

PERSPECTIVES

OPINION

Behavioural medicine and gastrointestinal disorders: the promise of positive psychology

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Abstract | Psychosocial risk factors linked to brain–gut dysregulation are prevalent across the spectrum of gastrointestinal disorders and are associated with poor patient outcomes. Robust and reproducible data in the areas of behavioural intervention science and the brain–gut axis have led to major advances in patient care, including the routine use of brain–gut psychotherapies to manage digestive symptoms and optimize coping. The logical next step for the emerging field of psychogastroenterology is to develop a scientific framework that enables the identification of those individual characteristics and coping styles that buffer patients against the negative psychological effects of chronic gastrointestinal disorders. A shift towards a strength-based, positive psychological science of gastrointestinal disorders could facilitate the integration of early, effective psychological care into gastroenterology practice. In this Perspective, I discuss the potential role of three human strengths with relevance to gastrointestinal health — resilience, optimism and self-regulation — and how these three constructs can be cultivated through existing or emerging brain–gut psychotherapies.

Gastrointestinal disorders pose a substantial burden to society, including high health-care costs, lost work productivity, disability and poor quality of life¹. In addition to their association with chronic pain, fatigue and psychological distress, upper and lower gastrointestinal tract symptoms are embarrassing for patients and stigmatized by others^{2–4}. There are several known psychological vulnerabilities related to the onset and/or exacerbation of gastrointestinal disorders — for example, early-life adversity, psychopathology and maladaptive coping have each been implicated in the pathophysiology of functional gastrointestinal disease (FGID) and motility disorders⁵. Depression and anxiety are often comorbid with IBD, especially when disease is active⁶; furthermore, failure to accept or adapt to complex disease demands, manage unpleasant adverse effects or cope with uncomfortable symptoms has been linked to depression, poor quality of life, unplanned surgeries and high

medical cost^{5,7–9} in this patient population. Advances in behavioural intervention science have enabled the development and validation of robust, manualized brain–gut psychotherapies such as gut-directed hypnotherapy, cognitive-behaviour therapy (CBT) and psychodynamic interpersonal psychotherapy, which focus on remediation of these specific psychological vulnerabilities. Indeed, these psychotherapies are now being integrated directly into gastroenterology practice by specialists in the emerging field of psychogastroenterology^{10,11}.

The shift towards integration of psychology into gastroenterology practice affords an opportunity to extend our reach beyond those individuals who are psychologically vulnerable towards a science and practice that cultivates the human strengths and coping styles that mitigate the presumed negative effect of chronic gastrointestinal disorders. This knowledge could ultimately facilitate access

to early, effective psychological care within gastroenterology practice well before patients develop maladaptive coping habits, engage in high physical and psychological symptom reporting and exhibit poor, costly disease outcomes. The principles and practices of positive psychology — the scientific study of positive emotions, positive character traits and the contexts and settings in which people flourish despite obstacles¹² — could provide a framework for such an advance in the field. Backed by the same rigorous psychological methods and techniques that have successfully informed our approach to human suffering and mental illness, positive psychology focuses on outcomes such as happiness and subjective well-being¹³.

Although there are many important positive psychology constructs to be studied in gastroenterology, in this Perspective, I have chosen to examine resilience, optimism and self-regulation specifically (FIG. 1). This decision was made because of a number of factors: there was already existing science in the construct related to gastrointestinal disease; there was existing science in other chronic disease groups for which there is similar pathophysiology or chronicity to gastrointestinal disease; and/or the construct could be readily cultivated within existing or emerging brain–gut psychotherapies.

Resilience

Resilience, or ‘grit’, can be defined by one’s ability to ‘bounce back’, or physically and emotionally adapt to adversity. Humans are a resilient species — even in the face of extreme stress, most people adjust to adversity or trauma and escape the development of psychiatric disease¹⁴. Only ~8–10% of individuals exposed to life-threatening trauma go on to develop post-traumatic stress disorder (PTSD)¹⁵. That said, early-life adversity, including sexual abuse, is a well-established risk factor for the development of FGIDs¹⁶, and early-life stress has been linked to visceral pain and inflammation in human and animal models of gastrointestinal disorders, with the female sex at highest risk^{17,18}. Resilience discriminates between teenagers with IBD who are ready for transition to adult-centred care settings and those who are less prepared for independent self-management¹⁹;

