

Audio-Recorded Guided Imagery Treatment Reduces Functional Abdominal Pain in Children: A Pilot Study



WHAT'S KNOWN ON THIS SUBJECT: Functional abdominal pain is a common complaint in childhood. Medical therapies can be effective, but many children need additional therapies. Behavioral therapies reduce pain symptoms and disability but are largely unavailable because of cost, time commitments, and shortages of therapists.



WHAT THIS STUDY ADDS: We developed and evaluated a novel way of delivering guided imagery treatment. This inexpensive, self-directed treatment can be administered easily by any health care professional and can be used in the comfort of the patient's own home.

abstract

OBJECTIVE: This study was designed to develop and to test a home-based, guided imagery treatment protocol, using audio and video recordings, that is easy for health care professionals and patients to use, is inexpensive, and is applicable to a wide range of health care settings.

METHODS: Thirty-four children, 6 to 15 years of age, with a physician diagnosis of functional abdominal pain were assigned randomly to receive 2 months of standard medical care with or without home-based, guided imagery treatment. Children who received only standard medical care initially received guided imagery treatment after 2 months. Children were monitored for 6 months after completion of guided imagery treatment.

RESULTS: All treatment materials were reported to be self-explanatory, enjoyable, and easy to understand and to use. The compliance rate was 98.5%. In an intention-to-treat analysis, 63.1% of children in the guided imagery treatment group were treatment responders, compared with 26.7% in the standard medical care-only group ($P = .03$; number needed to treat: 3). Per-protocol analysis showed similar results (73.3% vs 28.6% responders). When the children in the standard medical care group also received guided imagery treatment, 61.5% became treatment responders. Treatment effects were maintained for 6 months (62.5% responders).

CONCLUSION: Guided imagery treatment plus medical care was superior to standard medical care only for the treatment of abdominal pain, and treatment effects were sustained over a long period. *Pediatrics* 2009;124:e890–e897

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KEY WORDS

abdominal pain, functional colonic diseases, guided imagery, hypnosis, self administration

www.pediatrics.org/cgi/doi/10.1542/peds.2009-0028

doi:10.1542/peds.2009-0028

Accepted for publication Jun 3, 2009

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

Chronic abdominal pain that interferes with activities is one of the most common pain complaints in childhood, affecting up to 20% of children.^{1,2} In most cases, no identifiable disease or structural or biochemical abnormality can be identified and the pain is diagnosed as functional abdominal pain.^{3,4} Managing functional abdominal pain requires a multidisciplinary approach. Behavioral therapies such as cognitive behavioral therapy and guided imagery (also called self-hypnosis) are important components of a comprehensive approach to pain management. Many studies have shown that behavioral therapies, when offered as adjuncts to regular medical care, reduce pain symptoms and disability and improve quality of life.⁵ However, behavioral therapies currently are unavailable to most children because they are costly, require a significant investment of time by both the parent and the child (work and school absences for multiple medical visits), and require a highly trained therapist.

We aimed to develop and to test a self-directed behavioral treatment for functional pain in childhood that can be administered easily by any health care professional without the need for specialized training, can be used in the comfort of the patient's own home, and is inexpensive. Guided imagery is a state of engagement in imagery and relaxation.⁶ It is very well suited for home-based delivery because (1) it is one of the most effective behavioral treatments for pain in children, and randomized trials support its use in functional abdominal pain,^{7,8} (2) it can be delivered unidirectionally, without interaction between patient and therapist,⁹ and (3) there is preliminary evidence that guided imagery treatment using audio recordings is effective in reducing chronic pain.^{10,11} Treatment delivery through audio/video recordings that can be used at home without

a therapist may allow for greater availability of behavioral treatments for chronic pain.

METHODS

Subjects

Between March 2006 and March 2007, patients 6 to 15 years of age with a physician diagnosis of functional abdominal pain were recruited through pediatric gastroenterologists at the University of North Carolina at Chapel Hill and Duke University Medical Center.

