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Building an Evidence Base in Complementary and Integrative Healthcare for Child and Adolescent Psychiatry

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INTRODUCTION/BACKGROUND

Definition of Complementary and Integrative Health Care

Complementary and integrative health care includes a range of therapeutic approaches.¹ The National Center for Complementary and Alternative Medicine (NCCAM), within the National Institutes of Health (NIH), defines these health care strategies as “a group of diverse medical and health care systems, practices, and products that are not generally considered part of conventional medicine” (<http://nccam.nih.gov/health/whatiscam/>).² Many of these treatments are aimed at promoting health by promoting overall well-being, but some interventions have been examined for their value in treating certain disorders or targeting specific symptoms.

Based on the research methodological approaches needed to best study the effects, complementary medicine research falls into 2 basic categories: natural products and mind and body intervention research. Natural product therapies encompass a variety of herbal medicines (botanicals), probiotics, vitamins, minerals, other natural products, as well as diet-based therapies. Mind and body therapies include practices that focus on interactions among the mind/brain, body, and behavior (eg, meditation, biofeedback, deep breathing exercises, guided imagery, progressive relaxation, hypnotherapy, yoga, qi gong, tai chi), as well as

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approaches that entail procedures on bodily structures or systems performed by a therapist (eg, chiropractic or osteopathic spinal manipulation, massage therapy, acupuncture).

Complementary and Integrative Health Care Modalities in Child and Adolescent Psychiatry

Space constraints preclude an exhaustive review of the literature. This article provides an overview of complementary and integrative modalities that, based on data from the 2007 National Health Interview Survey (NHIS), are widely used in the United States by families in which children have mental health diagnoses. The most commonly used complementary and integrative strategies for child and adolescent psychiatry fall into the categories of natural products, mind and body approaches, and manipulative and body-based practices. For example, half of families of children with autism spectrum disorder reported use by the child of 1 or more natural products; 30%, a mind-body therapy; and 25%, a manipulation or body-based method.³

This article focuses on clinical conditions that are difficult to manage solely with conventional medicine, citing review articles and meta-analyses for a more in-depth review of specific areas of interest. Where the research evidence supports use of complementary approaches, where the research is weak, and where further research is needed to test safety and efficacy are described.

Historical Evolution

Over the past 20 years, there has been a dramatic increase in the prevalence and severity of psychiatric disorders in childhood and adolescence, with significant impairment in functioning and disruption of psychosocial development. This situation has led, with the goal of intervening early, to the increased use of psychotropic medication treatments in the pediatric population.^{3,4} For some stakeholders, the increased use of medication of children seems justified, given how rapidly change occurs during childhood and the long-term impact on development if the youth's psychiatric symptoms remain unabated. However, there have been increasing concerns about potentially severe adverse effects of mental health drugs, such as possible suicidality with antidepressants and anticonvulsants,⁵ addiction potential of stimulants, as well as commonly used antidepressants and anti-anxiety agents⁶; metabolic syndrome, weight gain, and gynecomastia⁷ with antipsychotics, and sudden death in pediatric as well as adult patients on antidepressants and stimulants.⁸

Consequently, the psychiatric community has increased its interest in understanding the efficacy, safety, and patterns of use of complementary and integrative strategies. Parents of children with mental health conditions have also shown increasing interest in these treatments, as the caregivers' role in treatment-related planning and decision making has evolved from ally to full partner to driver⁹: for example, 15% of children being treated for a psychiatric disorder in community mental health centers had been administered herbal products by their primary caregivers within the previous year.

Similarly, various evidence-based mind-body approaches are being incorporated in the care of children with mental health disorders. Meditation practice, particularly mindfulness meditation (moment-to-moment nonjudgmental awareness of breathing, physical sensations, emotions, and thoughts), can change brain activation patterns and contribute to enhanced mood, reduced anxiety, improved stress management, reduced pain, and enhanced immune function.¹⁰ Mindfulness techniques applied in a Boston public middle school resulted in improvement of various measures, including general well-being.¹¹ Movement-based meditation, including yoga, tai chi, and qi gong, has also been assessed as potential strategies for treating anxiety and depression.^{12,13} In addition, several small studies have suggested that relaxation may assist in treating phobias or panic disorder. Relaxation therapy

was found, in a small randomized controlled trial (RCT), to be as effective as cognitive behavioral therapy (a well-researched, evidence-based treatment) for a group of 30 depressed adolescents.¹⁴ Although this is an area of active investigation, there are no data from large-scale, high-quality RCTs. Similarly, there are no conclusive studies on the effect of acupuncture in the treatment of mental disorders.¹⁵

Historically, there has been expanding research on and clinical use of a variety of complementary and integrative modalities for treating psychiatric disorders in youth, but the research database remains sparse compared with the widespread use by consumers.

COMPLEMENTARY AND INTEGRATIVE MODALITIES IN CHILD AND ADOLESCENT PSYCHIATRY

Demographics of Complementary Therapy Use

The statistics shown in Tables 1–3 are based on data from the 2007 NHIS; specifically, the components of the Adult and Child Complementary and Alternative Medicine supplements, the Sample Adult core, the Sample Child core, and the Family core.¹⁶ These analyses were performed separately for children ages 0 to 17 years and 18 to 21 years, and direct comparisons between these 2 age groups are not possible for 2 reasons. First, separate questionnaires were used for each, and the specific items were worded differently. Second, information for children aged 0 to 17 years is reported by the child's parent or guardian, whereas information for youth aged 18 to 21 years is self-reported; research has shown that information provided by proxy respondents is not equivalent to that reported by children and adolescents with behavioral and emotional problems.¹⁶ Consistent with other studies,¹⁷ use of vitamin and mineral supplements was not included in total complementary medicine use, but is shown separately in the Tables.