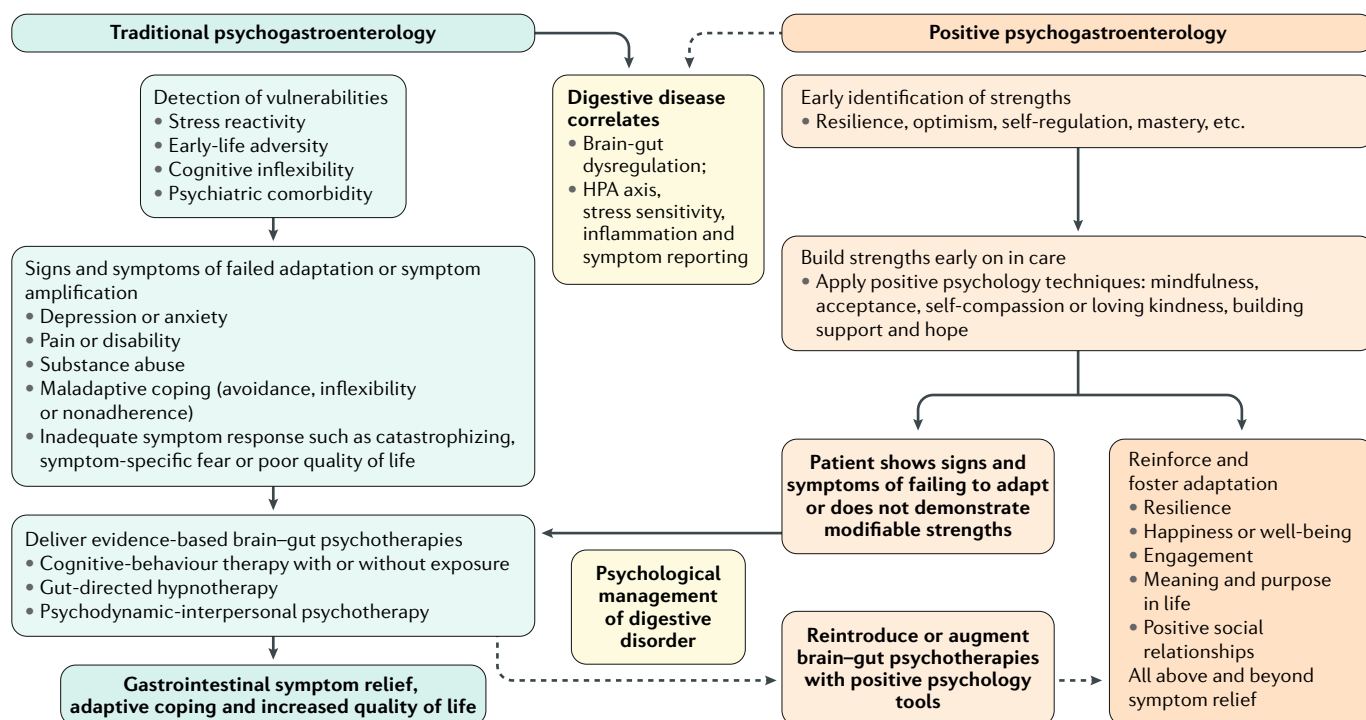


Fig. 1 | Synergy between traditional gastroenterology and positive gastroenterology approaches — a way forward. Vulnerability to gastrointestinal disorders, especially functional gastrointestinal disorders, is driven by underlying stress reactivity, early-life adversity, a history of psychiatric comorbidity or poor (inflexible) coping. These same factors will drive adaptation to organic diseases such as Crohn's disease and ulcerative colitis and, therefore, are still vulnerabilities in this model. Existing models of psychogastroenterology act on signals of an individual's failure to adapt, such as depression, anxiety, pain, disability or poor quality of life, as well as on an individual's disease-specific responses such as pain catastrophizing and symptom-specific anxiety. Brain-gut psychotherapies such as cognitive-behaviour therapy, gut-directed hypnotherapy and psychodynamic interpersonal psychotherapy are highly effective in promoting symptom relief, adaptive coping and quality of life in this

model. A positive psychology approach is complementary to the existing approach and could enable earlier, more effective psychological care. The positive psychology model first considers individual strengths that might be protective and/or, if leveraged or enhanced, could foster successful adaptation, bypassing the need for formal, costly psychological intervention and/or brain-gut psychotherapies. Resilience, optimism and self-regulation are three of many individual strengths that might be a focus of future study in the context of psychogastroenterology, given their association with the hypothalamic-pituitary-adrenal (HPA) axis, inflammation and symptom experience in other chronic disease groups. Applied positive psychology interventions could facilitate early adaptation to chronic gastrointestinal disease, enabling us to treat a wider range of individuals earlier in care, thereby reducing the risk of negative, costly disease outcomes.

resilience might also mediate the relationship between depression, anxiety and clinical disease activity in IBD²⁰.

