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Original Research Article

Pilot study of a parent-based intervention for functional somatic symptoms in children

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Abstract

Objective: Functional somatic symptoms are associated with significant distress and impairment for children and their families. Despite the central role that families play in their children's care, there is little clinical research to guide how parents can support their children with functional somatic symptoms and promote better functioning. To address this gap, we developed a parent-based intervention for functional somatic symptoms in children and obtained preliminary data on acceptability, feasibility, treatment satisfaction, and clinical outcomes.

Method: The intervention was adapted from SPACE (Supportive Parenting for Anxious Childhood Emotions), an evidence-based treatment for anxiety and related disorders in children. The intervention, SPACE-Somatic, was delivered to parents of 16 children (M_{age} = 14.50 years; 75% girls) with a range of functional somatic symptoms. Parents participated in seven weekly group sessions conducted via telehealth.

Results: We found that SPACE-Somatic was acceptable, feasible, and satisfactory to parents. There were significant improvements in several clinical outcomes from baseline to posttreatment, including children's level of functional impairment, with some gains maintained at 3-month follow-up. Parents also reported improvements in their own stress and their accommodation of children's symptoms.

Conclusion: This pilot study provides preliminary evidence that a parent-based intervention is viable and beneficial to children with functional somatic symptoms and their parents.

Keywords: functional somatic symptoms, children, adolescents, parents, intervention.

Functional somatic symptoms (FSS; also referred to as persistent somatic symptoms and medically unexplained symptoms) are physical conditions with no identified pathophysiology (Campo, 2012). In children and adolescents (henceforth "children"), FSS frequently include headache, gastrointestinal symptoms, musculoskeletal pain, and fatigue, with most children having more than one symptom (e.g., Wiggins et al., 2021). Specific syndromes, such as irritable bowel syndrome, fibromyalgia, and chronic fatigue syndrome, also fall under the umbrella of FSS. In the current psychiatric nosology, FSS are often classified under somatic symptom disorder or functional neurological symptom disorder (American Psychiatric Association, 2013).

FSS in children constitute a major public health problem. One systematic review found that 60% of children under 20 years old from across the world are prone to headache during a 3-month period (Abu-Arafeh et al., 2010), and a meta-analysis found that the pooled prevalence for functional abdominal pain is 13.5% in 4- to 18-year-olds globally (Korterink et al., 2015). FSS are also associated with psychiatric comorbidities, especially depression and anxiety, and significant impairment and disability across important domains of functioning (e.g., Campo, 2012; Essau, 2007; Vassilopoulos et al., 2021). Further, FSS are associated with frequent, repeated use of health services across levels of care (e.g., Campo et al., 1999). In one study of 33,272 Canadian children, healthcare costs for children with FSS were 6–8 times the costs for children without FSS (Saunders et al., 2020).

The substantial personal and societal burdens of FSS underscore the need to identify variables that maintain or exacerbate symptoms and can be targeted through intervention. Parent behaviors have received particular attention, as parents play a central role in their children's care (e.g., Beck, 2007). Research from the broader pediatric chronic illness literature highlights parents' grave concern with their children's symptoms and the extensive time and resources they dedicate to addressing them, sometimes resulting in overly solicitous and potentially "illness-encouraging" behaviors (e.g., providing reassurance, arranging repeated medical appointments, excusing participation in chores or school) (e.g., Van Slyke & Walker, 2006). These behaviors can contribute to emotional challenges in parents (e.g., anxiety, stress), and moreover are actually associated with more symptom complaints, greater disability, and increased healthcare utilization in children (e.g., Janssens et al., 2009; Jordan et al., 2007; Lewandowski et al., 2010; Peterson & Palermo, 2004).

Building on this research, there is growing interest in the FSS literature on *family accommodation* of children's

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symptoms (hereafter "accommodation") (Harrison et al., 2016; La Buissonnière-Ariza et al., 2021). Accommodation refers to the myriad ways that parents become involved in their children's symptoms and attempt to prevent and/or alleviate their symptom-related distress (Calvocoressi et al., 1995; Lebowitz et al., 2013). Accommodation has been extensively studied in obsessive-compulsive (OCD) and anxiety disorders and found to be highly prevalent, yet associated with greater symptom severity and impairment, worse treatment outcomes, and more parent distress and family dysfunction (e.g., Iniesta-Sepúlveda et al., 2020; Lebowitz et al., 2016; Peris et al., 2008).

Two studies examined and found this to be true of FSS and accommodation as well. Harrison et al. (2016) adapted the most-utilized scale assessing accommodation of OCD (*Family Accommodation Scale*; Calvocoressi et al., 1995) to assess accommodation of children's sickness and pain symptoms. They found that accommodation was prevalent and significantly associated with more symptom complaints in a community sample of $N = 220$ children ($M_{age} = 6.51$ years, $SD = 4.95$). Using this same scale, La Buissonnière-Ariza et al. (2021) found that 100% of parents endorsed accommodating their children's sickness and pain symptoms and this accommodation was significantly associated with functional impairment, controlling for symptom severity, in an outpatient sample of 66 adolescents with chronic pain ($M_{age} = 15.50$ years, $SD = 1.60$). As with anxiety and OCD, accommodation of FSS may contribute to children's symptoms and related impairment by reinforcing beliefs about the inability to tolerate symptoms, facilitating avoidance, and reducing opportunities for independent coping (Harrison et al., 2016; Shimshoni et al., 2019).

