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Invited Review

Psychological Treatments for Pediatric Functional Gastrointestinal Disorders

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ABSTRACT

Our objective was to systematically review and evaluate behavioral and psychological treatments applied to pediatric functional gastrointestinal disorders. Electronic searches were conducted in bibliographic databases including PubMed, PsychInfo, and Medline. Psychological and behavioral interventions were classified into the following 5 primary treatment modalities: psychoeducation, behavior therapy/contingency management, relaxation-based therapies (including biofeedback and hypnotherapy), and cognitive-behavioral therapy (including cognitive-behavioral family therapy). There was a wide variation in the quality and quantity of studies within each treatment category. Effective interventions generally involved multiple therapeutic components and included elements of both individual and family treatment. Psychological interventions that combine psychoeducation, relaxation-based therapies, and cognitive-behavioral therapy appear superior to standard care (reassurance or dietary manipulation) in the elimination of pain and reduction in functional disability. Although many psychological treatments demonstrated evidence of positive effects, few well-designed randomized controlled trials of psychological treatments for functional gastrointestinal disorders exist. More work is needed to determine the most potent, essential elements of psychological treatments alone or in combination with standard medical intervention, and to establish their applicability with diverse populations. Clinical and research implications are discussed. ***JPGN 48:13–21, 2009.*** **Key Words:** Functional gastrointestinal disorder—Psychological treatments—Psychoeducation—Behavior therapy—Relaxation treatment—Cognitive-behavioral therapy. © 2008 by European Society for Pediatric Gastroenterology, Hepatology, and Nutrition and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition

Functional gastrointestinal disorders (FGIDs) refer to chronic gastrointestinal (GI) symptoms that cannot be attributed to structural or biochemical abnormalities. Various criteria have been used to establish a diagnosis of FGID. The Rome II criteria (1) dominate the recent literature and require the presence of abdominal pain for at least 12 weeks in the preceding 12 months; recurrent abdominal pain (RAP) is defined as at least 3 episodes of abdominal pain severe enough to affect activities over a period of at least 3 months. The Rome III criteria (2) further define FGIDs by age range and symptom pattern or location, require pain 25% of the time, and 1 or both of the following: loss of daily functioning or additional somatic symptoms (eg, headache, limb pain).

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A biopsychosocial model incorporating genetic, physiological, and psychosocial factors often is used to conceptualize the etiology of FGIDs. Genetic and physiological factors (eg, motility, inflammation) as well as psychosocial factors (eg, social support, stress) may increase or decrease susceptibility to develop FGIDs (3,4). FGIDs are associated with significant functional impairment, including poor school attendance, decreased physical inactivity, extensive health service utilization, and family disruption (5). There is substantial evidence that children with FGIDs have more symptoms of anxiety and depression than healthy controls (6,7) and that they are more likely to meet criteria for irritable bowel syndrome as adults (5).

The number of psychological treatment outcome studies for pediatric FGIDs has grown during the past decade. The purpose of this article is to describe and critically review psychological treatments for commonly encountered pediatric FGIDs. Our goal is to enhance physician awareness of psychological and behavioral problems and treatments for pediatric GI patients, to

promote more integrated models of clinical care as well as more research.

MATERIALS AND METHODS

Literature Search

We conducted a thorough search of the medical and psychological literature using PsychInfo, Medline, and PubMed. The key search terms used to identify FGIDs were *recurrent abdominal pain, irritable bowel syndrome, functional abdominal pain, functional dyspepsia, functional vomiting, stomachache*, and *stomach pain*. The psychological and behavioral terms used were *anxiety, depression, school refusal*, and *school phobia*. The psychological intervention terms were *psychoeducation, relaxation, guided imagery, biofeedback, psychotherapy, hypnotherapy, cognitive-behavioral therapy, parent training*, and *contingency management*. In addition, the key words used to exclude articles about psychological treatments for adults with GI disorders were *pediatric, youth, children*, and *adolescents*. Reference lists within the primary and review articles were searched to locate additional relevant publications.