On the physiological side, resilience is associated with healthy functioning of the central nervous system, including autonomic regulation, vagal nerve function and brain development²¹. Neurochemical markers associated with the functioning of the brain-gut axis (for example, noradrenaline, corticotropin-releasing hormone and cortisol) and chemicals such as serotonin and dopamine mediate resilience in the face of acute stress²¹. Although not yet well studied in gastroenterology, resilience could serve as a protective characteristic mitigating the onset and/or maintenance of gastrointestinal symptoms. Work published in 2017 by Park and colleagues has suggested that reduced resilience as measured by the Brief Resilience Scale²² and by elevated glucocorticoids, an indicator of chronic stress, is a differentiating characteristic

between individuals with FGID and healthy individuals²³.

Further support of the link between resilience and gastrointestinal symptoms is provided by evidence of aberrations in the hypothalamic-pituitary-adrenal (HPA) axis in both FGIDs and commonly comorbid stress-sensitive disorders such as depression or PTSD²¹ — a shared assumption among these patient populations is that there is altered neural circuitry or inadequate functioning of neuroendocrine systems that result in a physiological stress response, even under normal circumstances²¹. Alternatively, dehydroepiandrosterone (DHEA) and neuropeptide-Y have emerged as potential pro-resilience biomarkers in humans; for instance, if secreted during an acute stressor, DHEA can reduce one's risk of the development of PTSD, and elevated DHEA levels in individuals with PTSD are associated with improved treatment outcomes^{24,25}. It has been inherently difficult

to study the HPA axis in FGIDs given the high heterogeneity among symptom-based phenotypes and the high rate of overlapping psychiatric comorbidity; hence, the importance of HPA axis reactivity remains a complex topic in gastrointestinal disease. One area for future inquiry is whether early detection of low resilience could lead to prevention of negative outcomes through the development of interventions that mitigate heightened physiological response to stress in vulnerable patients.

Chronic stress, amplified by poor coping (such as symptom catastrophizing), has also been shown to affect us both genetically and neurologically, with chronic stress and the excess secretion of cortisol limiting the ability of the brain to make new connections or pathways that would normally enable someone to behaviourally adapt to a diagnosis or set of chronic symptoms. One example of this is in the impairment of brain mechanisms

to adequately filter benign sensory input from the gut (threat detection) such that individuals eventually lose their natural ability to discriminate between a true threat (colonic perforation) and a benign sensation (feeling of fullness after eating)²⁶. Despite extensive research on the link between stress and IBD^{27,28}, results have been inconclusive. Unfortunately, the majority of this research has been retrospective and cross-sectional, has varied in the definition of stress, has lacked appropriate control groups and has failed to account for individual variation in disease state or activity, coping or symptom perception.

Benson's relaxation response meditation has shown to be effective in IBS²⁹ and associated with modified expression of the inflammatory marker nuclear factor- κ B (NF- κ B) in IBS and IBD³⁰. Although the consideration of stress in the onset or maintenance of gastrointestinal disorders is not novel, we might look to translate some of the animal research that has shown that certain 'active' resilience mechanisms can actually counteract molecular changes that occur as a response to stress in susceptible individuals²⁵. For example, attachment research in both humans^{31–33} and cotton-top tamarin models of ulcerative colitis³⁴ has also suggested that social support, a mediator of resilience, might buffer against a stress response in IBD. In another study, 19 long-term practitioners of Benson's relaxation response meditation demonstrated differential expression of more than 2,000 genes associated with cell metabolism, oxidative phosphorylation and reduced oxidative stress compared with non-practitioners, highlighting that stress management training could counteract

the cellular damage seen in patients under chronic stress³⁵. Other proposed genetic markers of resilience and outcomes are discussed in a review published elsewhere²¹.