The above research provides compelling justification to target accommodation in an intervention for FSS, as has been done for OCD and anxiety disorders with positive outcome (e.g., Lebowitz, 2013; Lebowitz et al., 2014). Yet, a systematic review of family-based interventions for children with FSS ($k = 16$ studies; children 5–18 years-old) shows that parents' role has focused mainly on psychoeducation and/or training to help their child engage in cognitive-behavioral strategies (Hulgaard et al., 2019). This approach has yielded mixed results and has not consistently been found to significantly improve outcomes for FSS and other chronic pediatric illnesses (Bonvanie et al., 2017; Eccleston et al., 2015; Hulgaard et al., 2019; Law et al., 2019).

Another important reason to target accommodation in an intervention for FSS is that not all children are able or willing to engage in their own cognitive-behavioral therapy (e.g., Bonvanie et al., 2017; Simons et al., 2010). Targeting accommodation only involves parent behavior change and therefore obviates the need or expectation for child participation in treatment, offering a novel, alternative approach. However, reducing accommodation is not a straightforward or simple task. Parents often receive mixed messages from both physicians and therapists about whether to accommodate their child's symptoms. Even when advised not to, they may struggle with how much and in which ways to accommodate, or encounter difficult reactions from their child when they attempt to accomodate less (e.g., Eccleston et al., 2015; Kozlowska et al., 2012). A treatment that guides parents through these issues therefore fills an important gap.

Accordingly, we developed and preliminarily evaluated the first fully parent-based intervention targeting the accommodation of children's FSS. We adapted SPACE (Supportive Parenting for Anxious Childhood Emotions), an evidence-based treatment for pediatric OCD and anxiety disorders (Lebowitz, 2013; Lebowitz et al., 2014). SPACE helps parents to systematically identify and reduce accommodations while increasing a supportive attitude toward their child. Open and randomized controlled trials support SPACE's feasibility, acceptability, and efficacy (i.e., decreased anxiety and OCD symptoms and impairment), and show reductions in parent accommodation and stress (Lebowitz, 2013; Lebowitz et al., 2014, 2019; Storch et al., 2023). SPACE has also been adapted and found beneficial for reducing other pediatric problems characterized by high levels of accommodation (e.g., avoidant/restrictive food intake disorder; Shimshoni et al., 2020).

We designed the intervention—henceforth "SPACE-Somatic"—for delivery in a group format via telehealth. Both group- and telehealth-based interventions can promote access to care and lower service fees (e.g., Bower & Gilbody, 2005; Lindgren et al., 2016), factors that may be especially important given that children with FSS typically have high service utilization rates and costs (Saunders et al., 2020). A group format may also be particularly well suited for parents of children with FSS, who often feel isolated and lacking in social support (e.g., Kratz et al., 2009). SPACE for child anxiety/OCD has been delivered effectively in telehealth and group formats in prior studies (Dekel et al., 2021; Storch et al., 2023). Our first aim of this pilot study was therefore to assess feasibility, acceptability, and treatment satisfaction for SPACE-Somatic. Our second aim was to preliminarily evaluate clinical outcomes by examining child- and parent-reports of children's symptoms, functioning, and well-being at pre- and posttreatment and 3-month follow-up (FU). As in prior studies, we also examined parent accommodation and stress. We expected that SPACE-Somatic would be acceptable, feasible, satisfactory, and beneficial for children with FSS and their parents.

Methods

Participants

Participants were recruited via flyers (posted across the University and in local businesses), social media outreach (posts in Facebook groups for pediatricians and parents), and emails sent to local pediatricians. Inclusion criteria were that children: (a) were between 10 and 17 years old, (b) had one or more FSS including headache, gastrointestinal symptoms, musculoskeletal pain, chronic fatigue, fibromyalgia, irritable bowel syndrome, symptoms related to chronic Lyme disease, perceived cognitive impairment, or other nonspecific symptoms not attributable to a known biomedical disorder despite adequate evaluation, (c) had symptoms for at least 3 months with some degree of impairment (e.g., missing school), (d) were proficient in English, and (e) lived with their participating parent >50% of the time. Exclusion criteria were: (a) presence of a medical condition by history that better explained the child's symptoms, including chronic autoimmune or inflammatory conditions, (b) lifetime history of a psychotic disorder, bipolar disorder, autism spectrum disorder, or intellectual disability in the child or parent, (c) concurrent participation in another psychotherapeutic treatment for FSS (it was not necessary that children cease other medical or psychiatric assessment or treatment), and (d) presence of

severe emotional or behavioral problems that required more immediate treatment (e.g., suicide ideation with plan and intent).

Procedures

Recruitment and enrollment

All procedures were approved by the University's Human Investigation Committee and the study was registered on Clinicaltrials.gov (NCT04277715). Interested parents completed an initial phone screen with a clinical psychologist (first author) who provided additional information (e.g., explained the study/treatment goals and schedule), and preliminarily assessed eligibility through a series of questions about the child's symptoms, diagnoses, and treatment. Following the phone screen, the lead study physician (last author) verified eligibility by reviewing the child's medical chart and/or consulting the child's pediatrician to confirm that inclusion and exclusion criteria were met (e.g., checking for prior biomedical disorder diagnoses that would better explain symptoms).

For eligible and interested families, children and parents participated in a consent meeting over Zoom; informed child assent and parent consent forms were signed and returned. If applicable, both parents were invited to participate in treatment, but one parent was the "primary parent" who completed all measures and attended all treatment sessions. Treatment began when at least four families were enrolled to ensure adequate peer support and diversity of experiences. Each group was limited to eight families to allow for personalized attention throughout the treatment.

Assessment and treatment

Assessments, described below, were securely administered through Qualtrics.com and collected the weeks before (PRE) and after treatment (POST), and at 3-month FU (data available upon request). Treatment groups meet once per week for seven consecutive weeks. Each session lasted 1.5 h, scheduled in the evenings (after work hours) to promote accessibility. Only parents, not children, attended the treatment sessions, which were conducted over Zoom. Families received the intervention at no cost.