Eligibility Criteria

Studies were included if they were published in English in a peer-reviewed journal between 1986 and 2007, the sample included children or adolescents 4 to 18 years of age with a functional GI disorder (see FGID search terms above), and the study evaluated a planned psychosocial intervention targeting children and adolescents and/or family members. Interventions delivered individually or in a group or family context were included. Studies that involved exclusively medical or physical treatments such as pharmacotherapy, nutrition therapy, or physical therapy without a psychological component were not included. Methodological rigor was not a criterion for inclusion or exclusion in this review. The studies included in this review are summarized in Table 1.

FUNDAMENTALS OF PSYCHOLOGICAL AND BEHAVIORAL TREATMENTS

Before describing the results of the interventions, we describe the fundamental characteristics of the common psychological interventions below.

Psychoeducation

Psychoeducation for FGIDs involves the explicit dissemination of information to patients and families regarding the nature of abdominal pain, the relation between psychological factors and abdominal pain, and factors that may maintain pain, such as social reinforcement and school avoidance. Psychoeducation may be delivered through patient–provider contact or through media-based materials. Psychoeducation is often 1 element of multicomponent psychological interventions.

Behavior Therapy/Contingency Management

Behavior therapy, also referred to as behavior modification or contingency management, is based on principles of learning through conditioning. A preliminary assessment identifies environmental antecedents and consequences that may be manipulated to affect a child's desirable and maladaptive behaviors. For example, positive reinforcement (eg, positive attention, tangible reward) may be provided to strengthen desirable behavior, whereas attention or privileges may be withdrawn to diminish undesirable or maladaptive behaviors.

Relaxation

Relaxation treatments guide patients to reduce psychological distress by achieving a physiological state that is the opposite of how the body reacts under stress. Physiological changes that typically occur during relaxation include decreases in heart rate, respiration rate, blood pressure, muscle tension, oxygen consumption, and α-wave brain activity (8). Common relaxation techniques include abdominal breathing, progressive muscle relaxation, visualization, hypnotherapy, and biofeedback. These techniques generally are taught in a clinical setting with assignments to practice the skills at home.

Abdominal or deep breathing stimulates the parasympathetic nervous system to increase feelings of calmness and relaxation. Patients are taught in a stepwise fashion to inhale slowly and deeply through their nose and to hold the breath before slowly exhaling completely. Progressive muscle relaxation is frequently used with children who complain of muscle pain. These techniques involve systematically tensing and releasing each muscle group of the body. Patients are encouraged to maintain their attention on the relaxed feeling that results after tensing each muscle. Guided imagery or visualization techniques direct patients to imagine themselves in a peaceful scene to create an experience that is incompatible with stress and anxiety. The peaceful scene is individualized for each patient and is visualized with sufficient sensory detail to absorb the patient's attention. Hypnosis is a relaxed state characterized by increased receptiveness and responsiveness to a set of ideas. Hypnotherapy includes 3 sequential elements: hypnotic induction, deep relaxation, and suggestion. Hypnotic induction (eg, eye fixation) sets the stage for the relaxation and deepening phases, which may incorporate the deep breathing, visualization, and muscle relaxation strategies described above. Once a state of deep relaxation is achieved, hypnotic suggestions are made (eg, pain is leaving your body). Biofeedback uses electronic equipment in combination with relaxation techniques. Biofeedback provides immediate continuous feedback to raise patients' awareness and conscious control of their own physiological functions related to relaxation (eg, heart rate, muscle tension).

TABLE 1. *Characteristics of psychological interventions for functional gastrointestinal disorders (FGIDs), listed chronologically*