Resilience screening, standard practice in the IBD Center at Mount Sinai, NY USA, where I work, enables us to stratify patients who are less likely to bounce back from their symptoms, a surgery or an unwelcome diagnosis and offer early, effective psychological intervention to vulnerable patients before negative outcomes ensue. Indeed, this approach to IBD care, which is probably relevant across the spectrum of gastrointestinal disorders, is called GRITT (Gaining Resilience Through Transitions), and preliminary data show that the GRITT method can improve outcomes and reduce emergency department visits and hospitalizations in patients with IBD (L.K., unpublished observations). Two good measures of resilience have been used in the population of patients with gastrointestinal disorders: the Connor–Davidson Resilience Scale³⁶ and the Brief Resilience Scale²². TABLE 1 describes several positive-psychology-based measures for use in clinical practice and research. Future research aligning resilience screens with biomarkers, including those related to both the HPA axis as well as inflammation and other disease-specific end points, is absolutely critical to this line of inquiry.

Optimism

Optimists view adversity as temporary, limited in scope (not all encompassing) and manageable; this 'explanatory style', or adaptive coping technique, has been tied to whether patients will continue to pursue their life goals despite chronic disease³⁷. Optimistic people are grateful, happier,

less stressed and less depressed than their pessimistic counterparts³⁷ and are more likely to experience positive health-care system interactions³⁸. Sometimes referred to as 'meaning finding' or 'post-traumatic growth', optimism in the setting of chronic, even terminal, diseases is a protective factor³⁹, potentially through more robust self-care pathways⁴⁰ or social support^{41–43}, the latter of which has been linked to positive outcomes in IBD and IBS^{44,45}. When present, optimism predicts the extent to which a patient will exhibit adaptive disease coping, adhere to medical or lifestyle recommendations and recover from cardiac events, stroke and cancer⁴⁶. Optimism has been independently associated with reduced cardiac rehospitalization in patients with acute coronary syndrome and reduced risk of myocardial infarction among patients with coronary artery disease, and optimism promoted quality of life in cardiac transplant recipients up to 4 years post-transplantation⁴⁷ but has not been well studied in gastrointestinal disorders. Optimists, defined through self-report questionnaires (TABLE 2), in the general population seem to be healthier in the long term, with healthier lipid profiles, lower levels of inflammatory markers, higher levels of serum antioxidants and a stronger immune response than non-optimists⁴⁸.

There might also be a neural basis for the ability to create positive meaning from negative experiences. Optimism has been linked to healthier autonomic function and increased levels of heart rate variability⁴⁹, which are increasingly implicated in the pathophysiology of gastrointestinal disorders including IBS and IBD^{50–52}. Optimistic reappraisal of negative events has been linked to increased connectivity

Table 1 | Similarities and differences between traditional and positive psychogastroenterology research and practice

Features	Traditional psychogastroenterology	Positive psychogastroenterology
Primary population of interest	- Patients who exhibit poor coping and/or psychopathology in the setting of gastrointestinal disorders - Large subset of patients with gastrointestinal complaints and comorbid psychopathology and/or poor coping	- Patients who do well or thrive despite having a gastrointestinal disorder - Any patient who has a gastrointestinal disorder, regardless of psychosocial outcomes
Timing of interventions	When patient exhibits distress or psychological assessment tools indicate psychopathology	At point of diagnosis and throughout lifespan, particularly during care transitions
Common outcome metrics	Adequate relief of gastrointestinal symptoms, improved disease-related quality of life and reduction in psychological distress	Happiness and subjective well-being, adaptation, reduced morbidity and mortality and global physical and emotional health
Psychological constructs of interest	Depression, anxiety, stress, catastrophizing, fear of symptoms, somatization and vulnerabilities, including early-life adversity	Resilience, optimism, self-regulation, flexibility, acceptance, adaptation and social support
Existing evidence-based brain–gut therapies	Cognitive-behaviour therapy, gut-directed hypnotherapy and psychodynamic interpersonal psychotherapy, especially in functional gastrointestinal disorders ¹³⁹	Preliminary data exist for mindfulness; acceptance-based psychotherapies show promise in other chronic disease groups and to some extent in gastrointestinal disorders ^{105,113,140}

Data in this table are taken from REFS^{141–143}.

