

Limited Support for the Efficacy of Nonpharmacological Treatments for the Core Symptoms of ADHD

Attention deficit hyperactivity disorder (ADHD) is a common disorder affecting 7%–9% of children and adolescents (1, 2). ADHD can be associated with significant morbidity, including school failure, difficulties with peer relationships, and family conflict. A majority of youths with ADHD also have co-occurring psychiatric disorders, the most common being oppositional defiant disorder, anxiety disorders, and learning disabilities, which lead to further impairment and which affect treatment choices (3).

Treatment for ADHD should start with a comprehensive assessment and treatment plan that may include a multimodal, multidisciplinary approach (4). Stimulant medication is the first-line treatment for uncomplicated ADHD because of its demonstrated efficacy (4). However, families often have concerns about starting and continuing with medication (5). One recent study that used data from a Medicaid managed behavioral health system found that 45% of children with newly diagnosed ADHD did not begin with medication treatment (6). The article by Sonuga-Barke et al. in this issue (7) provides clinicians with information on the efficacy of nonpharmacological treatments to help them make evidence-based recommendations to families.

The Sonuga-Barke et al. study has several unique traits. It covers a wide range of nonpharmacological treatments—restricted elimination diets, artificial food color exclusion, free fatty acid supplementation, cognitive training, neurofeedback, and behavioral interventions. The authors used a rigorous methodology for the meta-analysis by including only randomized controlled trials. They used two different methods for examining outcomes: “most proximal assessment,” in which outcomes were assessed by raters closest to the therapeutic setting, and “probably blinded assessment,” which covered both blinded and probably blinded assessments. This approach allowed the authors to better control for potential bias in raters who may be invested in the success of the treatments. The outcome measures were limited to ADHD core symptoms. The authors reported results as standardized mean differences, also known as effect size.

All of the treatments produced statistically significant effects based on the most proximal assessment outcomes. However, when using the probably blinded assessment outcome, only artificial food coloring exclusion (standardized mean difference=0.42; 95% CI=0.13–0.70, $z=2.86$, $p=0.004$) and free fatty acid supplementation (standardized mean difference=0.16; 95% CI=0.01–0.31, $z=2.05$,

Behavioral treatments have been demonstrated to be helpful for children with co-occurring disorders and symptoms, although this blinded analysis did not show efficacy for core ADHD symptoms.

$p=0.04$) resulted in significant decreases in outcome measure symptoms. The improvements demonstrated in the other treatments (restricted elimination diets, cognitive training, neurofeedback, and behavioral interventions) were no longer statistically significant based on the probably blinded assessment outcome.

These results are informative but should be understood in light of the study design and several limitations. The meta-analysis did not fully address assessment procedures. In supplemental tables, the authors include the assessment instrument used in each trial. Research diagnostic interviews were used in only a minority of the studies. Thus, there is a risk that some of the samples were not exclusively children and adolescents with ADHD. Given the high rates of co-occurring conditions with ADHD, many participants may have had comorbidities. Data from other studies, such as the Multimodal Treatment Study for Children With ADHD (MTA), demonstrated that treatment response varied based on the child's comorbidities (3). While medication was effective for uncomplicated ADHD, behavioral treatment improved outcomes in children with certain co-occurring conditions. Thus, it is possible that outcomes in the studies Sonuga-Barke et al. analyzed were affected by the presence of children with attentional problems who were incorrectly diagnosed as having ADHD or by the presence of comorbid conditions. Additionally, the lack of statistically significant improvement in the behavioral intervention group may not be generalizable to ADHD with co-occurring conditions.

The authors limited their outcome measures to differences between pre- and posttreatment ratings of ADHD symptoms, using ADHD-specific scales, ADHD questionnaires, or direct observations. This may have been particularly relevant to interpretation of the outcomes of the behavioral treatments because behavioral therapies such as parent behavioral training may improve other aspects of a child's behavior, such as parent-child interactions or oppositional behavior, neither of which was assessed in this meta-analysis. Similarly, for the behavioral treatments, teacher ratings were considered more "blind" than parent ratings. It is also possible that the behavioral interventions, many of which relied on parent training, were effective in the home but did not generalize to school. The elimination of efficacy in the most proximal assessment to the probably blinded assessment also raises the question of what qualifies as a positive outcome. Family conflict is a known consequence of ADHD. We also know a great deal about the power of the placebo effect. Thus, if the "unblinded" parent distinguishes an improvement that is not detected by the teacher or observer, perhaps it is still a valid measure of improvement.

Other meta-analyses have demonstrated the efficacy of parent behavioral training (8). The lack of demonstrated efficacy in Sonuga-Barke and colleagues' blinded analysis may be due to the authors' more rigorous methodology of including only randomized controlled trials, using the blinded outcome measures, and using only core ADHD symptom outcomes. Additionally, the authors included multiple behavioral interventions in their search criteria as well as a broad age range. The majority of these behavioral interventions had a parent training component. The final set included two studies that may have affected the outcome—a small study in which only the children received behavioral training (9) and the MTA, in which the control group received care in the community and a majority of the children received medication (10). However, secondary analyses by the authors indicated that the lack of efficacy still held when the MTA sample was excluded.

The interpretation of the strength of the effect of food color exclusion is interesting. An earlier meta-analysis (11) demonstrated that much of the efficacy of food color exclusion was attributable to food dyes that were not approved by the Food and Drug Administration (FDA). Two of the studies that included non-FDA approved coloring were included in these analyses, and thus that limitation may also apply to this study. Additionally, some of the food coloring exclusion studies have been noted to preselect for children with food sensitivities. Thus, the effects of the food coloring exclusion may not generalize to FDA-approved dyes or to children without sensitivities.

The authors note that while their results demonstrate efficacy of nonpharmacological interventions (in particular free fatty acid supplementation and food color exclusion), the standardized mean difference (or effect size) is less than that of medications, which is approximately 0.9 (12). Thus, free fatty acid supplementation has a small but significant impact on symptoms.

Thus, for core ADHD symptoms, all of the nonpharmacological treatments in the study demonstrated efficacy that was eliminated in the blinded analyses in all but two of the treatments. Unfortunately, given the small effect size of free fatty acid supplementation, it may not be a sufficient treatment for a majority of our patients. Food color exclusion may also be helpful in a subgroup of patients.

Pharmacological treatment is very effective for the core symptoms of ADHD, but nearly half of youths with ADHD do not start with this treatment. Behavioral treatments have been demonstrated to be helpful for children with co-occurring disorders and symptoms, although this blinded analysis did not show efficacy for core ADHD symptoms. This meta-analysis also demonstrated the role of dietary treatments. We know that one size does not fit all. More research is needed to identify effective nonpharmacological treatments and in which cases they are most effective. Additionally, we need further studies to help us understand parent and clinician attitudes and beliefs and decision making on treatment choices to help facilitate safe and effective treatment. These analyses are a valuable addition to the evidence base of the efficacy of nonpharmacological treatments.

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Dr. Galanter is on the Scientific Steering Committee of the Pediatric Psychopharmacotherapy Program of the Resource for Advancing Children's Health and receives royalties from American Psychiatric Publishing. Dr. Freedman has reviewed this editorial and found no evidence of influence from these relationships.