Article	Target population, sample size, age, race	Content of intervention/control condition	No. and duration of sessions	Outcome
Vlieger et al, 2007 (14)	C, n = 53, 8–18 y, Dutch, –*	Relaxation/hypnotherapy • General relaxation • Gut-directed hypnotherapy • Ego-strengthening suggestions Randomized control condition: SMC • Education • Dietary recommendation • Extra fiber • Pain medication or proton-pump inhibitors • Supportive therapy	Hypnotherapy • Six 50-min sessions for 3 mo • Conducted by hypnotherapist outside medical setting SMC • Six 30-min sessions for 3 mo • Conducted by physicians in medical setting	Both groups decreased significantly in pain frequency and intensity. Significantly greater decrease and clinical remission in hypnotherapy vs SMC groups at 1-y follow-up (85% vs 25%)
Duarte et al, 2006 (19)	C/P, n = 32, 5–13 y, –*	CBT • Psychoeducation • Behavioral Strategies • Cognitive Strategies • Self-monitoring Randomized control condition: SMC • Psychoeducation • "Pain management strategies" • "General support"	4 monthly sessions, duration unknown	Both groups decreased pain frequency. CBT had higher reduction of pain episodes compared with controls (86.6% vs 33.3%). No group difference in pressure pain threshold
Weydert et al, 2006 (15)	C, n = 22, 5–18 y, –*	Relaxation groups compared • Breathing exercises vs guided imagery with progressive muscle relaxation	4-weekly 1-h sessions Daily practice 3 follow-up sessions	Both groups decreased pain frequency, intensity, and missed activities; significantly greater decrease in pain frequency and activities missed in guided imagery/progressive muscle relaxation group vs breathing exercise group posttreatment (6.7% to 21%) and 2-mo follow-up (82% vs 45%)
Robins et al, 2005 (20)	C/P, n = 69, 6–16 y, white 88.4%, African American 4.3%, other 7.2%	CBT • Psychoeducation • Relaxation strategies* • Coping statements* • Increase child/parent "partnership"* Randomized control condition: SMC • High-fiber diet • Psychoeducation • Office follow-up "as needed"	Five 50-min sessions	Significantly less abdominal pain among CBT and SMC group; however, no significant difference in functional disability
Ball et al, 2003 (11)	Child, n = 11, 5–18 y, white	Relaxation with psychoeducation • Abdominal breathing • Progressive muscle • Visualization Control condition: waitlist	4, duration unknown	67% decrease in pain during treatment in 2 mo, pain episodes decreased by 36% in month 1; after end of training, pain decreased by another 49% All patients randomized to waitlist withdrew from study
Anbar, 2001 (13)	Child, n = 5, 8–16 y, –*	Relaxation/hypnotherapy • Hypnotherapy • Progressive muscle relaxation • Imagery Control: none, pre-post case report	1–3, duration unknown	Symptoms for 4 patients resolved in 3 wk; 1 did not improve

Continued

TABLE 1. *Continued*

Article	Target population, sample size, age, race	Content of intervention/control condition	No. and duration of sessions	Outcome
Humphreys and Gervitz, 2000 (17)	C/P or child alone, n = 64, 4–18 y, >50% white	Comparison of 4 randomized groups: Fiber alone vs fiber and 3 psychological treatments • Fiber and relaxation (biofeedback) • Fiber, relaxation, CBT • Fiber, relaxation, CBT, parent training	8, duration unknown	All groups reported a decrease in pain. Fiber alone: 79% reduction in pain reports Fiber and relaxation: 100% reduction in pain reports Addition of CBT or parent training did not improve outcome. 3 psychological treatments vs fiber alone associated with greater elimination of pain (72% vs 7%)
Sanders et al, 1994 (21)	C/P, n = 44, 7–14 y, –*	CBT • Parent contingency management • Relaxation training • Improve self-talk • Relapse prevention Randomized control: waitlist	Six 50-min sessions	Both groups reported a significant decrease in pain. CBT group had a lower relapse rate and a higher rate of complete elimination of pain than controls (70.6% vs 38.1%).
Edwards et al, 1991 (10)	C/P, n = 11, 6–12 y, –*	Relaxation • Progressive muscle relaxation • Self-monitoring of pain • Parent training/contingency management Control condition: increase dietary fiber	4–11, duration unknown	Support for effectiveness of dietary fiber treatment, effectiveness of relaxation treatment was inconclusive
Sanders et al, 1989 (18)	C/P, n = 16, 6–12 y, –*	CBT • Self-monitoring of pain • Parent contingency mgmt • Relaxation training • Relapse prevention Randomized control: waitlist	8, duration unknown	Both groups improved, but treatment group improved faster, and had greater elimination of pain posttreatment (75% vs 25%) and at follow-up (87.5% vs 37.5%)
Finney et al, 1989 (16)	Child, n = 16, 6–13 y, –*	CBT plus: • Relaxation training • Self-monitoring of pain • Parent training/contingency mgmt • Participation in routine activities • Fiber (5–10 g) Control condition: SMC	2.5 sessions, duration unknown 1–6 telephone calls	81% of children in CBT group reported significant reductions in pain, school absences, and medical utilization. Significantly fewer medical visits in CBT vs control
Bury, 1987 (9)	C/P, n = 111, 5–12 y, –*	Psychoeducation • Nature of pain • Participation in routine activities • Encourage child to take responsibility for pain management • Further consultations as needed Control condition: none	No data	Complete disappearance of pain in 70% of children (n = 111); follow-up indicated sustained improvement