Tables 1 and 2 show sociodemographic factors for children who used complementary therapies within the previous 12 months. Consistent with previous research,^{17,18} factors associated with use of complementary therapies in children include being older, white, of non-Hispanic origin, having a parent with higher education, of higher income (poverty status), not living in the south, and having a parent who used complementary therapies. In addition, for children 18 to 21 years old, being female was associated with greater use of complementary therapies, whereas having public health insurance was associated with less use of these therapies. These trends held across the major categories of complementary medicine: biologically based, mind and body, manipulative and body-based, and vitamin and mineral supplements, except that 5-year-old to 11-year-old children are more likely to take vitamins than children in the other age groups, consistent with previous research.¹⁹

Intended Use of Complementary Therapy

The 2007 NHIS included a question to assess whether children who used complementary therapies did so to treat a specific health problem or condition ("Yes" or "No"), rather than for other reasons, such as to promote general health. Overall, in both age groups (0–17 years and 18–21 years), most youths used complementary therapies for reasons other than to treat a specific health problem, especially with the mind and body therapies (see Tables 1 and 2). Although we were unable to find similar studies in children, our findings are consistent with Davis and colleagues,²⁰ who found that adults use mind and body therapies more than any other category of complementary medicine for reasons other than specific medical treatment. Vitamin and mineral supplements, not included in the total complementary medicine category, are rarely used to treat specific disorders in youngsters of both age groups (see Tables 1 and 2).

We also examined use of complementary therapies in 0-year-old to 21-year-old children for 5 mental health conditions: anxiety/phobia or fears, insomnia or trouble sleeping, attention-deficit/hyperactivity disorder (ADHD), depression, and autism. Use rates for these conditions are similar to those found in other publications.^{21–26} For both age groups, children with these 5 psychiatric conditions are more likely to use complementary therapies than all children their age (ie, children with and without these mental health conditions). This finding is consistent with previous studies reporting higher use of complementary medicine among children with medical conditions.^{17,27–29} Likewise, children with mental health conditions were more likely to take vitamin supplements than all children. In both age groups, children who had anxiety, phobia, or fears were twice as likely to use complementary therapies compared with all children their age. For children with insomnia or trouble sleeping, and for children with autism, similarly high rates of complementary medicine use were found. Children with ADHD and depression were also considerably more likely to use complementary therapies than all children, but at lower rates than found for anxiety/phobia/fears, insomnia/trouble sleeping, and autism. Thus, although youths generally used complementary interventions for reasons other than treating specific conditions, youths with psychiatric and other medical conditions tended to use more complementary interventions than other youths.

NCCAM Research Priorities for Natural Products

The NCCAM third strategic plan, *Exploring the Science of Complementary and Alternative Medicine* (<http://nccam.nih.gov/about/plans/2011>),¹ emphasizes the importance of building the evidence base for complementary and integrative approaches, especially for personalized, individualized decision making. As part of this strategy, NCCAM places a strong emphasis on basic mechanism-oriented research, especially exploratory studies that have the potential to yield mechanistic insights, and to identify biological signals of physiologic effects. The goal is a sufficient level of mechanistic insight to allow measurement of signatures of biological effects relevant to coherent evidence-based hypotheses in addition to softer clinical outcomes. Given available resources, investment in large clinical efficacy trials must be justified either by particularly promising preliminary results in smaller studies or by a compelling public health need (eg, safety information). There also remain major gaps in knowledge about both adult and pediatric safety profiles of most complementary and alternative medicine (CAM) natural products because small studies have not been sufficiently powered to precisely quantify adverse effects.

Studies of Natural Products in Pediatric Populations

Natural products (herbs, supplements, dietary manipulations, and probiotics) are the most commonly used complementary therapy, with an estimated \$23 billion in total consumer expenditure in 2007.¹⁶ Most of the claims about use of CAM natural products to treat behavioral health conditions in children are based on data from small, open-label, inadequately controlled trials or case studies; and many of them were conducted in adults. There is no single definitive large-scale trial of a natural product for these indications in children.³⁰ Nonetheless, many herbal medications are touted as effective treatment of anxiety, depression, ADHD, autism, and sleep disturbances. They include belladonna, cannabis, oats, chamomile, ginkgo, St. John's wort, hops, lavender, kava, American ginseng, mistletoe, valerian, omega-3 fatty acids, pycnogenol, carnitine, and probiotics,^{31–34} but only a few have been rigorously studied. Furthermore, little is known about the safety or appropriate dosing of natural products in children.

Many studies in pediatric patients lack sufficient size or rigor to allow evaluation of safety or effectiveness. As a result, the evidence base for virtually all of the natural product treatments is minimal. Even when certain complementary treatments have been found to be

effective, they may be not clinically useful because of their adverse effects (eg, kava seems useful for anxiety, but is hepatotoxic).^{35,36} In addition, some natural products can produce significant drug-herb interactions (eg, St. John's wort), caused by their cytochrome P450 (CYP) properties.³¹

Like other complementary interventions, natural product treatments are often in widespread use despite a lack of adequate safety or efficacy information. Probiotics are used frequently in the treatment of autism on the hypothesis that children with autism may have abnormal gut flora and increased intestinal permeability. Treatment with antibiotics for presumed bowel bacterial overgrowth seems to result in only temporary changes in bowel flora, which has led to the inference that ongoing use of probiotics might be necessary to ensure normal bowel flora. Despite widespread use and anecdotal reports of efficacy, there are no well-designed studies concerning the impact of probiotics in the treatment of autism.³² The potential risks of the use of probiotics and antibiotics in this clinical condition are not well described, although the indiscriminate use of antibiotics without clear-cut benefit is widely condemned in medicine.