Each group was led by two clinicians who were clinical psychologists and/or a psychiatrist (first through third authors). All clinicians specialized in child psychopathology and had experience with group-based treatment. To ensure treatment fidelity, each session was reviewed with a supervisor, a licensed clinical psychologist and the developer of SPACE (fifth author). Supervision entailed reviewing the manual, watching videos of sessions (with written parent consent), planning for upcoming sessions, and discussing roadblocks/barriers to prevent therapist drift.

Treatment content

As discussed, SPACE-Somatic was adapted from the original SPACE protocol for child anxiety disorders/OCD and informed by FSS theory and research. The protocol is manualized but designed to be implemented flexibly. It includes six parts implemented sequentially over the seven group sessions. Each session involves active discussion and practice of skills in addition to didactic components. Parents are also given tasks to complete between sessions and review the following week. The key components of each part of the treatment are presented in Table 1.

Table 1. SPACE-Somatic treatment components.

Treatment part	Key interventions
1	• Orient parents to the program • Build group cohesion • Discuss parents' goals • Provide psychoeducation • Set the stage for parent-based work to help children with FSS function better • *Homework*: Identify child, family, and community strengths
2	• Introduce concept of supportive parental responses • Form and practice supportive statements • Discuss how and when to implement supportive statements • Discuss potential barriers and challenges to increasing support • *Homework*: Monitor use of supportive statements
3	• Introduce concept of accommodation • Discuss how to identify and to monitor accommodations • Discuss the goal of picking a "target" accommodation to reduce • Introduce concept of overtures • *Homework*: Chart accommodation and pick a target
4	• Discuss how to develop a plan to reduce accommodation • Discuss how to manage and problem-solve potential difficult child reactions • Discuss how to inform child of plan with a written announcement • Introduce concept of supporters and how they can assist with plans • *Homework*: Develop a plan to reduce accommodation and announcement
5	• Review and problem-solve efforts to increase support and reduce accommodation • Discuss tools for increasing parent self-regulation to manage difficult child reactions • *Homework*: Monitor plan to reduce accommodation
6	• Review and problem-solve efforts to increase support and reduce accommodation • Review skills and children's progress • Plan for potential next steps • Discuss relapse prevention

Note. FSS, functional somatic symptoms.

SPACE-Somatic, like SPACE for anxiety/OCD, has two overarching goals: to increase parental supportive responses to children, and to decrease parental accommodation of children's symptoms. Parental supportive responses are defined as an integrated expression of validation/acceptance of the child's symptoms and related challenges, and confidence that the child can manage or cope with them. Examples of supportive statements are: "I know you are in pain, but you will get through it, the worst will pass" and "It's so hard feeling uncertain about why this is happening and when it will get better, but I believe you can handle those feelings." (In SPACE for anxiety/OCD, supportive statements convey acceptance and confidence about the child's anxiety).

The process of decreasing accommodation comprises several steps, including parents identifying and monitoring accommodations they engage in, picking a specific accommodation to reduce, making a detailed and practical plan for how they will reduce the target accommodation, and informing their child of this plan. These steps mirror the process of

SPACE for anxiety/OCD, but are adapted for the special considerations relevant to children with FSS. For example, plans to reduce accommodation of FSS include parents not picking up the child early from school due to physical complaints, not bringing the child meals in their room, and reducing response to excessive reassurance-seeking from the child about their symptoms. Parents are coached in managing potential difficult reactions from the child, such as aggression or threats of self-harm (which can also arise in the context of anxiety), as well as continued nonfunction or complaints of symptoms. Parents are also coached in supportive messaging when informing children of these plans (e.g., acknowledging the symptoms may persist but stating the goal of wanting to help the child live a fuller life). The concept of engaging *supporters*, individuals outside of the immediate family who can help facilitate parents' plans and support the child's functioning, is also emphasized. A related but novel tool included in SPACE-Somatic is increasing *positive overtures*, or invitations directed toward the child without demand or expectation (e.g., invitations to engage in family activities).

Like in SPACE for anxiety/OCD, ample time is spent setting the stage for parent-based work. In SPACE-Somatic, the goal is to highlight how much parents have already done to help their child medically, and how they can continue to help by learning new ways to promote functioning in light of, or despite, the FSS. Woven throughout the treatment is also a discussion of parents' challenges, fears, past experiences, and hopes/goals. Emphasis is placed on balancing these experiences (e.g., hoping to still receive a medical diagnosis or cure for their child) with conveying acceptance and confidence, regardless of what might happen medically. It is clearly stated that groups do not focus on discussing the veracity of children's diagnoses or the merits of other treatment approaches and medical interventions.

Measures

Acceptability, feasibility, and treatment satisfaction

Acceptability was calculated as the proportion of eligible participants who elected to enroll in the study. Feasibility was calculated as the proportion of participating parents who attended more than half of the treatment sessions. Treatment satisfaction was assessed using the 8-item *Client Satisfaction Questionnaire* (Attkisson & Greenfield, 1996), administered to parents at POST. Parents rated items on a 0–4 scale, with higher summed scores indicating greater satisfaction with services (range = 0–32). Parents could also provide additional feedback about the treatment in an open-ended response format.