Table 2 | Positive psychology self-report measures for use in GI conditions

Construct	Measure	Basic features
Resilience, or one's general belief in his or her ability to bounce back from life's adversities	Connor–Davidson Resilience Scale ³⁶	Includes 25-item, 10-item and 2-item versions, is widely used in mental health research and has been tested in a range of patients with gastrointestinal conditions
	Brief Resilience Scale ²²	Includes 6 items and has been tested in populations with IBS as well as with fibromyalgia, cardiac rehabilitation and other health conditions
Optimism, or the belief that good things will come	Life Orientation Test-Revised ⁵⁹	Includes 10 items, is intended for research use only and measures optimism and pessimism in a range of populations with different health conditions (youth version available)
Social support	The Perceived Support Scale ¹⁴⁴	Includes 11 items, is recommended for clinical and research use and measures tangible, informational and emotional support
	NIH Toolbox Social Relationships Scales ¹⁴⁵	Includes a range of 5–8-item scales measuring social support, loneliness, companionship and social distress in paediatric and adult populations; see http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox
Acceptance and adaptation	Digestive Diseases Acceptance Questionnaire ¹¹⁶	Includes 20 items adapted from McCracken's 34-item Chronic Pain Acceptance Questionnaire ¹⁴⁶ that measure symptom tolerance and active behavioural engagement in daily life activities despite digestive symptoms
	Illness Perception and Representation Questionnaire ¹⁴⁷	Includes 38 items assessing multiple domains (identity, cause of illness, chronicity of illness, impact on life and beliefs about control over illness); see http://www.uib.no/ipq/
Self-efficacy, or confidence in one's ability to engage in disease-related demands	IBD Self-Efficacy Scale ^{75,72148}	Includes 32 items with 4 domains (managing medical care, managing emotions, maintaining remission and managing symptoms) for IBD and eosinophilic oesophagitis Includes a 13-item, single-domain scale for teens with IBD and their parents
	Mindful Attention Awareness Scale ¹⁴⁹	Includes 5 items measuring an individual's ability to engage in mindful attention or awareness and is used in populations with cancer
Happiness and subjective well-being	Satisfaction with Life Scale ¹⁵⁰	Includes 5 items measuring an individual's global judgement of his or her satisfaction with life
	The Positive and Negative Affect Schedule ¹⁵¹	Includes 20 items measuring positive and negative affect in 2 orthogonal dimensions
	Positive Affect and Well-Being Scale Neuro-Quality of Life Item Bank v1.0 Short Form ¹⁵²	Includes 9 items and is a well-being scale normalized to the general population through NIH PROMIS; see http://www.healthmeasures.net/explore-measurement-systems/nih-toolbox

PROMIS, Patient-Reported Outcomes Measurement Information System.

between brain reward centres such as the ventral striatum and ventromedial prefrontal cortex and brain regions involved in emotional self-regulation, arousal and self-control including the amygdala⁵³ (comprehensively reviewed elsewhere⁴⁷). Mirroring research in cardiovascular disease, future gastrointestinal research might seek to determine the degree to which optimism is associated with brain–gut dysregulation and/or inflammation in IBS and IBD.

Behaviourally, optimists and pessimists also differ in their problem-solving approach, with optimists being willing to engage equally in emotion-focused and problem-focused coping as the situation demands⁵⁴. Interestingly, inflexible problem-solving skills in FGIDs have been shown to drive symptom severity^{55–57}; patients with FGIDs often fail to engage in emotion-focused coping techniques (for example, humour, prayer, relaxation or seeking social support) when problems do not have a solution. Optimism can be learned⁵⁸, potentially by building disease acceptance, improving self-confidence and perspective taking

(decatastrophizing). Optimism, like resilience, might be a new way to account for differences in patient coping and problem solving and could improve the precision with which CBT could be delivered in this population. Optimism can be measured for research purposes through the Life Orientation Test-Revised^{59–62}.

Self-regulation and mastery

The ability to self-regulate, or to manage thoughts, feelings and behaviours and/or impulses to achieve a desired goal, even if the goal is distant or abstract⁶³, is another human strength with relevance to gastrointestinal disorders. Indeed, one of the major discoveries attributed to positive psychology was that positive and negative emotions were not merely two ends of the same spectrum but rather sit along a continuum on two orthogonal axes — the experience of positive as well as negative emotions must be provided equal attention⁶⁴. Individuals with strong self-regulation skills tend to have better educational and career trajectories⁶⁵, better social skills and more

satisfying social relationships⁶⁶ and better overall health and longevity than those with self-regulation deficits⁶⁷.