An additional important consideration is the question of dosing and the impact of developmental changes on pharmacokinetics (PK) and pharmacodynamics (PD) in the pediatric population. Children are unique patient populations because they not only differ physiologically and anatomically from adults but also experience rapid changes in growth and development in the course of their childhood.³³ These developmental anatomic and physiologic changes often have major impact on the PK/PD profile for drugs and natural products, because of developmentally dynamic and variable changes in absorption, distribution, metabolism, and elimination. Our incomplete understanding of the developmental maturation of natural product disposition (PK) and effects (PD) poses a significant challenge to the development of age-appropriate dosing regimens and complicates adverse events risk assessment. However, the National Institute of Child Health and Human Development Pediatric Pharmacology Research Unit (PPRU) Network have used population PK/PD analysis in pediatric populations, successfully identifying predictive covariates for conducting pediatric PK/PD studies. This methodology has enabled investigators to quantitatively assess the separate effects of growth and development on drug disposition in a manner not available before PPRU Network.³⁴

The evidence base concerning complementary natural products treatments requiring a substantial expansion to elucidate questions regarding safety, efficacy, drug interactions, dosing protocols for youths of different ages, and clarification of indications and contraindications for treatment.

NCCAM Natural Product Integrity Policy

As a result of NCCAM's commitment to the rigorous scientific investigation of natural products used in complementary and integrative health care, studies of many natural products (eg, dietary supplements, botanicals) require rigorous and special quality control procedures, particularly in cases in which the product is not regulated by the US Food and Drug Administration (FDA) as a drug. The NCCAM Natural Product Integrity Policy provides guidance on the kinds of information required by NCCAM for different types of products before they can be used in both mechanistic and clinical research. NCCAM guidance is offered for a variety of natural products, including simple organic substances, complex botanic products, complex animal products, probiotics, refined products, and placebos. It applies to all study agents not acquired through a competitive process or developed by NCCAM-supported research-grade product development contractors or grantees.

In the context of the NCCAM Natural Product Integrity Policy, the term natural product refers to any substance of natural origin or its synthetic alternative. Product integrity refers to the entirety and completeness of information about a product that ensures it meets NCCAM policy requirements. The requested information helps provide the investigator, NCCAM, and the public with the requisite level of confidence that the research will yield definitive and reproducible results (see NCCAM Natural Product Integrity Policy: <http://nccam.nih.gov/research/policies/naturalproduct.htm>).³⁵

POTENTIAL DRUG INTERACTIONS BETWEEN PRESCRIPTION MEDICATIONS AND NATURAL PRODUCTS

Concomitant use of complementary health products and psychotropic drugs for mental health conditions is frequent. Hence, patients who are using herbal medicines in conjunction with conventional drugs are at risk for potential drug interactions.³⁷ The interaction of herbal medicines with prescribed drugs presents significant safety concerns, especially for drugs with narrow therapeutic indices (eg, lithium, lamotrigine). Because the PK or PD of the drug may be altered by combination with natural products, severe and perhaps even life-threatening adverse reactions may occur in clinical practice.³⁶ Some of these products are known to produce significant drug-herb interactions (eg, St. John's wort) mediated by CYP,³¹ but data regarding interactions of prescription pharmaceuticals with most natural products are minimal. St. John's wort has monoamine oxidase inhibitor and selective serotonin reuptake inhibitor properties, so concomitant administration of St. John's wort with these inhibitors should be avoided to prevent serotonin syndrome.³⁸ Furthermore, St. John's wort is a CYP 3A4 inducer, and a few case reports have suggested its inhibition of CYP1A2, so concomitant administration of St. John's wort with substrates of these pathways can be problematic.³⁶

Valerian is another herbal medicine with documented interactions with psychotropic drugs. Valerian may potentiate the effects of barbiturates and other central nervous system (CNS) depressants, and a possible interaction between valerian root and fluoxetine has been reported.³⁹ There have been case reports of a possible interaction between ginseng and the monoamine oxidase inhibitor phenelzine, CNS stimulants, and haloperidol.⁴⁰ In addition, at least 1 case report has documented ginseng as the likely agent in a manic episode,³⁶ so its use in combination with drugs that potentially induce mania should be approached with caution. Ginkgo biloba extracts may lower seizure threshold in individuals with epilepsy, so ginkgo is contraindicated in patients taking drugs that lower seizure threshold, such as antidepressants.⁴⁰ Although drug interactions between herbal medicines and psychotropic drugs have been documented, most are case reports, and FDA reporting is not required. Therefore, the frequency of drug-herb interactions remains unknown.

NCCAM's Research Priorities for Mind and Body Approaches (Development of the Intervention)

In NCCAM's third strategic plan, one of the objectives described is to advance research on mind and body interventions, practices, and disciplines (<http://nccam.nih.gov/about/plans/2011>).¹ The term mind and body encompasses a diverse group of interventions, which are grouped together because they present similar challenges in designing rigorous and definitive clinical studies, such as difficulties with blinding, measurement of subjective outcomes, lack of detailed characterization or manualization, and uncertainty about underlying biological mechanism. The strategies to advance mind and body research include: harnessing state-of-the-art technologies and approaches, supporting translational research to build a solid biological foundation for future efficacy and effectiveness studies, and supporting clinical evaluation and intervention studies.

In the development of mind and body interventions, it is important to conduct preliminary studies to assess feasibility, optimize the intervention, and show a strong signal of beneficial impact. A 2-stage model has been proposed for behavioral intervention development and testing, which has applicability to mind and body interventions.⁴¹ NCCAM has proposed a modified version of this staged approach, depicted in Fig. 1, for mind and body intervention research. The stepped approach for mind and body research consists of the following steps: proof of concept; intervention refinement; pilot testing for feasibility and acceptability; efficacy or effectiveness studies; and dissemination/implementation studies. Often researchers and the public are most interested in whether or not a particular intervention is effective for a given condition. However, it is important to first conduct the necessary intervention refinement and pilot studies to be sure that the intervention tested in a definitive but complicated, lengthy, and expensive efficacy or effectiveness trial has been optimized for effect, feasibility, fidelity, and adherence.