Clinical outcomes

Three measures, completed by parents and children, pertained to children's FSS. The 15-item *Functional Disability Inventory* (Kashikar-Zuck et al., 2011; Walker & Greene, 1991) assesses children's physical and psychosocial functional impairment related to chronic symptoms, and is widely used, valid, and reliable in pediatric samples. Higher scores indicate greater functional disability (0–4 rating scale; parent/child αs = .861/.898). The *Symptom Impact Questionnaire—Revised* (Friend & Bennett, 2011) assesses children's somatic symptoms in terms of impairment (2-items; parent/child αs = .932/.888) and severity (10-items; parent/child αs = .740/.737). It has evidence of construct validity, test–retest reliability, and sensitivity for detecting therapeutic change. Higher scores indicate greater impairment and severity, respectively (0–10 rating scale). The 23-item *Pediatric Quality of Life Inventory* (Varni et al., 2001) assesses children's health-related quality of life. It is found to be valid and reliable in community samples and pediatric samples with chronic health conditions. Higher scores indicate a better quality of life (0–4 rating scale; parent/child αs = .920/.806).

Three measures assessed children's psychological symptoms, given that psychiatric comorbidities are common among children with FSS. The 41-item *Screen for Child Anxiety Related Emotional Disorders* (Birmaher et al., 1999), completed by parents and children, assesses children's anxiety symptoms. It has excellent psychometric properties in community and clinical samples (Etkin et al., 2021). Higher scores indicate greater anxiety severity (0–2 rating scale; parent/child αs = .929/.961). The 17-item *Child Depression Inventory—2* (Kovacs et al., 2011), completed by parents and children, assesses children's depressive symptoms. It has evidence of satisfactory internal consistency, test–retest reliability, and discriminative validity. Higher scores indicate greater depression severity (0–2 rating scale; parent/child αs = .869/.870). The 14-item *Perceived Stress Scale* (Cohen et al., 1983), completed by children, assesses stress about managing daily life. It has evidence of predictive validity in relation to physiological stress, anxiety, and depression, has been validated for use in children, and used as an outcome in other child interventions (e.g., Ahmed, 2023; Bluth & Eisenlohr-Moul, 2017). Higher scores indicate greater levels of stress (0–4 rating scale; α = .923).

Two measures pertained to accommodation. The 12-item *Inventory of Parent Accommodations of Children's Symptoms* (Harrison et al., 2016), completed by parents, assesses the frequency of accommodation of child sickness and pain symptoms in the past week. The initial validation study found factorial validity and high internal consistency for the total scale score. Higher scores indicate more frequent accommodation (1–5 rating scale; α = .821). The 9-item *Family Accommodation Scale—Anxiety* (Lebowitz et al., 2013), completed by parents and children, assesses the accommodation of children's anxiety symptoms. It is widely used with evidence of good internal consistency, convergent and divergent validity, and test–retest reliability. Higher scores indicate more frequent accommodation (0–4 rating scale; parent/child αs = .800/.912). Finally, two measures pertained to parent stress. The 36-item parent-report *Parenting Stress Index, 4th Edition, Short Form* (Abidin, 2012) assesses parenting stress in terms of parent distress, child difficulties, and parent–child interactional problems. The total score has been found reliable, valid, and sensitive to change following psychotherapy. It has been reliably used among parents of children up to 19 years old (e.g., Hiraoka & Tomoda, 2020). Higher scores indicate less parenting stress (1–5 rating scale; α = .893). Parents also completed the *Perceived Stress Scale* about themselves (α = .844).

Data analysis plan

Data were processed and analyzed using SPSS version 28.0. We first examined the data for normality, outliers, and missingness. We then computed descriptive statistics for child- and parent-report variables at each time point. To examine acceptability and feasibility, we computed the proportion of families who elected to enroll in the trial, and the percentage of attendance across sessions. We tested for differences in

baseline measures and characteristics between participants who completed and did not complete treatment with one-way analysis of covariance. We conducted a series of paired *t*-tests to determine the change in clinical outcomes from PRE to POST and FU. We elected to analyze data for treatment completers only and to handle missing data with listwise deletion, which is appropriate for small samples (McNeish, 2017). We evaluated significance (for two-sided tests) with alpha set to .05.

Results

Acceptability, feasibility, and satisfaction

Participants were 16 children with FSS and their primary participating parent. All participants were referred by pediatricians. Participant flow-through is shown in Figure 1, and demographic and symptom information is listed in Table 2. Consistent with prior research, the most commonly reported FSS were headache, fatigue, and musculoskeletal pain; most children (68%) experienced three or more symptoms. Regarding acceptability, 94% of eligible families ($n = 16$) elected to enroll in the study ($n = 1$ lost to contact following phone screen). There were three total groups with four to seven families each that ran sequentially between July 2021 and September 2022 (recruitment began in May 2021). Three families that enrolled did not complete the study due to their child's symptoms improving ($n = 1$) or scheduling conflicts ($n = 2$). Treatment completers and noncompleters did not significantly differ on baseline measures or characteristics except the child-report *Functional Disability Inventory* and *Symptom Impact Questionnaire* (*p*s = .001–.023; higher mean scores for treatment completers), and child age ($p < .001$; older mean age for treatment completers). There were no adverse events recorded during the study period.