Questionnaires

Abdominal Pain

Abdominal pain frequency and intensity were assessed with 2 questions derived from the Abdominal Pain Index,¹² as follows. (1) "In the last week, how often have you (your child) had abdominal pain (stomach aches)" (not at all, 1 or 2 days, 3 or 4 days, 5 or 6 days, or every day)? (2) "In the last week, when your (child's) stomach hurt, how much did it usually hurt" (10-point scale ranging from "no pain" to "the most pain possible")? Pain frequency and intensity were multiplied to yield 1 pain score, with a possible range of 0 to 40. We defined treatment response as $\geq 50\%$ reduction in the abdominal pain score from before treatment to after treatment.

Functional Disability Inventory

The Functional Disability Inventory¹³ is a 15-item questionnaire assessing the impact of physical health on children's functioning, scored on a 4-point scale (possible score range: 15–60). It possesses good internal consistency ($\alpha = .89$) and test-retest reliability ($r = 0.60$).¹³

School Attendance and Health Care Utilization

Parents were asked about numbers of visits to a medical provider and school

absences in the past 2 months (0 = none, 1 = 1–3 days, 2 = 4–6 days, 3 = 7–9 days, 4 = ≥ 10 days). Parents also recorded the use of any prescription or nonprescription medication for gastrointestinal problems. This method was used and validated in previous studies by our group.¹⁴

Pediatric Quality of Life Inventory

The Pediatric Quality of Life Inventory¹⁵ is a brief, validated, 23-item, generic measure of health-related quality of life. It has been shown to have excellent reliability (eg, for internal consistency of the total score, $\alpha = .88-.90$) and validity.¹⁶ Possible scores range from 0 to 92.

Global Rating of Change in Abdominal Pain

After treatment, parents were asked to rate, on a 7-point scale (ranging from "markedly worse" to "markedly better"), how much their child's abdominal pain had changed, compared with the beginning of the study. This estimate of the overall impact of the treatment has been recommended for use in treatment trials for functional gastrointestinal disorders.¹⁷

Treatment Compliance

To assess adherence to the treatment protocol, children were asked to attach a sticker to their treatment calendar at home on each day they listened to an audio-recorded session.

Questionnaire on Pediatric Gastrointestinal Symptoms

The Questionnaire on Pediatric Gastrointestinal Symptoms^{18,19} is a validated measure to determine the presence or absence of functional bowel disorders on the basis of Rome II criteria.

Treatment

All treatment materials were developed by 3 of the authors (Drs van Tilburg and Palsson and Ms Turner), who

are experienced in hypnotherapy and/or childhood studies. The treatment consists of (1) a 25-minute, instructional DVD, supplemented with written instructions for parents; (2) 3 biweekly sessions, including 1 booster session (~20–25 minutes) and 3 daily sessions (~10–15 minutes each), recorded on CDs; (3) a calendar; and (4) a portable CD player, to enable the children to listen to the CDs in a comfortable place at home. Treatment materials were developed to be understood by children as young as 6 years of age, to be completely self-explanatory, and to be engaging (for a more-detailed description of treatment development and content, see the Appendix).

Study Design

After referral by a pediatric gastroenterologist, parents of subjects were interviewed via telephone to assess the following inclusion and exclusion criteria: (1) child's age of 6 to 15 years; (2) abdominal pain at least once per week in the past 3 months, severe enough to disrupt activities; (3) symptoms for ≥ 1 month despite prescribed medications; (4) no previous experience with guided imagery for the treatment of abdominal pain; (5) no disability that could interfere with understanding of the audio/visual material; (6) no psychiatric disorder with psychotic elements (other psychiatric disorders, such as attention-deficit/hyperactivity disorder or anxiety, were not a basis for exclusion); and (7) English speaking. The study was approved by the institutional review boards at both the University of North Carolina at Chapel Hill and Duke University Medical Center.

