

## Preface

# Emerging Interventions



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The past decade and a half has seen enormous progress in neuroscience, neuropsychiatry, and neuropsychology. These developments have been fueled by technologic advances that have made neuroimaging possible, allowing for an increased understanding of patterns and dynamics of brain activation and biochemistry and their relationship to various psychiatric disorders. Given the strong appeal to academics of the powerful new lens provided by neuroimaging, interest and activity in neuropsychiatric research have grown rapidly.

This neuroimaging technology has not yet resulted in significant change in the interventions that are commonly used in psychiatry and clinical psychology, however. Although neuroimaging research is exciting and the technology is powerful, it provides the practitioner with little additional purchase in everyday practice. The clinician may experience this body of work as a tease. It would be fascinating to see what we are contending with in the brain, and attempting to impact with treatment. However, the neuroimaging studies are quite expensive, and because they do not yet assist in treatment, the expense is not easily justified.

This issue is intended to bring together informed consideration of several emerging approaches to the treatment of psychiatric disorders of children and adolescents that affect brain function in the bioelectric domain. For our purposes, these interventions include repetitive transcranial magnetic stimulation (rTMS), electroconvulsive therapy, vagal nerve stimulation (VNS), and electroencephalographic (EEG) biofeedback (EBF). Although including a discussion on deep

brain stimulation was considered, this area was omitted because, to the knowledge of the editors, there has been no work to date using this intervention in children and adolescents. An article on quantitative electroencephalographic (qEEG) assessment of brain function in disorders of childhood and adolescence also was included to establish the level of evidence and knowledge base about the relationship between brain function as revealed by the EEG and several neuropsychiatric disorders of childhood and adolescence. This sets the stage for a careful consideration of the use and promise of EBF.

Recent research in several laboratories that demonstrated the use of real-time functional MRI feedback to alter activation levels in several areas of the brain has generated a great deal of interest in the field. This recent work provides a current scaffolding and context for a careful consideration of a form of brain biofeedback that has been pursued for more than 25 years but has received little attention in child and adolescent psychiatry to this point: real-time EBF.

In assembling the reviews of these emerging approaches, our goal is twofold. First, these articles should facilitate the informed consideration of these interventions as treatment options in clinical practice. The articles are intended to provide the necessary information that might be presented by clinicians to patients and families of patients as part of a process of transparent collaborative thinking about the full range of treatment options available, including the scientific and clinical evidence base and the profile of practical advantages and disadvantages of each. This process has been called “evidence-based thinking.” The implications of the articles in this issue for this process of evidence-based thinking with child and adolescent patients are discussed in detail in the opening article.

Second, we wish to provide updated information to child and adolescent psychiatry researchers to facilitate pursuit of the additional research needed. It seems that there is more funded research being done with rTMS and VNS than with EBF. This imbalance may not be entirely warranted by the promise and track record of these techniques for child and adolescent psychiatry.

A third goal is to promote more productive dialogue and professional exchange between professionals involved in each of these emerging areas and the community of clinicians engaged in practice using more traditional tools. At least with regard to EBF, there seems to be little such productive exchange.

The three new intervention modalities (rTMS, VNS, and EBF) have evolved in dramatically different professional contexts. rTMS and VNS emerged out of the context of mainstream medical research and practice. Although these interventions are not yet part of everyday practice in psychiatry, they are not viewed as “alternative” or pseudoscientific approaches. Unfortunately, despite a significant, albeit far from complete, body of research showing efficacy for EBF and despite its discovery and initial investigation in mainstream neuroscience, there is a tendency among medical and psychological professionals to be wary of EBF without carefully considering the scientific and clinical data. At the same time, among practitioners of EBF and even among researchers and

academicians working in this area, there is a sense of alienation from the mainstream. It is our hope that this issue will help to change these patterns of skepticism on both sides.

In clinical practice with neuropsychiatric or neurodevelopmental disorders, the need for new approaches is evident. For example, many individuals with autistic spectrum disorder have extreme difficulties with emotional self-regulation. Descriptively, they seem to have a high background level of tension, stress, anxiety, or arousal. Many individuals attempt to cope with this excess arousal by increased avoidance to forestall overload. Because of this high background level of arousal, these individuals experience frequent overload; only a small additional challenge or stimulation can lead to overarousal and cognitive, emotional, and behavioral breakdown.

