Biofeedback for pediatric headache has been well established over the past 25 years. Biofeedback has traditionally been practiced and applied in hospitals, pain clinics, chemical dependency facilities, universities, and private practices. The purpose of this article is to share the author’s experience working in a children’s medical center in the neuroscience division and to encourage readers to pursue work in untapped, high-potential settings that could greatly benefit from this vital service. This article will detail how biofeedback has been used and integrated into a pediatric neurology clinic.

Introduction

Of the 28 million Americans suffering from headaches, 10.3 million are children between the ages of 5 and 17 years. Children and adolescents generally experience tension-type or migraine headaches. Among school-age children ages 5 to 17 years in the United States, 20% (10.3 million) are dealing with chronic headaches. It is estimated that approximately 15% of these kids experience tension-type headaches and 5% suffer with migraines (National Headache Foundation, 2000). Biofeedback treatment for children has been shown to be helpful in many areas and most notably with headache. Research over the past 25 years has shown efficacy in helping children gain control of and abort headache pain (Andrasik & Schwartz, 2006).

Case Example

“Julie” is a 15-year-old girl suffering from chronic daily headaches for the past 6 months. She has tried over-the-counter pain medication but has not experienced any relief from her headache pain. Her head hurts “all the time.” She is a good student in school, earning mostly A’s. She also plays a competitive sport and is involved in many clubs at school and the youth group at her church. Most of the time, she does not return home at night until 7 or 8 p.m. because of after-school activities. Homework begins for the next 2 to 3 hours, and then she may text message friends until 11 p.m. or midnight. She lies awake at night unable to fall asleep for 1 to 2 hours after turning out the light. The next morning, she awakens at 6:30 to get ready for school. The headache is usually already present on awakening. Although she has a difficult time waking up, she gets ready quickly and heads out the door with a caffeinated soda, skipping breakfast. Her headache continues throughout the day, and at times, it is difficult for Julie to concentrate. Her energy level lowers and she becomes frustrated that she does not have the stamina to carry out activities as easily as she used to. However, she continues to press on despite not feeling up to par. Meanwhile, her headache pain is worsening, and this is having an effect on her grades.

There are times when she does not feel well enough to go out with friends, and this adds to her frustration. Her parents grew concerned as her mother also suffers from migraines and does not want her daughter to suffer as she has. Her parents took her to a primary care doctor who prescribed medicine to relieve the pain. Julie noticed that her headache pain was lower for a few days and then returned to being quite painful. She was referred to a pediatric neurologist to determine the problem and to formulate a plan for treating the headaches. Following a neurological exam and a magnetic resonance image of her brain, the neurologist prescribed preventative medication and biofeedback. The biofeedback spanned six sessions. Home practice of acquired skills was an essential component to her treatment. Julie gradually acquired the ability to self-regulate her physiology and the mastery to diminish headache intensity, duration, and frequency. Her quantity of sleep improved, and she reduced her caffeine consumption. The morning soda has been replaced with a granola bar and juice. Her parents learned to set a limit on text messaging at night so that she can wind down for sleep. Areas of activity have been shaved to reduce the busyness that characterized her life. Despite the hereditary component of her headache, she has learned to recognize headache onset and apply the techniques she has learned to abort the headache in a timely manner.
Interventions
Fortunately, this very typical adolescent headache patient was able to receive the treatment she needs in one setting. This allows the patient and his or her family to receive collaborative care that addresses the multiple aspects of headache pain. A global view of the patient is taken to address issues that may be affecting, worsening, or contributing to the headache such as lifestyle habits (Figure), comorbidities, and parental concern for their child’s condition. Comorbidity disorders of depression and anxiety can often accompany the child’s condition. Parental distress toward their child’s condition is addressed through education about pain physiology and about the parent’s role in managing their child’s pain behaviors such as unknowingly reinforcing the pain (Allen & Shriver, 1998; Zeltzer & Blankett Schlank, 2005). General biofeedback procedures are applied, including surface electromyography, temperature, and heart rate variability training. Behavioral approaches encompass imagery, hypnosis, cognitive restructuring, and counseling to improve lifestyle habits (McGlothlin, 2005; see Figure) and education about the psychophysiology of the child’s condition. Patients can be referred within the medical center for Botox, physical therapy, individual counseling, and family therapy. A plethora of community resources are available to allow additional types of therapies for the patient, including massage, art and play therapy, or acupuncture.