At the first study visit (time 1), children and parents completed baseline questionnaires in separate rooms. Children picked a closed envelope that determined whether they would receive standard medical care with or without

guided imagery treatment. For children assigned to receive standard medical care without guided imagery treatment, a follow-up appointment was scheduled 8 weeks later and families were instructed to continue the medical care prescribed by their physicians. During the second visit, these families completed all questionnaires and began guided imagery treatment.

At the start of guided imagery treatment, children and parents watched the instructional DVD together and children listened to the first session in the clinic. Children were instructed to listen to the CDs at home ≥ 5 days per week for a period of 8 weeks. Parents were assigned as problem-solvers, and the research staff members were on call regarding questions and concerns. After treatment, parents and children again completed all questionnaires in separate rooms. At the 6-month follow-up time, mail-in questionnaires were sent to all participants.

Analyses

Independent *t* tests and χ^2 tests were used to test group differences at baseline. All subjects enrolled in the study were included in intention-to-treat and per-protocol analyses comparing the numbers of responders at the 1-month follow-up time (time 2) between the standard medical care group and the standard medical care plus guided imagery treatment group (χ^2 tests). In addition, differences between the 2 groups with respect to pain, disability, quality of life, school absences, and medication use were tested by using analysis of covariance with the outcome variables at time 2 as dependent variables and group as the independent variable. Baseline outcome variable values (time 1 values) were entered as covariates. *P* levels were set at .05 and, because this was an exploratory study, no adjustments were

made for multiple tests. To assess the long-term effects of treatment, all pre-guided imagery treatment scores were combined (time 1 for immediate guided imagery treatment and time 2 for delayed guided imagery treatment), as well as 1-month post-guided imagery treatment (time 2 for immediate guided imagery treatment and time 3 for delayed guided imagery treatment) and 6-month post-guided imagery treatment scores. Paired *t* tests were used to compare 6-month follow-up results with posttreatment and pretreatment values.

RESULTS

Characteristics of the Sample

A flow diagram of the progress through the phases of this study is presented in Fig 1. Sample characteristics are presented in Table 1. The 2 groups did not differ with respect to any baseline or demographic variables. Because the groups did not differ with respect to demographic variables, differences were not controlled for as covariates in later analyses.

Feasibility and Likeability of Guided Imagery Treatment

Posttreatment interviews with parents and children revealed that all treatment materials were self-explanatory and easy to understand and to use. Sessions were reported to be enjoyable, and children generally did not need help or reminders from their parents. The majority of children listened to the CDs more often than instructed. Inspection of the calendars that were kept at home yielded a compliance rate of 98.5%. No one contacted the research staff members with questions or problems. One child reported mild transient headaches after listening to the CDs within the first week of treatment; treatment was stopped for that child.