The application of this staged approach to the development of mind and body interventions for pediatric and adolescent mental health conditions requires particular attention to intervention refinement and pilot testing. Researchers may need to adapt interventions to make them developmentally appropriate depending on the age and functional level of the population of children being studied. For example, studies of mindfulness meditation may not be developmentally appropriate for young children with autism, but yoga may be more suitable and has been studied in a small uncontrolled pilot trial.⁴² There have been pilot studies of meditation and mindfulness-based stress reduction in adolescents,^{43–45} but few if any studies on the developmental appropriateness of these mindfulness interventions in younger pediatric populations. In some situations, it may be possible to modify aspects of interventions to make them more developmentally appropriate. For example, in mindfulness-based stress reduction training, it may be necessary to discard certain elements of the intervention or to make instructions more appropriate for children. A few small RCTs of meditation have been conducted in youth with ADHD, but the small number of participants limits the ability to draw any conclusions about efficacy of meditation for ADHD.⁴⁶ If current interventions are not acceptable or feasible, additional testing of the refined intervention in an iterative process may be needed to determine whether a feasible and acceptable intervention can be developed. As an example, the Mindful Attention Awareness Scale in Adolescents is a measurement tool that has been adapted and validated in normative and psychiatric populations to assess mindfulness in adolescents.⁴⁶ Additional measurement tools may be needed or may need to be adapted for research studies in pediatric populations (eg, proxy reports by the parent or rewriting adult-based measures).

Unique challenges arise in pediatric and adolescent research regarding acceptability and adherence to study interventions. Particularly in the adolescent population, peer pressure and acceptance can create challenges for ensuring that teens adhere to treatment interventions⁴⁷ or can be harnessed in group settings to enhance adherence. Research is needed to determine if children and adolescents find it acceptable to adopt mind and body practices such as tai chi, qi gong, yoga, or other practices. The intensity of the intervention needs to be considered in the context of the child's busy schedule of school, homework, activities, and family time.

Research Methodology, Challenges, and Public Health Impact

Although all investigators who perform clinical trials face many challenges to produce quality research, those who study natural products and other complementary and alternative interventions face another level of challenges, particularly in child and adolescent populations.

Recruitment—The ability to recruit enough individuals to obtain adequate statistical power is always a key consideration to the investigator and to funding agencies. Recruitment may be affected by many factors, such as the population served, the location of the research site, and the presence of competing studies in other institutions and within the same institution.⁴⁸ Recruitment into complementary and integrative medicine trials presents several unique challenges. There may be initial public enthusiasm to try a new natural approach, but frequently people are less interested in entering trials if they may receive either placebo or a conventional treatment that they would rather avoid. Also, natural products are frequently widely available at local health food stores or pharmacies, so potential subjects can try the product on their own.

Characteristics of patients—It has been suggested that clinical trials of natural products and other complementary and integrative therapies may attract a different population compared with studies of pharmaceutical psychotropics. This supposition is difficult to assess. The authors (D.M. and M.R.) have noticed that patients who enter studies of natural products often describe a strong conviction that natural remedies are better and healthier for them than pharmaceutical drugs, whereas patients who enter studies of pharmaceutical drugs may have different biases toward specific types of treatments. Does the belief in a particular treatment increase the chances of placebo effects? A meta-analysis found no difference in placebo response rates between natural and pharmaceutical antidepressants in depression trials.¹¹ Similarly, in a recently published study⁴⁹ investigating of the efficacy of St. John's wort in minor depression, the placebo response rate was comparable with the response rates for either St. John's wort or the active control, citalopram. On the other hand, a recent reanalysis of the 2002 Hypericum Depression Trial Study Group study⁵⁰ suggested that patients who believed that they were receiving St. John's wort as opposed to sertraline (active control) or placebo seemed to have better outcomes, regardless of treatment received.

In pediatric populations, one might think that patient disposition toward treatments and placebo response may be less important, because it is usually the parents who decide to bring their child into a study, and young children may not understand these issues well enough to be affected. However, children are much attuned to parental expectations, even if they do not understand the facts involved, and parents are usually informants for assessing the results; their ratings on a scale are often a primary outcome measure.

Retention—Once patients are recruited into a study, it is important to retain them for the full duration, barring safety concerns that may necessitate the immediate discontinuation of treatment. Retention is a particular challenge in depression trials, which have dropout rates in the range of 20% to 30%, often caused by side effects or lack of individual improvement. Although the Freeman 2010¹¹ meta-analysis found no differences in overall dropout rates in CAM versus non-CAM studies, non-CAM studies had a higher dropout rate because of adverse events. However, there is a tendency toward an apparent rapid disillusionment among patients who come in to CAM studies, perhaps because of unrealistic expectations about miracle cures.⁵¹

Blinding—In natural products studies, patient blinding may be more of a challenge than in studies of pharmaceutical drugs. Many natural products have distinctive smells or tastes (eg, valerian), or unique side effects (eg, St. John's wort), which risk early patient unblinding.^{51,52} Designing placebos with similar smells or tastes to the natural product under study can be complicated but is important.

