Mindfulness-Based Stress Reduction for Adolescents with Functional Somatic Syndromes: A Pilot Cohort Study

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Objective To assess the feasibility of a mindfulness-based stress reduction (MBSR) program for adolescents with widespread chronic pain and other functional somatic symptoms and to make preliminary assessments of its clinical utility.

Study design Three cohorts of subjects completed an 8-week MBSR program. Child- and parent-completed measures were collected at baseline and 8 and 12 weeks later. Measures included the Functional Disability Inventory (FDI), the Fibromyalgia/Symptom Impact Questionnaire-Revised (FIQR/SIQR), the Pediatric Quality of Life Inventory, the Multidimensional Anxiety Scale (MASC2), and the Perceived Stress Scale. Subjects and parents were interviewed following the program to assess feasibility.

Results Fifteen of 18 subjects (83%) completed the 8-week program. No adverse events occurred. Compared with baseline scores, significant changes were found in mean scores on the FDI (33% improvement, $P = .026$), FIQR/SIQR (26% improvement, $P = .03$), and MASC2 (child: 12% improvement, $P = .02$; parent report: 17% improvement, $P = .03$) at 8 weeks. MASC2 scores (child and parent) and Perceived Stress Scale scores were significantly improved at 12 weeks. More time spent doing home practice was associated with better outcomes in the FDI and FIQR/SIQR (44% and 26% improvement, respectively). Qualitative interviews indicated that subjects and parents reported social support as a benefit of the MBSR class, as well as a positive impact of MBSR on activities of daily living, and on pain and anxiety.

Conclusions MBSR is a feasible and acceptable intervention in adolescents with functional somatic syndromes and has preliminary evidence for improving functional disability, symptom impact, and anxiety, with consistency between parent and child measures. *(J Pediatr 2017;183:184-90).*

Trial registration ClinicalTrials.gov: NCT02190474.

Functional somatic syndromes include conditions such as chronic fatigue syndrome, irritable bowel syndrome, fibromyalgia, chronic unexplained pain, and symptoms attributed to chronic Lyme disease.[1-4] At least 13% of primary care visits are attributable to functional somatic syndromes.[5-7] These syndromes are prevalent, costly, and may be debilitating.[8] Patients with these syndromes often have psychiatric comorbidities, primarily anxiety or depression.[9-11] Many medical specialties have archetypal functional syndromes that may reflect similar underlying pathophysiology. Patients seen by different medical subspecialists often are labeled as having certain functional syndromes associated with the subspecialty (eg, irritable bowel syndrome for gastroenterologists; fibromyalgia for rheumatologists), but the syndromes may actually be more similar than they are different.[12,13]

Many functional somatic syndromes are associated with dysfunctional central nervous system processing[14,15] and may persist: 85% of patients with juvenile fibromyalgia continue to have symptoms into adulthood, and 50% of these patients meet diagnostic criteria for fibromyalgia.[16] Children with unexplained recurrent abdominal pain are at increased risk of developing fibromyalgia.[17]

As is true of many conditions that tend to be resistant to conventional treatments, patients with functional somatic syndromes often seek therapies outside of mainstream care.[18-20] Among the more promising interventions for functional somatic syndromes are mind-body therapies that can address both psychological and somatic symptoms.[21] Furthermore, nonpharmacologic interventions are

CBT	Cognitive behavioral therapy
FDI	Functional Disability Inventory
FIQR	Fibromyalgia Impact Questionnaire—Revised
MASC2	Multidimensional Anxiety Scale for Children, Second Edition
MBSR	Mindfulness-based stress reduction
PedsQL	Pediatric Quality of Life Inventory
PSS	Perceived Stress Scale
SIQR	Symptom Impact Questionnaire—Revised

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especially appealing in light of risks of adverse effects of psychotropic medications and analgesics, the stigma of being "medicated," and the effect of the intervention on the central nervous system.[22-24]

Mindfulness-based stress reduction (MBSR) involves meditation training, patient education, yoga exercises, and group support.[25-27] The standard 8-week MBSR curriculum for adults consists of weekly instructor-led group sessions (2.5 hours long with meditation practice, discussions, and skill-building activities), a full-day retreat, and 45-60 minutes of practice daily.[25,27] Clinical trials in adults have shown that various forms of mindfulness meditation result in improvement in pain, physical function, anxiety, and depression.[28-32] There are also data that support the use of MBSR in children and adolescents both for reducing perceived stress and for improving psychological health.[33] In this pilot study, we assessed the feasibility of an MBSR program for adolescents with widespread chronic pain and other persistent somatic symptoms and made preliminary assessments of its clinical utility.