C/P = Child and parent; SMC = standard medical care; CBT = cognitive-behavioral treatments.
* Not specified.

Cognitive-behavioral Therapy

Based on the belief that our thoughts, behaviors, and feelings interact, cognitive-behavioral therapy aims to reduce or eliminate physical symptoms through cognitive and behavioral changes. Cognitive-behavioral therapy guides patients to modify or change cognitive distortions or irrational, negative thinking to improve mood and functioning. For example, a patient who believes that his or her pain is a symptom of undiagnosed terminal illness would be taught to challenge this belief and consider substituting a more realistic thought, such as that the pain is likely to subside and does not represent a terminal illness.

Family Therapy

Families are routinely involved in interventions with children who have a chronic illness. Family therapy views problems in terms of family interactions and relationships rather than the individual patient. The therapist targets family interactions to change maladaptive behaviors or patterns. For example, family therapists may guide parents to ignore a child's pain complaints and to reward the child for attending school despite those complaints.

RESULTS

Our search identified 12 studies for pediatric FGIDs that met inclusion criteria. The review below is organized by type of psychological treatment.

Psychoeducation

We identified only 1 study that examined the effects of psychoeducation as a stand-alone intervention for RAP. Bury (9) conducted a retrospective medical chart review of 103 patients ages 2 to 13 years. There was no control group. During a routine medical appointment, all of the patients received information about the nature of pain to affirm that it was real yet did not have an identifiable organic basis. Older patients were encouraged to take responsibility for their pain and to continue participating in routine activities. Complete disappearance of pain was reported in 70% of the children. Follow-up (at unspecified intervals) indicated sustained improvement.

Relaxation

Edwards et al (10) investigated the efficacy of fiber and relaxation treatments for RAP and constipation using a single-subject experimental design that combined a multiple baseline with an A–B (baseline–fiber) or A–B–C (baseline–fiber–relaxation) design with 11 children between 6 and 12 years of age. Fiber supplementation (increase of 10 g of daily dietary fiber) was the treatment of choice for children who met criteria for constipation. Progressive muscle relaxation (6–7 weekly sessions) was the treatment of choice for children with RAP. Most children received the treatment of choice after receiving the treatment for the other condition to control for nonspecific effects. For example, a child who presented with constipation received relaxation treatment before the introduction of the indicated fiber treatment. Fiber treatment was associated with decreased transit time for each subject and reduced pain complaints, even in 2 nonconstipated subjects. The relaxation treatment demonstrated specific effects in only 1 participant. Fiber treatment, the treatment intended for participants with constipation and RAP, was more effective. Thus, there was minimal support for the effectiveness of relaxation treatment for participants with RAP either with or without constipation.