Identifying an appropriate control condition for manual therapies is challenging. Individuals may have an expectancy bias that confounds response to treatment. This bias may lead to differential dropout rates that jeopardize the study and may create havoc with traditional

statistical analyses. Study personnel may also introduce bias: is the practitioner able to perform the control condition in a manner that does not suggest that it may be less effective? Rater bias or unblinding may also enter: how are personnel responsible for assessing efficacy kept masked to the treatment condition? This is a particularly vexing issue because it risks creating a Yogi Berra situation, “I would not have seen it if I had not believed it.” Acupuncture is especially difficult to blind, because the treater cannot be blinded. Also, putative sham acupuncture procedures (eg, nonpenetrating needles) produce significant response rates when compared with nonacupuncture treatments,⁵³ or may be detected as different from real acupuncture if the patient has previous experience with acupuncture.⁵⁴ Children may be easier to blind, because they may be too young to understand the difference between active treatments and placebos and may be less concerned about what they are taking. Parents would need to be advised to not try to influence the child’s belief based on their own impressions.

Individualization of treatment—Certain CAM therapies, such as homeopathy⁵⁵ and acupuncture,⁵⁶ involve individualized treatment protocols based on each patient’s characteristics and symptoms. In a clinical trial, ideally all patients assigned to active therapy should receive the same intervention or at least the same decision tree, but this may seem to philosophically go against the principles underlying the particular therapy practice. Our group has recently performed 2 open studies of acupuncture for depression, using a standardized fixed acupoint protocol for all participants, with excellent results.^{56,57} Controlled studies using this approach are under development.

Variability of active ingredients—A particular brand of a natural product may differ significantly from another. Different manufacturers have different methods for extracting and preparing the remedy from the herb or plant, and this may produce different proportions of active ingredients.⁵² Therefore, conclusions drawn from a clinical trial of a herbal product may need to be interpreted with caution, particularly regarding dosing and toxic effects.

Regulation by the FDA—Many natural products are marketed as dietary supplements. Manufacturers of natural products may make so-called structure-function claims (eg, “supports digestive function” or “improved memory”), but they may not make claims that the product treats, prevents, or mitigates a disease or condition. In general, products being investigated for the treatment of a disorder or a specific symptom of a disorder, such as high blood pressure or depression, are regulated by the FDA as drugs, and those studies must be conducted under an Investigational New Drug Application. The FDA typically requires preclinical pharmacology and PD data, animal toxicology data, and evidence of good manufacturing standards, including assessments of product stability.

Ethical Issues

In the past decade, psychopharmacology research in pediatric populations has come under fire by many factions, both within the psychiatric field⁵⁸ and outside it. Concerns over antidepressants precipitating suicidal ideation or behavior in children and young adults^{59,60} and worries about overmedicating of children with conditions such as attention-deficit disorders⁶¹ have resulted in criticism of pediatric psychopharmacology.⁶² However, natural products are generally better tolerated than conventional pharmaceutical drugs and tend to have fewer side effects.⁵⁶ Consequently, they may be more acceptable to parents of young children, as well as to older adolescents, who may feel less stigmatized if they are treated with a natural product.

SUMMARY AND FUTURE DIRECTIONS

The integration of complementary and integrative therapies with conventional practice is gaining traction for the management of mental health conditions in child and adolescent psychiatry, and this trend is largely driven by substantial caregiver interest. The integration of safe and efficacious complementary therapies with proven conventional medicine may result in better patient outcomes as assessed by symptom relief, school performance, social functioning, and family/peer relations.

We have reviewed the evidence for the prevalence of complementary and integrative health care use in child and adolescent psychiatry, specifically for clinical conditions that are difficult to manage with conventional medicine. The evidence for these therapies in child and adolescent psychiatry and health is fragmentary, but some areas of promise exist for treating difficult chronic conditions. NCCAM has just released its third strategic plan, which strongly emphasizes building the evidence base for CAM. Well-designed, adequately powered clinical trials incorporating suitable controls on key promising CAM modalities (mind and body, manipulative, natural products) for children and adolescents with mental conditions are needed. The strengthening of the evidence base for personalized, individualized decision making about using complementary therapies is a guiding principle for NCCAM's research programs, and this approach holds great promise for the future of child and adolescent psychiatric treatment.

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KEY POINTS

- The integration of safe and efficacious complementary therapies with proven conventional medicine may result in better patient outcomes as assessed by symptom relief, school performance, social functioning, and family/peer relations.
- The evidence for complementary therapies in child and adolescent psychiatry is fragmentary, with a paucity of well-designed, adequately powered clinical trials incorporating suitable controls on promising modalities (mind and body, manipulative, natural products).
- The National Center for Complementary and Alternative Medicine third strategic plan, Exploring the Science of Complementary and Alternative Medicine (<http://nccam.nih.gov/about/plans/2011>), strongly emphasizes building the evidence base for complementary and integrative approaches, using a personalized, individualized decision-making process about the use of complementary therapies.

Fig. 1.

A staged approach for developing nonpharmacologic interventions, such as mind and body interventions.

Table 1

Complementary therapy use among US children aged 0 to 17 years in the past 12 months, 2007 NHIS