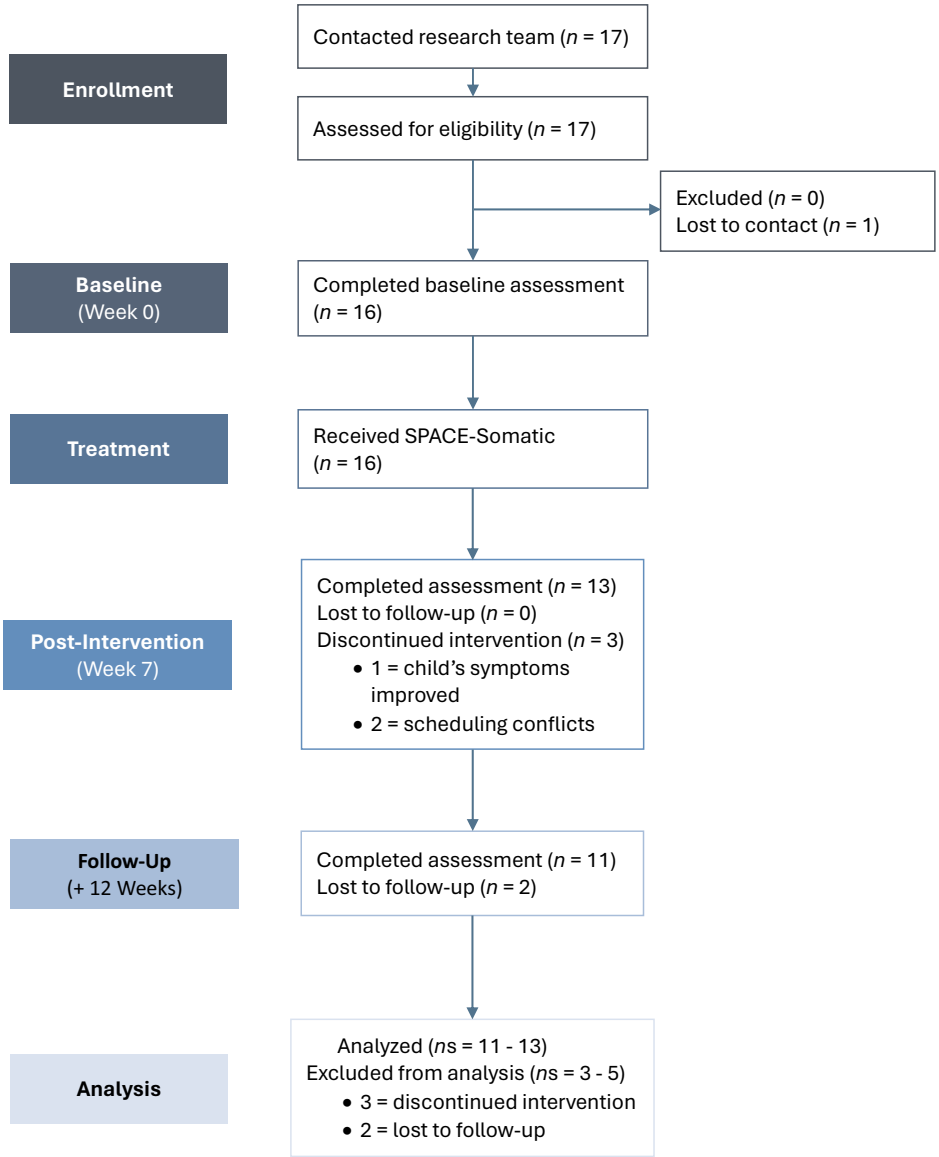

Figure 1. Diagram of participant flow-through. *Note.* *n*s presented for parent participants. For child participants, $n = 13$ completed at least some of the posttreatment assessment and $n = 7$ completed at least some of the follow-up assessment.

Table 2. Participant characteristics ($N = 16$).

Child characteristics	
Age in years	$M = 14.50$, $SD = 2.10$, Range = 11–17
Sex—*n*	
Girls	12
Boys	4
Ethnicity—*n*	
Non-Hispanic	15
Hispanic	1
Race—*n*	
White	14
Asian	2
Functional somatic symptoms—*n*	
Musculoskeletal pain[a]	6
Back pain	1
Abdominal pain	4
Joint pain	2
Muscle weakness	2
Headache	7
Migraine	1
Postural orthostatic tachycardia syndrome	3
Fatigue	7
Dizziness/balance issues	3
Gastrointestinal distress[b]	5
Tingling in extremities	2
Shortness of breath	2
Vision issues	1
Tinnitus	1
Memory issues	1
Rash	1
Urinary incontinence	1
Rumination syndrome	1
Parent characteristics	
Age in years	$M = 45.60$, $SD = 4.90$, Range = 36–55
Primary participant—*n*	
Biological mother	15
Biological father	1
Marital status—*n*	
Married or domestic partnership	16
Education—*n*	
Bachelor's degree	8
Master's degree	7
Advanced degree (e.g., JD, MD)	1
Annual family income—*n*	
$41,000–$60,999	1
$81,000–$99,999	2
$125,000–$149,000	3
>$150,000	10

Note. Parent demographics presented for primary participating parent; M = Mean, SD = Standard deviation.
[a] Also reported as amplified musculoskeletal pain syndrome, fibromyalgia, chronic pain syndrome;
[b] Also reported as nausea, irritable bowel syndrome, stomachache.

Regarding feasibility, attendance among the remaining 13 families averaged from 78.6% to 82.8% across groups. Across parents, five completed 100% of treatment sessions, two completed 85.7%, four completed 71.4%, and two completed 57.1%. Six "non-primary" parents (five fathers, one mother) participated alongside the "primary" parent in some of the treatment sessions; of these, three attended more than one session, and none attended all of the sessions. Of the treatment completers, there were no missing data for parent-report PRE and POST measures. Two parents did not complete the FU assessment (15% missing; lost to contact). There were no missing data for the child-report measures at PRE. There were 15–23% missing data for child-report measures at POST (except *Pediatric Quality of Life Inventory*, which had complete data), and >50% missing data at FU.