In the gastroenterology clinical setting, differences in self-regulation can be seen during the diagnostic process, which can take several months and involve uncomfortable or unpleasant procedures. Early in treatment, self-regulation is required while medications are titrated, unpleasant adverse effects are experienced, and therapies are augmented with major lifestyle change. Self-regulation is required long term to maintain wellness, for example, in managing long-term use of medications, monitoring of disease-associated comorbidities and symptoms, managing the emotions of having a chronic disease, practising surveillance and participating in routine medical check-ups. High self-regulators, when faced with a choice between an immediate (symptom relief from an opioid, surgery or anxiolytic medication) or a delayed reward (6 months on a biologic agent, 1 year with an ostomy or a gluten-free diet), are able to draw upon positive emotions related to reaching the goal; this anticipation

of feeling good, or of returning to school or work, enables them to tolerate distress and persist despite obstacles (such as insurance pre-authorization delays, medication adverse effects or restricted activity)⁶⁸. Unfortunately, excessive self-control can also occur in gastroenterology practice, presenting as obsessive-compulsive tendencies around bowel habits⁶⁹ or maladaptive or restrictive eating behaviours^{70,71}.

Self-efficacy, or mastery, is intricately tied to self-regulation and has been directly linked to positive health outcomes⁷². Self-efficacy reflects one's confidence in his or her ability to succeed at any specific disease self-management task and is particularly relevant when an individual must adopt a new health behaviour (injection, attending infusions, dietary restrictions or pill swallowing) or adjust his or her beliefs or attitudes (disease acceptance, pain as non-threatening or disease or medication knowledge)⁷³. My research team and I have shown that self-efficacy, as measured through a validated self-reported measure, is associated with improved outcomes in paediatric^{19,74} and adult IBD^{75,76} as well as in the care of eosinophilic oesophagitis⁷⁷. In patients with IBD, self-efficacy can be directly modified through behavioural intervention, particularly those that are skills-based such as CBT or self-management training^{78–81}.

Finally, one's ability to self-regulate can be influenced by several biological and immunological processes. For example, cortisol affects brain functions that impair self-regulation⁸² and immune system activity, including circulating pro-inflammatory cytokines, and influences cognition, motivation and behaviour^{83–85}. This reverse connection has been previously described in IBD-associated depression research^{8,86}. Whether the acquisition of self-regulatory behaviours during inflammation could offset this link is an area for future research.

Applying positive psychology

More than 40 randomized controlled trials of brain–gut psychotherapies have pitted CBT in various forms^{87–89} — with and without exposure therapy⁹⁰, gut-directed hypnotherapy^{91,92}, mindfulness-based stress reduction⁹³ and psychodynamic interpersonal psychotherapy⁹⁴ — against attention-control, psychoeducation, psychotropic medication, fibre and/or psychotherapy wait lists. Collectively, most of these therapies have yielded modest effect sizes in the areas of gastrointestinal symptom reduction (adequate relief), reduced psychological

distress (depression, anxiety or substance abuse) and improved quality of life^{95,96} but have not necessarily gone the next step to determine the effects on long-term subjective well-being and/or happiness. CBT and gut-directed hypnotherapy have been applied to a range of digestive diseases, including IBS, functional dyspepsia, non-cardiac chest pain, IBD and GERD, yielding a number needed-to-treat between 2 and 4 (REFS^{95,96}).

In severe IBS, psychodynamic interpersonal psychotherapy has also demonstrated efficacy and cost-effectiveness^{97,98}, particularly among those patients with early-life adversity⁹⁹. There are limitations to the scientific evidence currently available in this area as well, including a lack of comparative effectiveness studies of efficacious brain–gut psychotherapies, a limited understanding of how these interventions might be personalized, shortened or delivered digitally and the need for stronger linkage between behavioural interventions and underlying disease processes. Although these therapies have been well adopted by the field, there are substantial problems related to access to qualified providers and obtaining payment and/or reimbursement for such services. Online psychotherapy delivery systems that mirror in-person protocols do demonstrate effectiveness in IBS^{6,80,100,101} but currently are affected by attrition rates as high as 50–60%, especially among those patients with the highest levels of psychopathology¹⁰². Adaptation of these interventions for digital delivery, including development of validated patient engagement techniques in these domains, is desperately needed, and applied positive psychology might hold the key to this approach.