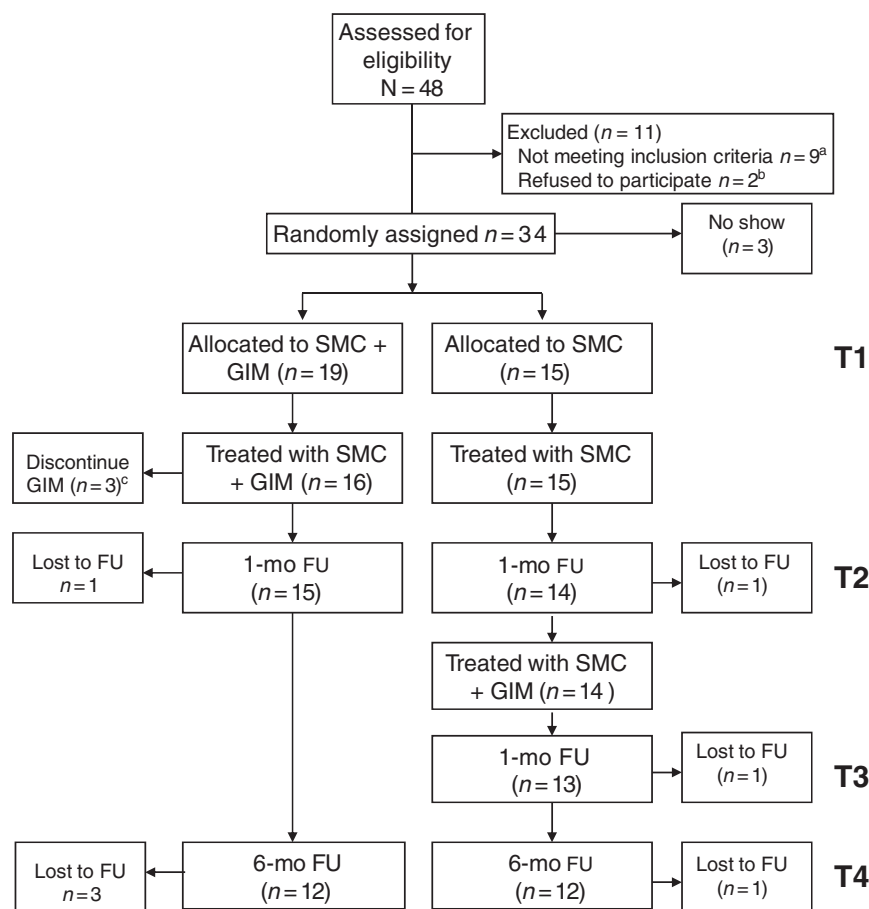


FIGURE 1

Diagram of study flow. GIM indicates guided imagery; SMC, standard medical care; FU, follow-up monitoring; T, time. ^aRenewed testing for organic disease ($n = 4$), symptoms < 1 times per week ($n = 3$), psychiatric disorder ($n = 1$), or age of < 6 years ($n = 1$). ^bRefused because of time involvement ($n = 2$). ^cSide effects ($n = 1$), did not like guided imagery ($n = 1$), or death of dog ($n = 1$).

Treatment Success

Intention-to-treat analyses were confirmed by analyses limited to patients who returned for follow-up evaluations at 1 month. All patients who dropped out were considered to be nonresponders except for 1 case in which the mother completed the abdominal pain questions via telephone and the child was free of pain. Intention-to-treat analyses showed that there were significantly more responders in the guided imagery treatment group (12 [63.1%] of 19 children) than in the medical care-only group (4 [26.7%] of 15 subjects; $P = .03$), according to parent report, at the 1-month follow-up evaluation (number needed to treat: 3). Per-protocol analy-

ses revealed similar results; 73.3% of children (11 of 15 subjects) who received guided imagery treatment were considered treatment responders, compared with 28.6% (4 of 14 subjects) who received standard medical care alone ($P = .02$; number needed to treat: 2).

When the children in the standard medical care-only group also received guided imagery treatment, 61.5% (8 of 13 subjects) became treatment responders, which was not significantly different from the response rate in the group that received immediate guided imagery treatment ($P = .4$). At the 6-month follow-up evaluation, 62.5% of subjects in the pooled sample (15 of 24 subjects) were responders.

According to child reports, 52.6% of children (10 of 19 subjects) who received guided imagery treatment were treatment responders, compared with 33.3% (5 of 15 subjects) in the standard medical care-only group, but this was not a significant difference ($P = .3$) in the intention-to-treat analysis. Per-protocol analyses showed similar results; 53.3% of children (8 of 15 subjects) were treatment responders after guided imagery treatment, compared with 35.7% (5 of 14 subjects) in the standard medical care-only group ($P = .3$). When the children in the standard medical care group also received guided imagery treatment, 69.2% (9 of 13 subjects) became treatment responders. At the 6-month follow-up evaluation, 60.9% of subjects in the pooled sample (14 of 23 subjects; data for 1 child were missing) were responders.

In addition, parents rated the global change in abdominal pain after completion of the guided imagery treatment. The majority of parents (85%) reported that their children were somewhat to markedly better after guided imagery treatment; only 1 parent reported no change, and no parents reported that their children fared worse.