Methods

Almost all subjects were 12-18 years of age (one 10-year old participated) and had symptoms consistent with fibromyalgia, chronic fatigue, musculoskeletal pain, headache, abdominal pain-related bowel dysfunction, perceived cognitive impairment, or other nonspecific symptoms that had been present for ≥3 months, were associated with some degree of disability (eg, missing school), and were not attributable to an organic medical disorder despite adequate evaluation (ClinicalTrials.gov: NCT02190474).

Potential subjects were excluded if they had a chronic autoimmune or inflammatory condition, had a serious illness within 90 days of enrollment, used opioid analgesics, or screened positive on the Columbia-Suicide Severity Rating Scale at enrollment. Written informed consent/assent was obtained from parents and subjects. All subjects received $200 for participation. The study was approved by the Human Investigation Committee of Yale University.

Subjects attended weekly 1.5-hour group sessions for 8 weeks and one 4-hour retreat, all led by an experienced MBSR instructor. Assignments were 15- to 20-minute guided (step-by-step) daily home practice with the use of audio recordings from the instructor. We condensed the standard adult MBSR protocol but retained core curricular elements while modifying it to be both developmentally appropriate and logistically feasible for adolescents. Subjects were assessed at baseline, at 8 weeks (at the end of the MBSR program), and at 12 weeks. Subjects received a daily text message via a secure mobile data broadcast service (callfire.com) to remind them to record minutes of home practice (if any) and to minimize recall bias. Parents of subjects were encouraged, but not required, to participate in a concurrent parent group to encourage familiarity with the MBSR program. The parent groups listened to the weekly audio recordings of guided meditations given to study subjects and were instructed not to encourage nor to formally practice MBSR with their children.

Measures

Measures included the Functional Disability Inventory (FDI), which assesses physical and functional impairment in adolescents with chronic pain.[34,35] Scores range from 0 to 60, with greater scores indicating greater functional disability, and can be categorized as no/minimal (0-12), moderate (13-29), or severe (>30) disability.[34,36] A 7.8-point change in the FDI has been determined empirically to be the minimal clinically important difference in adolescents.[37]

We used the Fibromyalgia Impact Questionnaire—Revised (FIQR) for subjects who met diagnostic criteria for fibromyalgia (n = 7) and the analogue Symptom Impact Questionnaire—Revised (SIQR) for subjects who did not meet diagnostic criteria for fibromyalgia (n = 8).[38,39] A 14% change in the FIQR has been determined empirically as a minimal clinically important difference in adults.[40] The FDI and FIQR/SIQR were our primary measures.

We assessed health-related quality of life with the Pediatric Quality of Life Inventory (PedsQL) 4.0 adolescent form.[41] We also used the Child and Adolescent Mindfulness Measure, a 10-item questionnaire assessing mindfulness skills.[42] Child and Adolescent Mindfulness Measure scores are correlated positively with quality of life, academic competence, and social skills and correlated negatively with somatic complaints, internalizing symptoms, and externalizing behavior problems. We assessed subjects' stress with the Perceived Stress Scale (PSS),[43] a 14-item scale that assesses perceived stress of life situations in adolescents[44] and adults and has well-established validity in relation to physiological stress responses[45] and anxiety and depressive disorders.[46] We assessed anxiety with the Multidimensional Anxiety Scale for Children, Second Edition (MASC2),[47] consisting of 50 items distributed across 6 domains: Physical Symptoms, Social Anxiety, Harm Avoidance, Separation Anxiety/Phobias, Generalized Anxiety, and Obsessive-Compulsive symptoms.[48] Parents completed parent versions of the MASC2 and PedsQL.

Qualitative Interviews

We interviewed each subject-parent dyad together after the 8-week session in a semistructured, open-ended manner. These 15- to 20-minute interviews explored 3 broad areas: the feasibility and practicality of meeting weekly for 8 weeks (eg, participating during the school year); the structure and content of the MBSR course (eg, age-appropriateness of instructions, class size and length, feasibility of home practice); and perspectives on clinical and psychosocial benefits realized through mindfulness practice. Interviews conducted by 2 investigators were audio recorded and transcribed verbatim (Transcription Plus, LLC, Bristol, Connecticut). Data analysis followed the constant comparative approach.[49] After each cohort, the transcripts were reviewed, and emerging themes in the data were identified.

Statistical Analyses

Because of the relatively small sample size and the potential for underlying non-normality of the results, differences in distributions between baseline and week 8 and between