Ball et al (11) conducted a randomized controlled investigation of an intervention that included psychoeducation and relaxation training. Eleven children (ages 5–18 years) diagnosed with RAP were assigned to intervention or a waitlist control conditions. Four 50-minute sessions consisted of psychoeducation, deep abdominal breathing, progressive muscle relaxation, and visualization. Positive coping strategies were embedded in the visualization exercise by asking the child to recall his or her last pain episode, then to visualize an image of pain using all of the senses, and finally to visualize an individually tailored second image that would destroy the pain. Each participant was given a relaxation audiotape and asked to practice twice daily at home. Ratings of stomach pain in the intervention group decreased by 36% in the first month of treatment and 67% after 2 months. Because the first 4 children randomized to the waitlist control group withdrew from the study, no data were available from the waitlist control group.

Hypnotherapy has been shown to be effective in the treatment of FGIDs in adults (12). Using a single-case pre-post design, Anbar (13) investigated the efficacy of self-hypnosis among children. Five participants were taught hypnotic self-induction through visualization, imagery, and progressive muscle relaxation with special attention to the abdominal muscles. Pain symptoms resolved for 4 out of 5 participants within 3 weeks.

Hypnotherapy was recently compared with standard medical care in a randomized trial conducted in Holland (14). Patients ages 8 to 18 years old with either functional abdominal pain ($n = 31$) or irritable bowel syndrome ($n = 22$) were randomized to hypnotherapy or standard care. Standard care was conducted by study physicians within the tertiary medical center. Standard care consisted of education, dietary advice, fiber, and pain medication in addition to six 30-minute sessions of ''supportive therapy'' conducted during a 3-month period. In contrast, the hypnotherapy protocol was administered

by an experienced hypnotherapist/nurse. Hypnotherapy occurred outside the tertiary medical setting and consisted of six 50-minute sessions during a 3-month period. Hypnotic suggestions were tailored toward gastrointestinal symptoms. Suggestions for general relaxation, sleep improvement, and ''ego strengthening'' also were provided. Patients in both groups recorded the daily frequency and intensity of abdominal pain and other gastrointestinal symptoms. Pain scores decreased significantly in both groups, but decreases were significantly greater in patients who received hypnotherapy versus standard care. At 1-year follow-up, there was an 85% remission among the hypnotherapy group as compared with 25% in the control group.

Components of relaxation therapies (breathing exercises alone vs guided imagery with progressive muscle relaxation) were compared in a randomized trial with 22 children with functional abdominal pain, ages 5 to 15 years old (15). Both groups received 4 weekly sessions. Patients kept a diary of pain frequency and intensity, and activities missed due to pain. Measures were collected 1 month before, during, and 1 month after the intervention. Both groups improved on pain frequency, intensity, and number of missed activities. Children who received guided imagery with progressive muscle relaxation reported a significantly greater decrease in pain frequency and missed activities when compared with the breathing exercise group. There were no differences between the groups in pre-post changes in pain intensity.

In summary, in 1 early study, relaxation was inferior to increased dietary fiber in the treatment of abdominal pain with and without constipation. However, based on 2 recent randomized trials and 3 studies with small samples and weak designs, the evidence is accumulating that relaxation-based interventions are effective in reducing functional abdominal pain. As with psychoeducation, elements of relaxation training are typically combined with other strategies in the treatment of FGIDs, as illustrated below.

Cognitive-behavioral Treatments

Three studies were identified by their authors as cognitive-behavioral treatments (CBTs) (16–18) and 3 studies were identified as cognitive-behavioral family interventions (19–21). We consider these treatments together because all of the CBT treatments for pediatric FGID involved other family members. Most of the CBT studies were multicomponent in nature.

Finney et al (22) delivered a brief (2.5 sessions) multicomponent cognitive-behavioral treatment to 16 children 6 to 13 years of age with RAP. Treatment also included relaxation training, reducing parent attention to pain, increasing fiber, self-monitoring of pain, and required school attendance. Thirteen (81%) participants reported significant reductions in pain, school absences, and medical utilization. There was a control group but their outcome measures were not reported.

