of participants in the ACTIB randomised trial. *Lancet Gastroenterol Hepatol*. 2019;4(11):863–72.
29. Gonsalkorale WM, Miller V, Afzal A, Whorwell PJ. Long term benefits of hypnotherapy for irritable bowel syndrome. *Gut*. 2003;52(11):1623–9.
30. Aziz I, Palssson OS, Tornblom H, Sperber AD, Whitehead WE, Simren M. Epidemiology, clinical characteristics, and associations for symptom-based Rome IV functional dyspepsia in adults in the USA, Canada, and the UK: a cross-sectional population-based study. *Lancet Gastroenterol Hepatol*. 2018;3(4):252–62.
31. Van Oudenhove L, Vandenberghe J, Geeraerts B, et al. Determinants of symptoms in functional dyspepsia: gastric sensorimotor function, psychosocial factors or somatisation? *Gut*. 2008;57(12):1666–73.
32. Masuy I, Van Oudenhove L, Tack J. Review article: treatment options for functional dyspepsia. *Aliment Pharmacol Ther*. 2019;49(9):1134–72.
33. Orive M, Barrio I, Orive VM, et al. A randomized controlled trial of a 10 week group psychotherapeutic treatment added to standard medical treatment in patients with functional dyspepsia. *J Psychosom Res*. 2015;78(6):563–8. **The largest RCT to date on brain-gut psychological treatment of FD, showing substantial benefits of CBT of adjunctive therapy.**
34. Haug TT, Wilhelmsen I, Svebak S, Berstad A, Ursin H. Psychotherapy in functional dyspepsia. *J Psychosom Res*. 1994;38(7):735–44.
35. Calvert EL, Houghton LA, Cooper P, Morris J, Whorwell PJ. Long-term improvement in functional dyspepsia using hypnotherapy. *Gastroenterology*. 2002;123(6):1778–85.
36. Durazzo M, Gargiulo G, Pellicano R. Non-cardiac chest pain: a 2018 update. *Minerva Cardioangiol*. 2018;66(6):770–83.
37. Klimes I, Mayou RA, Pearce MJ, Coles L, Fagg JR. Psychological treatment for atypical non-cardiac chest pain: a controlled evaluation. *Psychol Med*. 1990;20(3):605–11.
38. Mayou RA, Bryant BM, Sanders D, Bass C, Klimes I, Forfar C. A controlled trial of cognitive behavioural therapy for non-cardiac chest pain. *Psychol Med*. 1997;27(5):1021–31.
39. Spinhoven P, Van der Does AJ, Van Dijk E, Van Rood YR. Heart-focused anxiety as a mediating variable in the treatment of noncardiac chest pain by cognitive-behavioral therapy and paroxetine. *J Psychosom Res*. 2010;69(3):227–35.
40. van Peski-Oosterbaan AS, Spinhoven P, van Rood Y, van der Does JW, Brusckhe AV, Rooijmans HG. Cognitive-behavioral therapy for noncardiac chest pain: a randomized trial. *Am J Med*. 1999;106(4):424–9.
41. Jonsbu E, Dammen T, Morken G, Moum T, Martinsen EW. Short-term cognitive behavioral therapy for non-cardiac chest pain and benign palpitations: a randomized controlled trial. *J Psychosom Res*. 2011;70(2):117–23.
42. Tyrer P, Tyrer H, Cooper S, Barrett B, Kings S, Lazarevic V, et al. Cognitive behaviour therapy for non-cardiac pain in the chest (COPIC): a multicentre randomized controlled trial with economic evaluation. *BMC Psychol*. 2015;3:41.
43. Jones H, Cooper P, Miller V, Brooks N, Whorwell PJ. Treatment of non-cardiac chest pain: a controlled trial of hypnotherapy. *Gut*. 2006;55(10):1403–8.
44. Miller V, Jones H, Whorwell PJ. Hypnotherapy for non-cardiac chest pain: long-term follow-up. *Gut*. 2007;56(11):1643.