In some instances, psychopharmacology can be helpful and lead to a calmer state. Unfortunately, there are also instances in which medications either do not help or help insufficiently. Although psychotherapeutic and psychoeducational approaches may assist the children and their families to better cope with or manage this arousal regulation problem, these approaches often do not lead to a reduction in the fundamental problem of the readiness for or predisposition to overly heightened states of arousal.

Another example involves children with severe obsessive-compulsive disorder, who have a similar predisposition to intense emotional arousal and stress. Psychopharmacologic approaches are not always effective in reducing this readiness for overarousal. When symptoms are severe, some children and adolescents are not able to comply with the rigorous and painful demands of cognitive behavioral therapy. Occasionally, even with successful treatment and symptom reduction, an individual still must work hard to actively manage arousal, rather than live with the grace of calm. The situation is the same in younger children with regulatory disorders.

This is the context in which I initially investigated biofeedback—to see if this technique offered promise for this group of patients who had been only partially helped by other forms of treatment. Would biofeedback help these patients achieve and maintain greater capacity for arousal regulation and a greater degree of calm? My reading of the research and my subsequent clinical experience has convinced me that EBF, in particular, can be helpful in these cases. For example, two of four patients in the last several years with severe medication- and psychotherapy-resistant obsessive-compulsive disorder improved dramatically with EBF. The other two would not attempt it. Many, but certainly not all, of my patients with autistic spectrum disorder have benefited significantly from EBF.

For several of the approaches included in this issue, application to child and adolescent populations is beginning to emerge. This is especially true of rTMS, VNS, and, to some extent, EBF for depression, anxiety, addictions, traumatic brain injury, and seizures. Given this situation, the authors have presented what is known about the approaches with adult populations and addressed the question of the applicability of these interventions to a younger population. They also have presented case examples with child and adolescent patients.

The issue opens with an article by the guest editors. The article is intended to serve as a summary of subsequent articles and as a guide to readers. It provides a discussion of the approaches covered in the issue in the context of recent developments in neuroscience and neuropsychiatry. Other new approaches are briefly presented, as are applications of EBF to additional disorders. We also discuss the findings for each application of these emerging interventions in relation to standards or frameworks for the use of evidence-based thinking in clinical practice. This includes a discussion of three important dimensions of empirical support: (1) efficacy as established in controlled research, (2) effectiveness in applied clinical contexts, and (3) efficiency or cost effectiveness. In this context, we attempt to place each of the emerging intervention modalities within efficacy categorizations as promulgated in the American Academy of Child and Adolescent Psychiatry guidelines for stimulant medication. We conclude with a consideration of future directions for these promising new approaches.

After an update on the role of qEEG in child and adolescent psychiatric disorders by Chabot et al, the next six articles are devoted to different areas of application of EBF. In some areas, such as attention deficit hyperactivity disorder, there is a substantial research literature on the use of this intervention with child and adolescent patients. Monastra systematically presents this research and discusses the use of EBF as a part of a multimodal approach in clinical practice. Related to this research on EBF for attention, Gruzelier et al have conducted a sustained and systematic investigation into the validity of EBF in general and present their findings.

There also is a solid body of research into the use of EBF for epilepsy, the earliest application of this approach. Walker and Kozlowski briefly review this body of work and then discuss a new approach to EBF training with this population, summarizing a case series of ten patients treated with this approach and providing more detailed case studies of two.

In other areas of EBF application, the literature on controlled research is more sparse and is supplemented with presentations of clinical findings and case reviews in articles on addictive disorders by Trudeau, anxiety and depression by Hammond, and traumatic brain injury and reading disabilities by Thornton and Carmody.

The extant research and clinical work with VNS for neuropsychiatric disorders is presented by Martinez et al. After reviewing the research and clinical experience with VNS for epilepsy and depression in adults, the authors discuss the potential of VNS for intervention with chronic and recurrent treatment-resistant mood disorders in child and adolescent populations.

In the final article, Morales and colleagues review the research and clinical experience with rTMS for child and adolescent neuropsychiatric disorders. Although most of this work has focused on adults, the authors conclude that the strategy of focal brain stimulation has considerable potential for child and adolescent populations. Noting that recent interest in rTMS occasioned renewed interest and experience with electroconvulsive therapy, these authors also review recent work with this modality and characterize electroconvulsive therapy as a

second- or third-line treatment that requires careful consideration of clinical circumstances in the risk-benefit analysis.

The emergence of these new forms of technologically sophisticated brain-based intervention seems to offer considerable promise to child and adolescent neuropsychiatry, which is only just beginning to experience the benefit of the technologic explosion that has occurred in other areas of medicine.

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