Effects on Pain and Disability

Analysis of covariance yielded significant improvement in abdominal pain ($F_{1,26} = 4.4$; $P = .02$; partial $\eta^2 = 0.18$) and disability ($F_{1,25} = 7.0$; $P = .02$; partial $\eta^2 = 0.19$) after treatment, controlling for pretreatment scores (Figs 2–3). When children in the standard medical care group subsequently received guided imagery treatment, paired t tests revealed significant reductions in pain ($P = .01$) and disability ($P = .01$) (Figs 2 and 3).

No significant differences between groups with respect to child recall of abdominal pain after treatment were

TABLE 1 Characteristics of the Sample

	Standard Medical Care With Guided Imagery (N = 19)	Standard Medical Care Without Guided Imagery (N = 15)
Rome II diagnosis, % (n/N) ^a		
Irritable bowel syndrome	57.9 (11/19)	66.7 (10/15)
Functional dyspepsia	26.3 (5/19)	13.3 (2/15)
Functional abdominal pain	10.5 (2/19)	6.7 (1/15)
Abdominal migraine	15.8 (3/19)	20.0 (3/15)
Female, % (n/N)	77.7 (14/18)	64.3 (9/14)
Age, mean ± SD, y	10.6 ± 3.0	9.9 ± 2.2
Baseline findings		
Abdominal pain score, mean ± SD ^b	18.7 ± 12.6	20.1 ± 6.7
Functional disability score, mean ± SD ^b	26.2 ± 10.6	29.8 ± 14.6
Missed school days score, mean ± SD ^b	0.9 ± 1.2	1.8 ± 1.3
Quality of life score, mean ± SD ^b	24.7 ± 14.7	32.4 ± 15.9
No. of medications for gastrointestinal problems, mean ± SD	1.7 ± 1.7	2.0 ± .9
Physician visit score, mean ± SD ^b	1.3 ± 1.3	2.5 ± 1.4

^a These numbers do not add up to 100% because 5 patients suffered from 2 different functional gastrointestinal disorders.

^b Higher scores indicate more pain, more disability, more missed school days, lower quality of life, and more physician visits.

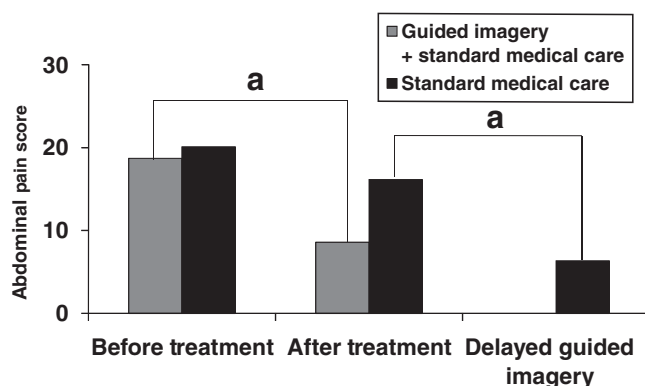


FIGURE 2 Effects of guided imagery treatment on abdominal pain. ^a $P < .05$.

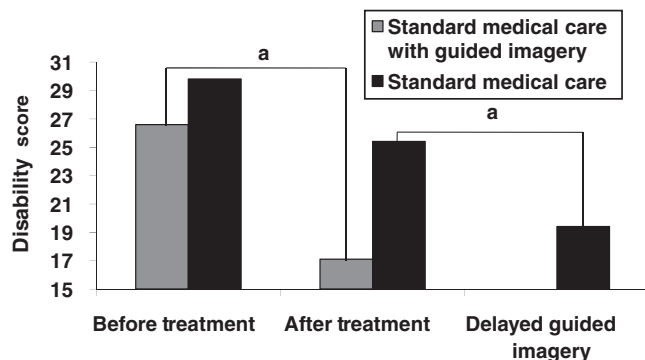


FIGURE 3 Effects of guided imagery treatment on disability. ^a $P < .05$.

found. Child reports of disability showed a trend ($F_{1,23} = 3.9$; $P = .06$; partial $\eta^2 = 0.15$). Because the child

reports yielded mainly trends, we limited further analyses to parent reports.