	All Complementary Therapies ^a			Biologically Based Therapies ^b			Mind-Body Therapies ^c			Manipulative and Body-Based Therapies ^d			Vitamin and Mineral Supplements ^e		
	Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)	
Total ^f	7760	10.5 (0.44)		3790	5.1 (0.34)		3121	4.2 (0.29)		2678	3.6 (0.27)		31,377	42.6 (0.72)	
Therapy Used to Treat Health Problems ^g															
Used to treat a specific health problem	3152	4.3 (0.29)		1420	1.9 (0.24)		828	1.1 (0.15)		1341	1.8 (0.17)		1102	1.5 (0.16)	
Not used to treat a specific health problem	3721	5.0 (0.3)		1235	1.7 (0.17)		2293	3.1 (0.24)		1337	1.8 (0.19)		25,173	34.1 (0.7)	
Sex															
Male	3735	9.9 (0.62)		1957	5.2 (0.52)		1393	3.7 (0.43)		1189	3.2 (0.33)		15,852	42.1 (0.96)	
Female	4025	11.2 (0.56)		1833	5.1 (0.43)		1728	4.8 (0.35)		1489	4.1 (0.39)		15,525	43.1 (1.01)	
Age															
0–4 y	1268	6.2 (0.59)		762	3.7 (0.47)		383	1.9 (0.33)		436	2.1 (0.39)		7766	37.7 (1.19)	
5–11 y	2691	9.6 (0.66)		1370	4.9 (0.52)		1062	3.8 (0.40)		781	2.8 (0.38)		14,133	50.6 (1.12)	
12–17 y	3801	15.1 (0.79)		1658	6.6 (0.61)		1677	6.6 (0.61)		1461	5.8 (0.5)		9478	37.6 (1.11)	
Race															
White, single race	6482	11.6 (0.52)		3184	5.7 (0.41)		2440	4.4 (0.35)		2431	4.4 (0.33)		24,997	44.9 (0.82)	
Black or African American, single race	501	4.4 (0.62)		183	1.6 (0.35)		322	2.8 (0.54)		83	0.7 (0.25) ^j		3760	32.9 (1.4)	
Ethnicity															

	All Complementary Therapies ^a		Biologically Based Therapies ^b		Mind-Body Therapies ^c		Manipulative and Body-Based Therapies ^d		Vitamin and Mineral Supplements ^e	
	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)
Hispanic	928	6.0 (0.58)	465	3.0 (0.44)	403	2.6 (0.38)	276	1.8 (0.34)	4859	31.7 (1.06)
Non-Hispanic	6832	11.7 (0.54)	3325	5.7 (0.42)	2718	4.7 (0.35)	2402	4.1 (0.33)	26,518	45.4 (0.86)
Family Structure										
Mother and father	5995	11.5 (0.55)	3025	5.8 (0.45)	2166	4.1 (0.34)	2153	4.1 (0.34)	23,728	45.4 (0.83)
Mother, no father	1395	8.2 (0.75)	573	3.4 (0.48)	800	4.7 (0.6)	423	2.5 (0.37)	6226	36.8 (1.38)
Parent's Education										
Less than high school diploma	340	3.8 (0.66)	124	1.4 (0.41)	163	1.8 (0.45)	128	1.4 (0.48) ^f	1920	21.2 (1.35)
High school diploma or General Educational Development	1060	6.6 (0.68)	470	2.9 (0.49)	365	2.3 (0.39)	405	2.5 (0.43)	5264	32.9 (1.26)
More than high school	6207	13.5 (0.61)	3127	6.8 (0.5)	2532	5.5 (0.42)	2108	4.6 (0.37)	23,475	51.2 (0.88)
Poverty Status ^h										
Poor	622	5.3 (0.7)	267	2.3 (0.46)	343	2.9 (0.46)	160	1.4 (0.35)	3177	26.9 (1.36)
Near poor	1201	7.8 (0.86)	678	4.4 (0.69)	343	2.2 (0.5)	402	2.6 (0.48)	5810	38.0 (1.57)
Not poor	5444	13.9 (0.68)	2645	6.8 (0.54)	2245	5.7 (0.45)	1944	5.0 (0.41)	19,932	51.0 (0.94)
Health Insurance										
Private	5561	12.8 (0.6)	2603	6.0 (0.47)	2221	5.1 (0.41)	2078	4.8 (0.4)	21,653	49.7 (0.92)
Public	1583	6.7 (0.6)	804	3.4 (0.42)	704	3.0 (0.42)	435	1.9 (0.3)	7617	32.4 (1.16)
Uninsured	594	9.3 (1.22)	372	5.8 (1.13)	191	3.0 (0.55)	160	2.5 (0.65)	2052	32.0 (1.89)

Region	All Complementary Therapies ^a		Biologically Based Therapies ^b		Mind-Body Therapies ^c		Manipulative and Body-Based Therapies ^d		Vitamin and Mineral Supplements ^e	
	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)
Northeast	1469	11.9 (1.19)	614	5.0 (0.83)	669	5.4 (0.75)	492	4.0 (0.82)	5558	45.0 (2.1)
Midwest	2098	12.0 (0.97)	887	5.1 (0.61)	778	4.5 (0.66)	781	4.5 (0.57)	8158	46.8 (1.44)
South	2029	7.5 (0.59)	1051	3.9 (0.46)	759	2.8 (0.35)	646	2.4 (0.32)	10,885	40.0 (1.12)
West	2164	12.9 (0.94)	1237	7.4 (0.92)	915	5.5 (0.68)	759	4.5 (0.6)	6777	40.5 (1.49)
Family Member Reporting										
Parent uses complementary therapies	3003	23.4 (1.37)	1485	11.6 (1.12)	1267	9.9 (0.41)	984	7.7 (0.83)	7471	58.1 (1.66)
Parent does not use complementary therapies	897	3.8 (0.47)	306	1.3 (0.19)	386	1.6 (0.38)	270	1.1 (0.23)	8421	35.2 (1.04)
Other relative or nonrelative uses complementary therapies	90	17.7 (4.29)	44	8.7 (3.46)	59	11.7 (3.38)	31	6.1 (2.63) ^f	217	42.6 (6.68)
Other relative or nonrelative does not use complementary therapies	54	3.2 (1.15)	<i>j</i>	<i>j</i>	<i>j</i>	<i>j</i>	<i>j</i>	<i>j</i>	353	21.3 (2.77)

^aIncludes NVNMDS (nonvitamin, nonmineral, dietary supplements), special diets, homeopathy, biofeedback, relaxation techniques (meditation, guided imagery, progressive relaxation, and deep breathing), yoga, tai chi, qi gong, chiropractic and osteopathic manipulation, massage, movement therapies (Feldenkrais, Alexander technique, Pilates, and Trager).