Positive-psychology-based interventions, described in more detail later, could facilitate early access to care and/or better engagement in existing psychogastroenterology care models because they reinforce an individual's strengths, are potentially more portable, are amenable to digital delivery and can often be applied in real-time outside of the therapist office. Access can also be improved by introducing positive psychology techniques into patient care before psychological vulnerabilities arise, leaving the psychogastroenterology specialists to handle more complex cases. Finally, in depression research, patients have expressed higher satisfaction with positive psychology treatments over traditional CBT¹⁰³, potentially because of their more positive, less stigmatizing message.

The scientific research to date in the area of positive psychology among chronic diseases is promising but riddled with

methodological limitations, with the majority of studies relying on cross-sectional analyses, having a lack of powerful control groups and relying on patient self-report of outcomes.

The intervention science done within applied positive psychology shows promise but has been limited by small sample sizes, mixing of positive psychology techniques with existing effective interventions, lack of credible control groups or the choice of outcome measures that are unrelated to the disease itself. Below, I explore how some of the empirically supported positive psychology interventions might be adapted for digestive disease, used to augment existing brain–gut psychotherapies or foster early, effective psychosocial care.

Mindfulness. Mindfulness-based stress reduction (MBSR) programmes have emerged as an efficacious brain–gut psychotherapy in gastrointestinal disorders including IBS¹⁰⁴ and in IBD with functional overlap¹⁰⁵, potentially through reductions in visceral hypersensitivity and other maladaptive cognitive-affective processes¹⁰⁴. MBSR is often delivered in hospital settings and has been associated with increases in the regional brain grey matter involved in learning and memory, improved self-regulation of mood and emotion^{106,107} and increased resilience¹⁰⁸. Being present, a fundamental aspect of all mindfulness-based interventions, means bringing awareness to the here and now and to present moment experiences. Rather than engaging in behaviour that amplifies one's experience of gastrointestinal symptoms (catastrophizing, problem solving or avoiding food or activities), a patient is asked to recognize and adapt to one's internal (and external) experiences. Mindfulness skills have also been shown to increase distress tolerance and activity in parts of the brain associated with goal-directed behaviour^{106,109} and have been linked to improved resilience in high-risk military recruits¹¹⁰. Mindfulness has been linked to reduced output of the HPA axis during acute stress challenges in patients with anxiety¹¹¹ and reduces cortisol blunting or the likelihood that one will not mount an adequate physiological response to stress during cancer chemotherapy¹¹². Mindfulness as a positive psychology technique lends itself well as a real-time self-regulation technique that can be used in a clinical or non-clinical context, with several digital applications commercially available on the market.

Third-wave behaviour therapies focused on acceptance. Third-wave behaviour therapies de-emphasize the importance of restructuring maladaptive thoughts such as catastrophizing and instead focus

Box 1 | Open research questions in positive psychogastroenterology: why do patients with chronic gastrointestinal disorders thrive?

- What are the core ingredients (relaxation, cognitive change, mindfulness, exposure and self-efficacy) of existing brain–gut psychotherapies, and how can they be more widely disseminated (for example, digital therapeutics, online delivery or self-administration) to patients with chronic digestive disorders?
- How do existing brain–gut psychotherapies perform on the longer-term positive psychology outcomes such as happiness and subjective well-being?
- Can we develop novel treatment approaches based on an improved understanding (qualitatively and quantitatively) of resilient patients — for example, those who bounce back from a gastrointestinal disorder and live a meaningful life?
- What are some better clinical and research tools to identify, measure and track patients at risk of poor outcomes?
- How do positive psychology constructs such as resilience and optimism align with known biomarkers of gastrointestinal diseases, including those related to the hypothalamic–pituitary–adrenal axis, inflammation and the epigenetics of stress?
- How does disease activity including inflammation and immune-mediated brain changes affect self-regulation?
- What are the cost benefits of shifting towards a practice of psychogastroenterology that offers early, effective psychosocial care and emphasizes the promotion of happiness and well-being over existing models focused on remediating psychopathology or poor coping when present?