Biofeedback Development
Biofeedback has become a popular, beneficial treatment for pediatric headache and is currently a standard service for children seen in the Neuroscience Department at Cook Children’s Medical Center (CCMC) in Ft. Worth, Texas. The Neuroscience Department is an outpatient clinic consisting of neurologists and neurosurgeons specializing in headache, movement disorders, epileptology, and neuro-oncology. It is composed of a team of neuropsychologists, a biofeedback practitioner, nurse educators and clinicians, social workers, and child life specialists working in collaboration with physicians to provide optimal treatment for the child. Biofeedback is provided for children ages 6 to 18 years. The population of children seen is ethnically and socioeconomically diverse. Approximately 40% of children are from low-income families.

Before CCMC began offering this service, children were referred outside the clinic for biofeedback to practitioners in private practice. Unfortunately, the greater majority of children were not able to benefit because of biofeedback not being a covered service under insurance policies or parents being unable to afford the cost for treatment. If the child did receive biofeedback, communication between the biofeedback specialist and the neurologist was irregular, and there was a lack of collaboration between professionals regarding patient care and progress.

In 2003, a biofeedback position within the neurology clinic was created. The position requirements included being certified under the Biofeedback Certification Institute of America and holding a state license in a mental health–related field, because our approach is wholistic and embraces the biopsychosocial nature of headaches and various neurological conditions.

Standard Operating Procedure
The child is evaluated by the neurologist and then referred for biofeedback. Neurologists are knowledgeable of the types of conditions treated and the appropriate selection of patients for biofeedback. Initially, patients are scheduled for 4 to 6 weeks, once per week. Fifty minutes are spent with each patient; that time is devoted to education and training. Immediately following the weekly biofeedback session, a brief medication consult and neurological exam are performed by the treating neurologist with the biofeedback therapist and parent(s) present. This allows the service to be billed as a regular doctor’s office visit and allows all children to benefit from this treatment. Our comprehensive approach provides the patient and their parents with the ability to treat all aspects of their condition. Medically, patients can be treated pharmacologically or with herbal supplements in conjunction with behavioral approaches.

Migraine, tension-type, and chronic daily headache are the primary conditions treated in the neurology clinic. However, additional conditions treated can include Tourette’s syndrome, anxiety secondary to neurologic conditions, pain, pseudo-seizures, insomnia, and complex

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**Figure.** Lifestyle reminders for migraine patients (adapted from McGlothlin, 2005).
regional pain syndrome. Biofeedback and hypnosis can also be applied to prepare children for surgical procedures such as deep brain stimulation, which is commonly implemented for children with dystonia.

Children with various conditions learn to become aware and take control of or modulate symptoms. The self-mastery the child achieves often leads to sharing and teaching others these skills, as illustrated in the actual case that follows.

**Case Example**

“Kathy,” a mother of three, felt faint. She had cut her foot so deeply that she could see the bone and was suffering from excruciating pain. She needed to go to the emergency room but wasn’t sure she could make it there without passing out. Fortunately, she lived with an expert in the house who could help her manage the agony. He also happened to be her 11-year-old son, “Zackary.” Zackary had used biofeedback techniques to manage his pain. He had used slowed, paced breathing to cope with injuries suffered after he was attacked by a bully on the playground at school. The incident resulted in damaged ligaments in his jaw and nerve injuries to his neck.

For 3 years, Zachary suffered with jaw locking. He saw several specialists to help with his pain but could not find relief. After seeing five specialists, he saw a child neurologist. The neurologist referred Zachary to biofeedback. The family was skeptical to try yet another treatment because nothing had helped thus far. Reluctantly, they agreed to try biofeedback. Zachary was wary about starting treatment, but during the first visit, he learned to relax his facial muscles. He watched how his breathing related to his emotional states. By the second week, his jaw stopped locking. Eight sessions later, he learned to cope with his pain more effectively and with the stress of school and home—and things such as his mother cutting her foot and going to the emergency room. Zachary accompanied his mother to the emergency room. He looked at his mother and said, “OK Mom, look at me, breathe in three times, and then breathe out five.” His mother said, “Zachary talked me through it. It really helped me because of the techniques he learned by using biofeedback” (Cook Children’s Health Care System, 2008).

**Conclusion**

Biofeedback is a commonly used, successful treatment for children with multiple conditions. Children are generally very open to learning self-regulation of their physiology. They readily benefit from biofeedback, which then continues to be a lifelong skill. Our model combining medical and behavioral interventions contributes to a higher success rate and ensures reimbursement for biofeedback services. Pediatric neurology is a rich area of possibilities in which to teach and change the lives of children and their families. The addition of body/mind approaches contributes a dimension to traditional treatment and added credibility to the field of biofeedback.

**References**