Robins et al (20) implemented a randomized controlled trial that compared a group of 40 children with mild to moderate RAP who received CBT to a control group of 29 children with RAP who received standard medical care. (The CBT treatment group was larger due to higher refusal rates in the control group.) The 5 CBT sessions included psychoeducation; increasing awareness and control of the relations between cognitions, feelings, and pain; and parental encouragement of children's use of positive coping skills. The control treatment included recommendations for a high-fiber diet, psychoeducation, ''individualized recommendations,'' and follow-up office visits as needed. Both groups reported reduced abdominal pain, somatization, and significantly less functional disability at 3- and 6- to 12-month follow-ups. Children in the CBT condition reported significantly lower pain at posttreatment and follow-up than controls. Children who received CBT had less functional disability than controls, although differences were not statistically significant.

Sanders et al conducted 2 randomized controlled multicomponent CBT trials for the treatment of FGID (18,21). The first study (18) included 16 children 6 to 12 years of age who were randomly assigned to an 8-week CBT group or a waitlist control group. The CBT treatment also included relaxation training and parent training. Parents were taught to ignore nonverbal pain behaviors, redirect children to an activity after a verbal pain complaint, and provide praise and positive tangible reinforcement after compliance. Patients in both the CBT and control groups reported less pain posttreatment and at 3-month follow-up, with no significant group difference on pain ratings. The number of pain-free children in the CBT group was significantly higher than the control group at posttreatment (75% vs 25%) and at follow-up (87.5% vs 37.5%). This study was followed by 1 with a larger sample ($n = 44$) and shorter CBT treatment duration (6 sessions) (21). Significant reductions in pain were evident in both the CBT and control conditions. The CBT group had a higher rate of pain-free children than the control condition at posttreatment (70.6% vs 38.1%), and at follow-up. Thus, results of both studies were similar in that children in both CBT and control groups improved; however, the CBT groups had more pain-free children and a lower relapse rate.

A nonblind randomized clinical trial with a CBT group and standard care group was conducted with 5- to 13-year-old children with FGID and their parents (19). Two pediatricians delivered both treatments. CBT treatment also included psychoeducation, relaxation, and parent training. Standard care consisted of psychoeducation about pain and functional illness, pain management strategies, and general support. Pain was assessed via self-report and pressure pain threshold measured via mechanical pressure algometer at the end of each session

for both groups. During the course of 3 months, the CBT group reported a significant reduction in pain compared with the control group (86.6% vs 33.3%). There were no significant differences between pressure pain thresholds from pre- to posttreatment.

Humphreys and Gevirtz (17) conducted a randomized factorial design with 4 groups including fiber; fiber and relaxation; fiber, relaxation, and CBT; and fiber, relaxation, CBT, and parent training. All of the groups reported reductions in pain; however, compared with the fiber-only group, the 3 active psychological treatment groups reported greater reduction in pain, sick behaviors, school absences, and medication use. Elimination of pain was reported in 72% of psychological treatment participants versus 7% of the fiber-only group. Outcome was not significantly different among the 3 active psychological treatment groups.

The American Academy of Pediatrics subcommittee on chronic abdominal pain in children (23) recently rated CBT as an ''efficacious'' treatment. Although we concur with this conclusion, we believe that it is important to recognize that interventions characterized as CBT were multicomponent in nature and included strategies beyond cognitive-behavioral therapy, such as psychoeducation, relaxation, and parent training.

CONCLUSIONS

Given the accepted role of psychosocial factors in the etiology of pediatric FGIDs, the recent proliferation of psychological treatment outcome studies is welcome. A variety of psychological treatments have been developed to reduce psychological and physical symptoms in pediatric FGIDs. Our literature review identified 12 outcome studies, which fell on a wide continuum of empirical sophistication from case reports to randomized controlled studies incorporating multiple methods and standardized outcome measures. Most studies demonstrated evidence of positive effects of the psychological intervention and none demonstrated negative effects. Effective treatments were generally brief; 3 studies described treatments requiring only 1 to 3 sessions, more than half (7 of 12) required 4 to 6 outpatient sessions, and 2 interventions required 7 to 11 sessions.