on acceptance, distress tolerance and dialectical processes to foster behaviour change. Although only preliminarily tested in IBS¹¹³, Acceptance and Commitment Therapy (ACT)¹¹⁴ shows the most promise in chronic disease given the inherent suffering associated with chronic, sometimes debilitating symptoms and pain¹¹⁵. The degree to which a patient accepts their diagnosis of IBD, for example, as measured by the Digestive Diseases Acceptance Questionnaire¹¹⁶, predicted quality of life and the degree to which patients would work towards self-management⁹. The primary treatment targets of ACT are radical acceptance and psychological flexibility, or the ability to change behaviour in accordance with one's future goals rather than over-focus on one's current thoughts or feelings (rumination, fear or catastrophizing)¹¹⁷. The scientific roots of ACT come in part from thought-suppression research, in which attempts to suppress negative thoughts result in a paradoxical increase in negative thoughts¹¹⁸. ACT differs from traditional CBT because instead of the focus being on restructuring maladaptive thoughts associated with the next disease flare, surgery or medical set-back, patients are redirected to accept their thoughts and focus on the things that they find most meaningful in life. In other words, ACT focuses on how a patient can achieve his or her goals despite a diagnosis of a gastrointestinal disorder. ACT teaches patients to embrace (or self-regulate) difficult experiences with the expectation that they will eventually reap the rewards (optimism)¹¹⁷. ACT also recommends that patients focus on living with symptoms rather than continuing to pursue a cure¹¹⁹, which is particularly important in FGIDs when patients become fixated on testing and fail to engage in symptom management and in IBD, for which symptoms will be lifelong and chronic

despite effective therapy. Mindfulness exercises are often helpful in ACT but not required¹²⁰. ACT has been successfully applied in chronic pain¹²¹ and cancer¹²² and might be adapted and tested for use in gastrointestinal disorders owing to its focus on the acceptance of difficult thoughts, feelings and sensations¹¹⁵ — particularly before maladaptive cognitive-affective processes or psychopathology have formed¹²³. Other third-wave therapies that have not been tested but might also be applicable to chronic gastrointestinal disorders include behaviour activation therapy¹²⁴, which emphasizes reducing the ruminating thoughts that drive inaction, mindfulness-based cognitive therapy¹²⁵, which adds mindfulness as a technique for reducing maladaptive thoughts, and dialectical behaviour therapy, which focuses on emotion-regulation skills¹²⁶ and is especially helpful when patients report comorbid depression.

Real-time self-regulation techniques.

Self-regulation techniques can be more precisely implemented, possibly through wearable sensors or other technologies^{127,128} once triggers of autonomic stress response or other physiological markers of symptom generation are identified. For example, diaphragmatic breathing¹²⁹, heart rate variability biofeedback^{130–132} and other techniques show promise for HPA-axis-related conditions and are currently being evaluated in GERD and other gastrointestinal disorders (L. Guadagnoli, personal communication). Wearable sensors for lifestyle contributors to health, including fitness trackers, sleep trackers and trackers of other modifiable behaviours^{127,128}, are gaining traction and, if leveraged properly, could assist with the teaching of disease self-management skills early in a patient's care and by a wider range of health professionals.

Another self-regulation technique that has gained traction is the practice

of self-compassion, which includes self-kindness instead of self-judgement, belief in a common humanity instead of isolation from others and mindfulness or a balanced awareness versus over-identification with suffering¹³³. 'Loving kindness meditations' are freely available online for the practice of this technique — the practice of loving kindness has been linked to improved nitric oxide metabolism, which for the gastrointestinal tract would have positive implications for motility (smooth muscle) and immune function¹³⁴. Self-compassion has been linked to the experience of positive affect and subjective well-being¹³⁵ and increases the likelihood that someone would engage in emotion-focused coping¹³⁶. Self-compassion can be taught^{137,138} and could be particularly helpful among patients who blame themselves for their symptoms or disease or who tend to engage in 'black or white' thinking. High-quality social support and attachment to others, also important positive psychology constructs, might also be leveraged through online communities and peer-support programmes⁴².

Conclusions

Psychogastroenterology, a field committed to the adaptation of psychological principles to improve the management of digestive diseases, has successfully demonstrated the benefit of brain–gut psychotherapies on the well-substantiated psychological vulnerabilities and maladaptive cognitive-affective processes associated with gastrointestinal disease. We are now well poised to begin addressing an important question in the field (see BOX 1 for a list of open research questions) — why do some patients thrive despite extreme adversity? Resilience, optimism and self-regulation could be some of the many positive psychology attributes that could be studied and strengthened as part of integrated psychogastroenterology, leading to early, effective psychological care and improved outcomes.

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Competing interests

The author declares no competing interests.

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Reviewer information

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