^bIncludes NVNMDS, special diets, and homeopathy.

^cIncludes biofeedback, relaxation techniques, hypnosis, and yoga, tai chi, and qi gong.

^dIncludes chiropractic or osteopathic manipulation, massage, and movement therapies.

^eIncludes multivitamin or mineral combination, calcium, chromium, coral calcium, folic acid/folate, iron, magnesium, niacin, potassium, selenium, vitamin A, vitamin B complex, vitamin B₆, vitamin B₁₂, vitamin C, vitamin D, vitamin E, vitamin K, zinc, and vitamin packets.

f_j Total complementary therapy use is less than total of individual categories because some respondents used multiple therapies.

g_j Treat variable totals do not equal totals for other variables because reference period for this item for NVNMDS and vitamins was past 30 days rather than past 12 months as for all other therapies.

h_j Poverty status is based on family income and family size using the Census Bureau's poverty thresholds for 2006. Poor is defined as below the poverty threshold. Near poor persons have incomes of 100% to less than 200% of the poverty threshold. Not poor persons have incomes 200% or greater than the poverty threshold.

i_j Estimate has a relative standard error of greater than 30% and less than or equal to 50% and does not meet the standard of reliability or precision.

j_j Estimate has a relative standard error greater than 50% and is not shown.

Table 2

Complementary therapy use among US children aged 18 to 21 years in the past 12 months, 2007 NHIS

	All Complementary Therapies ^a			Biologically Based Therapies ^b			Mind-Body Therapies ^c			Manipulative and Body-Based Therapies ^d			Vitamin and Mineral Supplements ^e		
	Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)	
Total ^f	4495	27.5 (1.72)		1829	11.2 (1.13)		2849	17.4 (1.4)		1679	10.3 (1.12)		6654	40.7 (2.06)	
Therapy Used to Treat Health Problems ^g															
Used to treat a specific health problem	1197	7.3 (0.87)		304	1.9 (0.45)		368	2.2 (0.51)		698	4.3 (0.73)		392	2.4 (0.53)	
Not used to treat a specific health problem	3003	18.4 (1.48)		799	4.9 (0.66)		2482	15.2 (1.29)		982	6.0 (0.93)		4169	25.5 (1.66)	
Sex															
Male	1789	21.9 (2.1)		737	9.0 (1.5)		1127	13.8 (1.88)		613	7.5 (1.23)		2826	34.6 (2.94)	
Female	2707	33.0 (2.45)		1092	13.3 (1.67)		1722	21.0 (2.09)		1067	13.0 (1.79)		3827	46.7 (2.65)	
Race															
White, single race	3480	30.0 (2.1)		1453	12.5 (1.46)		2128	18.3 (1.78)		1395	12.0 (1.45)		4922	42.4 (2.49)	
Black or African American, single race	514	20.1 (3.27)		164	6.4 (1.95)		366	14.3 (2.77)		188	7.3 (2.32)		935	36.6 (4.12)	
Ethnicity															
Hispanic	402	14.2 (2.37)		118	4.2 (1.32)		293	10.4 (1.88)		100	3.5 (1.16)		748	26.5 (3.08)	
Non-Hispanic	4094	30.2 (1.91)		1711	12.6 (1.32)		2556	18.9 (1.62)		1579	11.7 (1.33)		5905	43.6 (2.37)	
Poverty Status ^h															

	All Complementary Therapies ^a			Biologically Based Therapies ^b			Mind-Body Therapies ^c			Manipulative and Body-Based Therapies ^d			Vitamin and Mineral Supplements ^e		
	Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)	
Poor	1417	32.2 (2.64)		586	13.3 (1.71)		899	20.4 (2.19)		459	10.4 (1.89)		1910	43.4 (3.93)	
Near poor	535	20.8 (3.49)		197	7.7 (1.9)		358	13.9 (3.15)		184	7.1 (2.11)		944	36.7 (4.63)	
Not poor	2085	28.3 (2.87)		859	11.7 (1.96)		1390	18.9 (2.37)		827	11.2 (1.95)		3015	41.0 (3.01)	
Health Insurance															
Private	2999	31.0 (2.34)		1199	12.4 (1.58)		1889	19.5 (1.97)		1280	13.2 (1.72)		4550	47.1 (2.88)	
Public	454	19.8 (3.27)		194	8.5 (2.12)		270	11.8 (2.53)		151	6.6 (2.03)		708	30.9 (3.63)	
Uninsured	983	23.2 (2.8)		418	9.8 (2.02)		649	15.3 (2.42)		235	5.5 (1.54)		1334	31.4 (3.24)	
Region															
Northeast	835	31.4 (4.73)		350	13.2 (3.39)		563	21.2 (3.8)		238	8.9 (2.5)		1021	38.4 (7.57)	
Midwest	1251	34.6 (3.51)		418	11.6 (2.52)		712	19.7 (2.36)		543	15.0 (2.75)		1589	44.0 (3.07)	
South	1252	21.0 (2.62)		563	9.5 (1.62)		752	12.6 (2.26)		338	5.7 (1.11)		2405	40.4 (3.51)	
West	1157	28.0 (3.44)		497	12.0 (2.21)		823	19.9 (3.03)		561	13.6 (2.76)		1638	39.6 (3.34)	

^aIncludes NVNMDS (nonvitamin, no-mineral, dietary supplements), special diets, homeopathy, biofeedback, relaxation techniques (meditation, guided imagery, progressive relaxation, and deep breathing), yoga, tai chi, qi gong, chiropractic and osteopathic manipulation, massage, movement therapies (Feldenkrais, Alexander technique, Pilates, and Trager).

^bIncludes NVNMDS, special diets, and homeopathy.

^cIncludes biofeedback, relaxation techniques, hypnosis, and yoga, tai chi, and qi gong.