The most effective psychological treatments for reducing the severity and frequency of recurrent abdominal pain contained multiple therapeutic components including psychoeducation, relaxation-based treatment, parent training on contingency management, and cognitive-behavioral strategies. An area requiring future study is the determination of which components of multicomponent treatment packages actively contribute to improvement in specific areas of functioning (eg, functional disability, physical symptoms, psychological symptoms). The initial findings of Humphreys and Gevirtz (17) concluded that when delivered in a brief format, the addition of CBT and parental support to relaxation therapy did not significantly enhance treatment effectiveness.

Standard medical care, in the form of physician reassurance and dietary fiber, also was effective in the short-term reduction of pain. This confirms the importance of psychological factors such as therapeutic expectation, therapist attention, and placebo effects in the pediatric FGID population. Although standard care was associated with reduction in pain frequency and intensity in children and adolescents, only psychological interventions were associated with significant elimination of pain, lower levels of functional disability, and reduced relapse. Positive effects of psychological treatments for FGIDs are particularly impressive when one considers the logistic difficulties in conducting randomized controlled trials or interventions with families who are often difficult to recruit and retain due to multiple stressors and high rates of discontinuation if assigned to a standard medical care group (24).

Limitations in the methodology of the pediatric FGID literature should be noted and improved in future studies. Most studies did not fully describe participant demographics, age at symptom onset, duration of illness, disease severity, medical regimen, or functional disability. Few included diverse population samples or measures of treatment adherence. Finally, diagnostic criteria for FGID were inconsistent across studies, which limits our ability to draw conclusions about the effectiveness of psychological treatments. Due to this diagnostic variation, an international expert panel on functional gastrointestinal disorders recently recommended standardization of study methods (25). Recommendations for FGID research included that pain evaluations should be based on patient reports, that efficacy evaluations should be based on the percentage of children meeting a predefined clinical outcome rather than the statistical significance of differences between groups or periods of time, and that psychological measures should be performed at baseline for use as covariates in analyses. A trend toward conforming to these recommendations was noted in the more recent publications.

One important limitation to address in future work is that the psychological treatment outcome studies rarely reported the interventions in sufficient detail for replication. Basic treatment details such as the duration and frequency of sessions, therapist training, treatment setting (medical or mental health provider office), treatment adherence, and participant treatment satisfaction were frequently omitted from the report. It would be beneficial for future studies to include an outline of the goals and/or content of each session so that the treatment can be implemented in other settings. A clear rationale for inclusion/exclusion criteria, adoption of standardized outcome measures, and treatment fidelity measures would increase generalizability and validity. Because

most trials did not include sufficient minority samples, attention to diversity among participant samples is warranted. It cannot be assumed that the outcomes of biological or psychosocial interventions developed in 1 population will be applicable to another population with significantly different biological and psychosocial histories.

Finally, there is a well-established association with psychological state in functional as well as ''organic'' gastrointestinal disorders (1,26). For example, psychological symptoms such as depression and anxiety are associated with functional abdominal pain as well as increased disease activity in patients with inflammatory bowel disease. Among adults with inflammatory bowel disease, depression and anxiety at baseline have been significantly associated with worse inflammatory bowel disease disease status 8 to 12 weeks later, a shorter time until subsequent relapse, as well as greater total number of relapses after 12 and 18 months of follow-up (27,28). Although the link between psychological state and gastrointestinal disorders is well accepted, the underlying causal mechanisms for this association are not well understood. For example, 1 plausible behavioral mechanism is that psychological distress adversely affects medical adherence, resulting in greater disease morbidity. Alternatively, there may also be a direct physiological relation between inflammatory proteins (cytokines) on the brain and psychological symptoms that have been linked to cytokines (eg, anhedonia, fatigue). Future psychological treatment research that examines biomarkers of disease simultaneously with behavioral intervention and change has much to contribute to our understanding of these mechanisms.

From a clinical perspective, this literature builds a strong case for psychological treatments to be offered to children with FGIDs as part of routine care. Incorporating psychological treatments into the management of FGIDs is likely to facilitate a decrease or elimination of psychological and/or physical symptoms, to provide patients with sustainable pain management and coping skills, and perhaps ultimately to be a cost-effective solution to excessive medical utilization in this population.

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