Long-Term Effects on Pain and Disability

To assess long-term effects of the guided imagery intervention, all scores recorded before guided imagery treatment were combined (time 1 for immediate guided imagery treatment and time 2 for delayed guided imagery treatment). At the 6-month follow-up evaluation, paired t tests revealed no relapse of pain and disability from the posttreatment assessment (Figs 4 and 5) but did indicate significant differences from the pretreatment assessment to the 6-month follow-up evaluation.

Effects on Quality of Life and School Absences

Compared with children in the standard medical care-only group, children who received guided imagery treatment showed improved quality of life (mean score: without guided imagery treatment: 9.3; with guided imagery treatment: 28.2; $F_{1,16} = 4.5$; $P = .049$; partial $\eta^2 = 0.22$) and reduction in the number of visits to a medical care provider (mean score on PEDS QL: without guided imagery treatment: 2.3; with guided imagery treatment: 1.10; $F_{1,25} = 5.8$; $P = .02$; partial $\eta^2 = 0.19$). No differences between groups with respect to days of school missed (mean score: without guided imagery treatment: 0.7; with guided imagery treatment: 1.7; $F_{1,24} = 1.6$; $P = .2$) and number of medications taken because of gastrointestinal problems (mean: without guided imagery treatment: 0.9 medications; with guided imagery treatment: 1.6 medications; $F_{1,26} = 0.8$; $P = .4$) were found.

DISCUSSION

Audio-recorded guided imagery treatment was superior to standard medical care in reducing abdominal pain, disability, and medical visits and improving quality of life. Treatment ef-

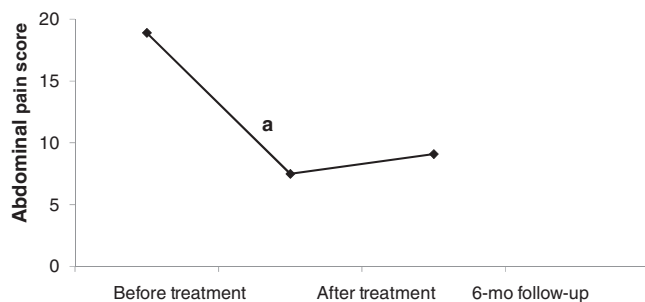


FIGURE 4 Long-term effects of guided imagery treatment on abdominal pain. ^a $P < .0001$.

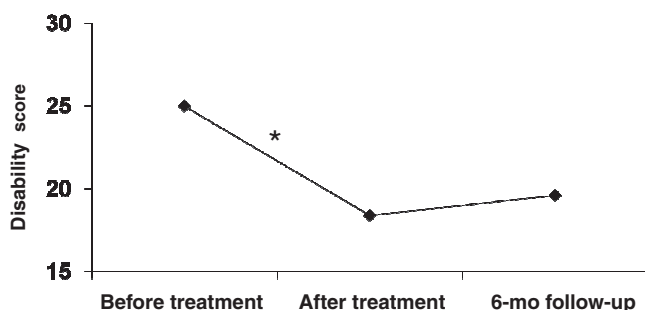


FIGURE 5 Long-term effects of guided imagery treatment on disability. Scores of <15 were not possible. ^a $P < .0005$.