Treatment satisfaction for participating parents was high based on *Client Satisfaction Questionnaire* scores: range = 25–32, $M = 29.923$, $SD = 1.977$. Several parents elaborated on their treatment experience in response to an optional, open-ended prompt. For example, one parent emphasized the value of the group-based implementation: "*The sessions I was able to make were immensely helpful. . .Also from a support system standpoint, it was great to be able to be around others who were dealing with similar issues*." Another parent noted the novelty and practicality of the intervention tools: "*The clear information provided about how my behavior and words can directly impact my child's mental health during chronic illness was invaluable and extremely helpful and not mentioned by anyone we've ever sought help from before. A class/group like this is a wonderful tool for parents in similar situations*." One parent also highlighted the positive impact on the child, despite them not being present during the intervention: "*[Child] actually told me 'Thank you mom for taking this, it really helped' – I was taken aback by this. She noticed the changes I was making in relating to her*." Finally, one parent suggested how to further improve the groups: "*Bigger groups so that more experiences can be shared. . .put groups together with more similar issues (children with same age, similar medical symptoms, etc)*."

Clinical outcomes

All data were normally distributed (skew < |2|) and no significant outliers were identified. Descriptive statistics and *t*-tests for parent-report measures are presented in Table 3. Descriptively, *all* parent-report measures' mean scores either decreased or increased in the expected direction (i.e., indicating improvement) across all three time points (i.e., PRE to POST, POST to FU). Paired *t*-tests revealed significant improvement in the three measures of children's symptoms and functioning from PRE to POST: *Functional Disability Inventory*, *Symptom Impact Questionnaire—Impairment Scale*, and *Pediatric Quality of Life Inventory* (ps = .017–.033). Effect sizes were large (Cohen's d = .669–.765). There were also significant improvements in parent accommodation and stress on all measures from PRE to POST: *Inventory of Parent Accommodation of Children's Symptoms*, *Family Accommodation Scale—Anxiety*, *Parenting Stress Index*, and *Perceived Stress Scale* (ps = .007–.029; Cohen's d = .686–.901). All significant gains from PRE to POST were maintained from PRE to FU, except for the *Family Accommodation Scale—Anxiety*. No significant changes were found from POST to FU.

Descriptive statistics and *t*-tests (including effect sizes) for the child-report measures are presented in Table 4. Given the degree of missing data at FU (>50%), this timepoint was dropped from analyses. Descriptively, *all* child-report measures' mean scores increased or decreased in the expected direction (i.e., indicating improvement) from PRE to POST. For the paired *t*-tests there was only one significant change from PRE to POST: the *Symptom Impact Questionnaire—Impairment Scale* ($p = .027$, Cohen's $d = .835$).

Table 3. Descriptive statistics and paired *t*-tests for parent-report measures.

Measure	PRE	POST	FU	PRE-POST	PRE-FU	POST-FU
PedsQL[a]	Range: 17.65–72.83; $M = 46.43$; $SD = 18.96$	Range: 36.96–82.61; $M = 59.13$; $SD = 13.95$	Range: 47.83–85.87; $M = 63.79$; $SD = 10.84$	$t(12) = 2.412$, **$p = .033$**, $d = .669$	$t(10) = 2.301$, **$p = .044$**, $d = .694$	$t(10) = 0.659$, $p = .525$, $d = .199$
FDI	Range: 8.00–38.00; $M = 21.15$; $SD = 9.06$	Range: 0.00–30.00; $M = 13.69$; $SD = 8.56$	Range: 2.00–20.00; $M = 10.81$; $SD = 5.17$	$t(12) = -2.759$, **$p = .017$**, $d = .765$	$t(10) = -3.102$, **$p = .011$**, $d = .935$	$t(10) = -0.177$, $p = .863$, $d = .053$
SIQR-I	Range: 0.00–20.00; $M = 11.75$; $SD = 5.29$	Range: 0.00–18.00; $M = 6.62$; $SD = 6.60$	Range: 1.00–14.00; $M = 6.45$; $SD = 4.16$	$t(12) = -2.630$, **$p = .023$**, $d = .759$	$t(10) = -2.293$, **$p = .048$**, $d = .725$	$t(10) = 0.679$, $p = .512$, $d = .205$
SIQR-S	Range: 17.00–72.00; $M = 42.15$; $SD = 16.88$	Range: 14.00–62.00; $M = 35.38$; $SD = 16.51$	Range: 11.00–63.00; $M = 33.27$; $SD = 16.77$	$t(12) = -1.437$, $p = .176$, $d = .399$	$t(10) = -1.503$, $p = .164$, $d = .453$	$t(10) = 0.260$, $p = .800$, $d = .078$
SCARED	Range: 13.00–69.00; $M = 28.54$; $SD = 14.60$	Range: 7.00–46.00; $M = 24.54$; $SD = 12.31$	Range: 1.00–43.00; $M = 19.73$; $SD = 13.27$	$t(12) = -1.484$, $p = .164$, $d = .411$	$t(10) = -1.324$, $p = .215$, $d = .399$	$t(10) = -0.496$, $p = .631$, $d = .149$
CDI	Range: 6.00–33.00; $M = 20.62$; $SD = 8.67$	Range: 6.00–29.00; $M = 17.62$; $SD = 7.30$	Range: 7.00–27.00; $M = 16.27$; $SD = 4.98$	$t(12) = -2.032$, $p = .065$, $d = .564$	$t(10) = -0.948$, $p = .365$, $d = .286$	$t(10) = 0.216$, $p = .833$, $d = .065$
IPACS	Range: 29.00–50.00; $M = 35.92$; $SD = 7.19$	Range: 21.00–39.00; $M = 29.00$; $SD = 6.44$	Range: 15.00–38.00; $M = 27.18$; $SD = 7.24$	$t(12) = -3.248$, **$p = .007$**, $d = .901$	$t(10) = -2.680$, **$p = .023$**, $d = .808$	$t(10) = -0.708$, $p = .495$, $d = .214$
FASA	Range: 8.00–28.00; $M = 15.31$; $SD = 5.88$	Range: 4.00–20.00; $M = 11.08$; $SD = 5.44$	Range: 1.00–19.00; $M = 10.64$; $SD = 5.57$	$t(12) = -2.401$, **$p = .033$**, $d = .666$	$t(10) = -1.359$, $p = .204$, $d = .410$	$t(10) = 0.514$, $p = .618$, $d = .155$
PSI[a]	Range: 83.00–163.00; $M = 119.85$; $SD = 22.07$	Range: 97.00–164.00; $M = 126.38$; $SD = 21.96$	Range: 110.00–153.00; $M = 134.73$; $SD = 12.64$	$t(12) = 2.474$, **$p = .029$**, $d = .686$	$t(10) = 2.406$, **$p = .037$**, $d = .725$	$t(10) = 1.042$, $p = .322$, $d = .314$
PSS	Range: 12.00–30.00; $M = 20.85$; $SD = 4.96$	Range: 7.00–26.00; $M = 17.23$; $SD = 6.22$	Range: 5.00–24.00; $M = 14.91$; $SD = 5.47$	$t(12) = -3.184$, **$p = .008$**, $d = .883$	$t(10) = -3.636$, **$p = .005$**, $d = 1.096$	$t(10) = -1.121$, $p = .289$, $d = .338$