^dIncludes chiropractic or osteopathic manipulation, massage, and movement therapies.

^eIncludes multivitamin or mineral combination, calcium, chromium, folic acid/folate, iron, magnesium, niacin, potassium, selenium, vitamin A, vitamin B complex, vitamin B₆, vitamin B₁₂, vitamin C, vitamin D, vitamin E, vitamin K, zinc, and vitamin packets.

^fTotal complementary therapy use is less than total of individual categories because some respondents used multiple therapies.

^gTreat variable totals do not equal totals for other variables because reference period for this item for NVNMDS and vitamins was past 30 days rather than past 12 months as for all other therapies.

^h Poverty status is based on family income and family size using the Census Bureau's poverty thresholds for 2006. Poor is defined as below the poverty threshold. Near poor persons have incomes of 100% to less than 200% of the poverty threshold. Not poor persons have incomes 200% or greater than the poverty threshold.

Table 3

Children aged 0 to 21 years with selected health conditions who used complementary therapies in the past 12 months, 2007 NHIS

Children with Selected Conditions ^a		Children with Selected Conditions Who Used Complementary Therapies ^{b,c}		Children Who Used Complementary Therapies for Selected Conditions ^d		Children with Selected Conditions Who Used Vitamin and Mineral Supplements ^{e,f}	
Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)	Number (in Thousands)	Percent (Standard Error)
Anxiety/Phobia or Fears							
0–4 y ^g	2.5 (0.76) ^j	33	31.0 (13.77) ^j	k	k	76	71.9 (14.44)
5–11 y ^g	7.8 (0.59)	584	26.8 (3.86)	197	33.7 (7.77)	1291	59.1 (3.81)
12–17 y ^g	11.2 (0.66)	922	32.8 (3.19)	144	15.6 (3.78)	1318	46.8 (3.51)
18–21 y ^h	9.7 (0.99)	1591	49.3 (5.32)	118	15.0 (5.55) ^j	862	54.2 (5.4)
Insomnia or Trouble Sleeping							
0–4 y ^g	2.3 (0.54)	70	36.5 (12.49) ^j	k	k	88	45.7 (11.77)
5–11 y ^g	3.8 (0.41)	214	20.0 (4.07)	53	24.9 (9.83) ^j	596	55.7 (5.34)
12–17 y ^g	7.6 (0.57)	575	30.1 (3.41)	64	11.1 (3.52) ^j	838	43.8 (4.19)
18–21 y ^g	10.8 (1.0)	793	45.0 (5.36)	k	k	890	50.5 (5.47)
Attention-Deficit/Hyperactivity Disorder–Attention-Deficit Disorder							
0–4 y ⁱ	1.4 (0.41)		k	k	k	119	66.2 (15.2)
5–11 y ⁱ	5.9 (0.44)	238	14.5 (2.54)	76	31.9 (8.94)	788	47.9 (3.94)
12–17 y ⁱ	10.5 (0.78)	635	24.1 (3.22)	140	22.1 (5.97)	968	36.7 (3.97)
18–21 y ⁱ	7.2 (0.9)	435	37.1 (5.78)	k	k	515	43.9 (7.01)

Children with Selected Conditions ^a			Children with Selected Conditions Who Used Complementary Therapies ^{b,c}			Children Who Used Complementary Therapies for Selected Conditions ^d			Children with Selected Conditions Who Used Vitamin and Mineral Supplements ^{e,f}		
Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)		Number (in Thousands)	Percent (Standard Error)	
Depression											
0–4 y ^j	k					k			k		k
5–11 y ^j	404	1.4 (0.27)	120	29.6 (7.69)		k			208	51.6 (8.56)	
12–17 y ^j	1289	5.1 (0.57)	330	25.6 (4.31)		81	24.6 (6.79)		492	38.1 (6.41)	
18–21 y ^g	1435	8.8 (1.16)	621	43.3 (6.43)		k			520	36.2 (5.8)	
Autism											
0–4 y ^j	40	0.2 (0.09)	k	k		k			32	80.0 (14.59)	
5–11 y ^j	313	1.1 (0.21)	75	24.1 (7.81)		k			185	59.1 (9.87)	
12–17 y ^j	144	0.6 (0.19) ^j	80	55.4 (16.12)		k			65	45.3 (14.14)	
18–21 y ^j	129	0.8 (0.38) ^j	72	56.2 (24.79) ^j		k			k	k	

^aDenominator is all children in the sample.

^bDenominator is children with the selected condition.

^cIncludes NVNMDS (nonvitamin, nonmineral, dietary supplements), special diets, homeopathy, biofeedback, relaxation techniques (meditation, guided imagery, progressive relaxation, and deep breathing), yoga, tai chi, qi gong, chiropractic and osteopathic manipulation, massage, movement therapies (Feldenkrais, Alexander technique, Pilates, and Trager).

^dDenominator is children with the selected condition who used complementary therapies.

^eDenominator is children with the selected condition who used vitamin and mineral supplements.

^fIncludes multivitamin or mineral combination, calcium, chromium, coral calcium, folic acid/folate, iron, magnesium, niacin, potassium, selenium, vitamin A, vitamin B complex, vitamin B₆, vitamin B₁₂, vitamin C, vitamin D, vitamin E, vitamin K, zinc, and vitamin packets.

^gQuestion wording asked if respondent had condition, but not whether it was diagnosed by doctor or health professional.

^hQuestion on anxiety asked if respondent had condition, but not whether it was doctor diagnosed; phobia or fears applies to doctor diagnosed only.

- ⁱ Question applied only to conditions diagnosed by doctor or other health professional.
- ^j Estimate has a relative standard error of greater than 30% and less than or equal to 50% and does not meet the standard of reliability or precision.
- ^k Estimate has a relative standard error greater than 50% and is not shown.