fects were sustained over a period of 6 months. The rates of treatment success were similar to studies of therapist-administered guided imagery treatment for children with functional abdominal pain, although results cannot be compared directly because the study end points defining treatment success were different in those studies. Weydert et al⁷ reported that 36% of children demonstrated recovery after treatment and 70% at 1 month after guided imagery treatment. Vlieger et al⁸ observed that hypnosis resulted in 59% of children being in clinical remission after treatment, 71% at 6 months, and 85% at 12 months. These results suggest that the initial effects of our audio-recorded treatment (63%–73% responders) were comparable to those of therapist-delivered treatment. Our therapeutic gains were maintained for ≥ 6 months but, with therapist-delivered guided imagery treatment, some patients may experience further improvements after the

end of therapy.⁸ It can be expected that, when treatment is individualized, the effects may be better and possibly longer-lasting for some patients. However, audio-recorded guided imagery treatment may be an attractive first-line therapy. It was effective for two thirds of patients, and the therapeutic gains were long-lasting. Patients who do not respond to audio-recorded guided imagery treatment may be referred for individualized therapy.

Compliance rates were high. In fact, children liked the treatment so much that many listened to the recordings more than once per day. Despite substantial improvement in symptoms with guided imagery treatment according to parent reports, child reports of symptoms and disability showed no significant effects. Previous studies that included larger numbers of patients and/or daily diaries showed significant effects of guided imagery treatment in child reports of pain.^{7,8}

Power calculations showed that ≥ 119 children would be needed for determination of significant effects on pain in our study (power = 0.08; $\alpha = .05$; number needed to treat: 5); therefore, our study might have been underpowered. In addition, we observed that many children <10 years of age had difficulties with weekly recall of pain. Unfortunately, our sample sizes were too small for subanalyses according to age group. We cannot exclude other possible explanations for the discrepancy between child and parent recall, such as increased parental expectations of benefits from hypnosis²⁰ or reductions in children's complaints of pain to their parents. This needs to be addressed in larger studies. Audio-recorded guided imagery scripts have been found to be successful in reducing child pain reports postoperatively,¹¹ which indicates the feasibility of this type of treatment.

Despite significant reductions in pain, disability, and number of health care visits and improvements in quality of life, we found no changes in the number of medications and the number of days missed at school. This seems counterintuitive but may be explained by a variety of factors. First, the rates of school absences and medication use were low at baseline, which might not have left much room for improvement. This is attributable to the fact that we recruited both new patients who had little disability and patients who were treatment resistant and had significant disability. Second, most medications were used not on a daily basis but as needed, and parents might not have been ready to part with them after only 2 months, although the medications may not have been used much. At the 6-month follow-up evaluation, considerably more children were not using any medication. The mean numbers of gastrointestinal medications for the group receiving guided

imagery treatment was 1.7 before treatment, 1.0 after treatment, and 0.14 at 6 months.

Our study is limited in that the standard medical care group did not receive a placebo treatment. Omitting a placebo treatment may lead to overestimation of treatment effects because of greater expectancy of benefit, a variable that we did not measure in this study. However, many parents in our study initially were skeptical that guided imagery could be beneficial but reported a willingness to try a new approach. Furthermore, we recruited only patients from tertiary care clinics; this is a special population with possibly more-intense pain, disability, and psychological distress. It is therefore uncertain how well these results can be generalized to primary care clinics. Scripts were delivered to patients across several developmental levels (6–15 years of age), and this might have reduced responsiveness. Feedback on the scripts was solicited, and all participants responded positively except for 2 children, both 15 years of age, who complained that the scripts were too childish. Adjustment of scripts to patients' developmental level may be necessary for future applications.

Approximately 25% of pediatric patients see a physician because of abdominal pain between the ages of 5 and 21 years.²¹ Many of these patients are treated effectively with reassurance and exhibit improvement over time. However, 39% of these children visit their physician more than once because of their pain.²¹ For such children, it may be appropriate to consider behavioral interventions. Given the large number of patients and limited resources, a home-based therapy that is not dependent on a therapist may be of huge benefit in this population, by increasing the availability of guided imagery treatment for the ma-

majority of children who suffer from chronic pain. Home-based treatments of this kind are not meant to replace traditional care but can be offered as an adjunct to medical treatment. Patients who do not respond to the home-based treatment may benefit from referral to a therapist for an individualized treatment plan. This may alleviate the referral burden on therapists currently treating patients with chronic pain and may facilitate timely delivery of treatment to the majority of children.