Note. Significant *t*-tests bolded. FU, follow-up; PedsQL = Pediatric Quality of Life Inventory; FDI = Functional Disability Inventory; SIQR-I/S = Symptom Impact Questionnaire—Revised, Impairment Scale/Severity Scale; SCARED = Screen for Anxiety Related Emotional Disorders; CDI = Children's Depression Inventory; ICPAS = Inventory of Parent Accommodations of Children's Symptoms; FASA = Family Accommodation Scale—Anxiety; PSI = Parenting Stress Index; PSS = Perceived Stress Scale; *M* = Mean; *SD* = Standard deviation.

[a] Increase indicates improvement.

Table 4. Descriptive statistics and paired *t*-tests for child-report measures.

Measure	PRE	POST	PRE-POST
PedsQL[a]	Range: 25.00–67.39; $M = 50.86$; $SD = 13.96$	Range: 28.26–71.74; $M = 56.79$; $SD = 11.89$	$t(12) = 1.459$, $p = .170$, $d = .405$
FDI	Range: 12.00–48.00; $M = 23.08$; $SD = 10.65$	Range: 2.00–34.00; $M = 16.82$; $SD = 9.37$	$t(10) = -1.650$, $p = .130$, $d = .498$
SIQR-I	Range: 7.00–19.00; $M = 12.92$; $SD = 3.55$	Range: 1.00–18.00; $M = 7.70$; $SD = 5.29$	$t(9) = -2.641$, $\mathbf{p = .027}$, $d = .835$
SIQR-S	Range: 30.00–79.00; $M = 52.62$; $SD = 14.34$	Range: 28.00–79.00; $M = 45.50$; $SD = 19.41$	$t(9) = -1.625$, $p = .139$, $d = .514$
SCARED	Range: 3.00–67.00; $M = 36.54$; $SD = 19.92$	Range: 4.00–75.00; $M = 33.82$; $SD = 21.83$	$t(10) = -1.156$, $p = .275$, $d = .348$
CDI	Range: 13.00–43.00; $M = 25.38$; $SD = 9.44$	Range: 10.00–56.00; $M = 23.18$; $SD = 13.34$	$t(10) = -1.388$, $p = .195$, $d = .418$
FASA	Range: 1.00–30.00; $M = 9.77$; $SD = 7.98$	Range: 0.00–24.00; $M = 9.18$; $SD = 8.18$	$t(10) = -0.474$, $p = .646$, $d = .143$
PSS	Range: 9.00–36.00; $M = 24.69$; $SD = 9.16$	Range: 4.00–37.00; $M = 20.00$; $SD = 9.08$	$t(9) = -1.419$, $p = .189$, $d = .449$

Note. Significant *t*-tests bolded. PedsQL = Pediatric Quality of Life Inventory; FDI = Functional Disability Inventory; SIQR-I/S = Symptom Impact Questionnaire—Revised, Impairment Scale/Severity Scale; SCARED = Screen for Anxiety Related Emotional Disorders; CDI = Children's Depression Inventory; FASA = Family Accommodation Scale—Anxiety; PSS = Perceived Stress Scale; *M* = mean; *SD* = standard deviation; *d* = Cohen's *d*.
[a] Increase indicates improvement.

Discussion

The findings of this pilot study demonstrate that it is feasible to recruit and retain parents of children with FSS in a parent-based intervention, SPACE-Somatic, delivered in a group format via telehealth over 7 weeks. Our findings further show that parents find this approach acceptable and highly satisfactory. Beyond the quantitative ratings, several parents qualitatively described their positive experiences, highlighting the novelty of the tools and strategies, the support they gained from other parents, and improvements in their child. Future research systematically collecting and analyzing qualitative data about parents' and children's participation in this intervention (e.g., with interpretative phenomenological analysis) would help shine a light on their lived experiences and could be used to refine the treatment to further improve outcomes (e.g., Lundkvist-Houndoumadi et al., 2016). Nonetheless, our data indicate that a fully parent-based group intervention is viable and fills an important need for families of children with FSS.