45. Ng SC, Shi HY, Hamidi N, et al. Worldwide incidence and prevalence of inflammatory bowel disease in the 21st century: a systematic review of population-based studies. *Lancet*. 2018;390(10114):2769–78.
46. Ananthakrishnan AN, Kaplan GG, Ng SC. Changing global epidemiology of inflammatory bowel diseases-sustaining healthcare delivery into the 21st century. *Clin Gastroenterol Hepatol*. 2020;18:1252–60.
47. Li C, Hou Z, Liu Y, Ji Y, Xie L. Cognitive-behavioural therapy in patients with inflammatory bowel diseases: a systematic review and meta-analysis. *Int J Nurs Pract*. 2019;25(1):e12699. **A systematic review and meta-analysis evaluating the effects of CBT in the treatment of patients with IBD.**
48. Keefer L, Taft TH, Kiebles JL, Martinovich Z, Barrett TA, Palssson OS. Gut-directed hypnotherapy significantly augments clinical remission in quiescent ulcerative colitis. *Aliment Pharmacol Ther*. 2013;38(7):761–71. **This was the first trial to demonstrate that psychological intervention may be able to affect the disease course in IBD.**
49. Moss-Morris R, McAlpine L, Didsbury LP, Spence MJ. A randomized controlled trial of a cognitive behavioural therapy-based self-management intervention for irritable bowel syndrome in primary care. *Psychol Med*. 2010;40(1):85–94.
50. Everitt H, Moss-Morris R, Sibelli A, Tapp L, Coleman N, Yardley L, et al. Management of irritable bowel syndrome in primary care: the results of an exploratory randomised controlled trial of mebeverine, methylcellulose, placebo and a self-management website. *BMC Gastroenterol*. 2013;13:68.
51. Ljotsson B, Falk L, Vesterlund AW, et al. Internet-delivered exposure and mindfulness based therapy for irritable bowel syndrome—a randomized controlled trial. *Behav Res Ther*. 2010;48(6):531–9.

52. Ljotsson B, Hedman E, Andersson E, et al. Internet-delivered exposure-based treatment vs. stress management for irritable bowel syndrome: a randomized trial. *Am J Gastroenterol*. 2011;106(8):1481–91.
53. Blanchard EB, Lackner JM, Sanders K, Krasner S, Keefer L, Payne A, et al. A controlled evaluation of group cognitive therapy in the treatment of irritable bowel syndrome. *Behav Res Ther*. 2007;45(4):633–48.
54. Moser G, Tragner S, Gajowniczek EE, et al. Long-term success of GUT-directed group hypnosis for patients with refractory irritable bowel syndrome: a randomized controlled trial. *Am J Gastroenterol*. 2013;108(4):602–9.
55. Lackner JM, Jaccard J, Radziwon CD, Firth RS, Gudleski GD, Hamilton F, et al. Durability and decay of treatment benefit of cognitive behavioral therapy for irritable bowel syndrome: 12-month follow-up. *Am J Gastroenterol*. 2019;114(2):330–8.
56. Kinsinger SW, Ballou S, Keefer L. Snapshot of an integrated psychosocial gastroenterology service. *World J Gastroenterol*. 2015;21(6):1893–9.
57. Riehl ME, Kinnucan JA, Chey WD, Stidham RW. Nuances of the psychogastroenterology patient: a predictive model for gastrointestinal quality of life improvement. *Neurogastroenterol Motil*. 2019;31(9):e13663.
58. Lores T, Goess C, Mikocka-Walus A, et al. Integrated psychological care reduces healthcare costs at a hospital-based inflammatory bowel disease service. *Clin Gastroenterol Hepatol*. 2020.
59. Kiebles JL, Kwiatek MA, Pandolfino JE, Kahrilas PJ, Keefer L. Do patients with globus sensation respond to hypnotically assisted relaxation therapy? A case series report. *Dis Esophagus*. 2010;23(7):545–53.
60. Riehl ME, Keefer L. Hypnotherapy for esophageal disorders. *Am J Clin Hypn*. 2015;58(1):22–33.

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