APPENDIX: DESCRIPTION OF STUDY INTERVENTIONS

Guided Imagery Treatment

Standardized guided imagery scripts were developed and recorded on CDs. Scripts first were tested for likeability and understandability with 3 healthy children (a boy 6 years of age and a girl and a boy 9 years of age) and then were tested with 3 different children who had a physician diagnosis of functional abdominal pain (2 boys 6 and 11 years of age and a girl 10 years of age); scripts were adjusted according to feedback. These children were excluded from further participation in the study.

The 8-week treatment program consisted of 3 biweekly sessions, including 1 booster session (~20 minutes in length) and 3 daily sessions (~10 minutes each) (Fig 6). Sessions were modeled after well-described, tested protocols for adults with irritable bowel syndrome,^{9,22} combined with imagery suited for children.⁶ Each session includes induction imagery to produce relaxation, followed by imagery and suggestions for decreased discomfort and healing. In session 1, children imagine floating comfortably on a big puffy cloud and are instructed to relax progressively. Suggestions are given for decreased discomfort, that is, imagining a special object melting into

Flow of treatment

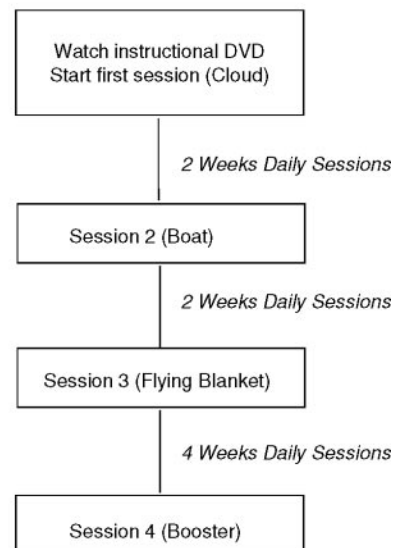


FIGURE 6
Flow of treatment.

one's hand like butter and making the hand shiny and warm. Children are instructed to place this hand on their belly, imagining the light and warmth spreading through their belly and making a protective barrier inside that does not let anything irritate the belly. In session 2, progressive relaxation is induced by the children imagining sitting in a gently rocking boat. Suggestions for decreased discomfort are for the children to imagine drinking a favorite drink to wash away discomfort, which leaves them feeling healthier and happier with each sip. In session 3, the children imagine sitting on a flying blanket and enjoying a flight to a mountaintop. On top of the mountain, children imagine the special object melting in their hand again. The light in the hand flashes and becomes stronger with every flash, so that the children have more power to decrease any pain or discomfort. For the booster session, children repeat 1 session of their choice. The suggestions for decreased discomfort and increased well-being build on each other in each session, and daily sessions are used to reinforce learned concepts. In the daily

sessions, imagery of a swing, a slide, and blowing bubbles are used to induce relaxation, with the image of the special object melting into the hand to reduce discomfort.

At the end of the 8-week period, children were instructed to continue listening to the CDs but to decrease slowly the frequency of listening from daily to as much or as little as they want. Children were instructed to begin using the CDs more frequently if stomachaches worsened. Children also were instructed to begin using

their newly learned skills without the CDs, so that they could become comfortable using guided imagery anywhere. The pediatric gastroenterologists and nurses at the University of North Carolina at Chapel Hill and Duke University were instructed by Dr van Tilburg in how to introduce the treatment to their patients so that the patients understand that this program addresses a physical problem (abdominal discomfort) and is not intended to treat psychological symptoms.

Medical Treatment

Medical treatment was tailored to each child and consisted of reassurance, education, and medication as deemed appropriate by the treating physician and the family. New medications needed to be initiated ≥ 4 weeks before the start of treatment.

ACKNOWLEDGMENTS

This work was supported by National Institutes of Health grants R24 DK067674 and RR00046.

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