We also found preliminary evidence that SPACE-Somatic may be beneficial for improving symptoms and functioning in children with FSS. There was a statistically significant change in parent reports of children's level of functional disability and health-related quality of life, and in parent and child reports of children's symptom-related impairment, following treatment. Parent reports also provided evidence of maintenance 3 months later. Findings must be interpreted with caution, as the sample size limited our ability to detect moderate or smaller effects. Yet, it is promising that descriptively, *all* child- and parent-report measures assessing children's FSS showed improvements across time points. Future studies containing larger, randomly assigned samples, will provide additional rigorous tests of this initial indication that SPACE-Somatic improves children's functioning and symptoms.

Descriptively, there were also improvements in children's levels of anxiety, depression, and stress across time points based on parent- and child-report measures, although statistical tests were not significant in this small sample. Children feeling that they can better manage their symptoms would likely have a positive impact on their psychological well-being. Indeed, research shows consistent and robust associations among FSS and psychiatric comorbidities (e.g., Campo, 2012). However, the lack of significant change in these measures may also speak to some degree of treatment specificity, as the intervention focused on FSS and not reducing children's anxiety or depression per se.

In addition to improvements for the children with FSS, there is indication that parents benefited from this intervention. They experienced significantly lower daily and parenting stress, with gains maintained 3 months later. They also reported significantly lower levels of accommodation of children's FSS and anxiety following treatment, with improvement maintained at 3-month FU for accommodation of FSS, the main clinical target of SPACE-Somatic. Family accommodation also decreases following SPACE for other clinical problems in children (e.g., anxiety, avoidant/restrictive food intake disorder; Lebowitz et al., 2019; Shimshoni et al., 2020). On one hand, the reductions in accommodation of anxiety at posttreatment may indicate that parents generalized the skills they learned, given the common co-occurrence and conceptual similarities of FSS and anxiety in children. On the other hand, the larger effect size and maintenance in reductions of accommodation of FSS specifically may underscore our success at adapting SPACE to focus on somatic symptoms (instead of anxiety/OCD). Accommodation of FSS can be extremely taxing for families and associated with negative consequences (e.g., Harrison et al., 2016; Jordan et al., 2007). Existing treatments for FSS in children do not contain specific, systematic guidance on how to identify and reduce accommodation in supportive ways (Bonvanie et al., 2017). As such, SPACE-Somatic fills a critical gap by addressing a pervasive, challenging, and underaddressed problem for this

population. Future research could test whether accommodation reduction is in fact a treatment mechanism for improving functioning and symptom-related distress in children with FSS (e.g., examining a mediation model whereby accommodation assessed at treatment mid-point explains reductions in FSS from pre- to posttreatment).

Limitations and next steps

The open trial design limits the extent of conclusions that can be drawn about treatment effects. In the absence of a comparator treatment, it is possible that results could reflect some degree of bias in participant expectations. Randomized controlled trials are needed to test whether improvements in children with FSS are attributable to the procedures of SPACE-Somatic versus the passage of time or influence of concurrent interventions. To better assess feasibility in future studies, additional assessments (e.g., measures of therapist fidelity/treatment integrity) could be included. Our sample size was modest for this initial pilot study, and future research with larger sample sizes would enable the evaluation of possible moderators of the treatment outcome (e.g., participation of one or two parents, type of FSS, child age and gender).

While it is a strength that we collected both parent- and child-report measures at three time points, there were more missing child-report than parent-report data at 3-month FU. The parent-report data also showed more significant improvements following treatment than did the child-report data, likely impacted by the lower degree of missing data. Informant discrepancies in child and parent data, including about FSS, are also more common than not (De Los Reyes et al., 2015; Hogendoorn et al., 2023). However, additional research is required to understand these findings, as a significant change in child-report outcomes was detected in open and randomized trials of SPACE for anxiety/OCD (e.g., Lebowitz, 2013; Lebowitz et al., 2014, 2019). It is unclear, for example, whether the higher proportion of missing data and fewer significant child-report findings in our study reflect lower levels of child engagement, a possibility that underscores the importance of parent-based work in this population. Testing whether SPACE-Somatic administered to parents in an individual format improves child engagement and outcomes would also be a worthwhile direction.

Finally, our sample had limited racial, ethnic, and socioeconomic diversity, which is of further concern given documented disparities in the treatment of somatic symptoms (e.g., Tait & Chibnall, 2014). Testing SPACE-Somatic in a larger sample including families from different sociodemographic backgrounds would help support its generalizability and address such disparities. Utilizing community-based recruitment strategies (e.g., community-based participatory research) and recruitment sites (e.g., community health centers) may help address the limitations of our study and achieve greater diversity in future research (e.g., Yancey et al., 2006).

Conclusion

SPACE-Somatic is a fully parent-based intervention designed to increase support and reduce accommodation of FSS in children. Our results show that it is feasible, acceptable, and satisfactory to parents of children with FSS. Results also show significant improvements in parent *and* child reports of symptom-related impairment. Parents further reported improvements in children's functioning, quality of life, and their own accommodation and stress. Although preliminary, these findings suggest that SPACE-Somatic holds promise as a novel intervention for pediatric FSS by offering parents specific tools for helping their child.

Author contributions

Rebecca G. Etkin (Conceptualization [equal], Data curation [lead], Formal analysis [lead], Investigation [lead], Methodology [lead], Project administration [lead], Writing—original draft [lead], Writing—review & editing [equal]), Sara M. Winograd (Investigation [supporting], Writing—review & editing [supporting]), Amanda J. Calhoun (Investigation [supporting]), Wendy K. Silverman (Conceptualization [supporting], Methodology [supporting], Writing—review & editing [equal]), Eli R. Lebowitz (Conceptualization [equal], Investigation [supporting], Methodology [equal], Project administration [supporting], Writing—review & editing [equal]), and Eugene D. Shapiro (Conceptualization [supporting], Funding acquisition [lead], Investigation [supporting], Project administration [supporting], Writing—review & editing [equal])

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