

5-2017

Practitioner Use of Neurofeedback in the Treatment of Children's Mental Health

Andrea Markworth

St. Catherine University, amarkworth@hotmail.com

Recommended Citation

Markworth, Andrea, "Practitioner Use of Neurofeedback in the Treatment of Children's Mental Health" (2017). *Master of Social Work Clinical Research Papers*. 767.

http://sophia.stkate.edu/msw_papers/767

This Clinical research paper is brought to you for free and open access by the School of Social Work at SOPHIA. It has been accepted for inclusion in Master of Social Work Clinical Research Papers by an authorized administrator of SOPHIA. For more information, please contact hltompkins@stkate.edu.

Practitioner Use of Neurofeedback in the Treatment of Children's Mental Health

by

Andrea Markworth, B.A.

MSW Clinical Research Paper

Presented to the Faculty of the

School of Social Work

St. Catherine University and the University of St. Thomas

St. Paul, Minnesota

In Partial fulfillment of the Requirements for the Degree of

Master of Social Work

Committee Members

Sarah Ferguson, Ph.D., LISW (Chair)

Dannielle White, MSW, LICSW

Kenny Turck, MSW, LICSW

The Clinical Research Project is a graduation requirement for MSW students at St. Catherine University-University of St. Thomas School of Social Work in St. Paul, Minnesota and is conducted within a nine-month time frame to demonstrate facility with basic social research methods. Students must independently conceptualize a research problem, formulate a research design that is approved by a research committee and the university Institutional Review Board, implement the project, and publicly present the findings of the study. This project is neither a Master's thesis nor a dissertation.

Abstract

This study explores the use of neurofeedback, also known as EEG biofeedback, by practitioners treating mental health conditions in children. A semi-structured interview with eight practitioners from various disciplines serves as the data source. Content analysis was utilized and data was coded and categorized. Five themes emerged from the analysis of the interview—Neurofeedback Education, How Neurofeedback Works, Neurofeedback Treatment Structure, Conditions Treated, and Feedback. These findings are in alignment with the existing literature. Specific conditions identified are attention deficit hyperactivity disorder (ADHD), anxiety, and autism spectrum disorder. Neurofeedback may improve symptomology in these conditions as well as others. Implications for neurofeedback as an alternative treatment for children’s mental health is discussed as well as a call for more research on the accessibility of neurofeedback.

Keywords: neurofeedback, EEG biofeedback, child mental health, alternative treatment, ADHD, anxiety, autism spectrum disorder

Acknowledgements

First I would like to thank all the individuals who directly helped with this research study. I thank my chair, Dr. Sarah Ferguson, for all her support and guidance throughout this project. I am grateful for her positive attitude and encouraging words every step of the way. I would also like to thank my committee members Dannielle White and Kenny Turck for taking the time out of their busy schedules to guide, support, and encourage me. Their enthusiasm about this topic significantly enhanced the process. Thank you to all the participants of my study. Taking the time out of your work day or personal life to help me learn more about this topic is so greatly appreciated. Every one of you is so passionate about the work you do and that really came through in the interviews.

I thank my husband David for his never-ending support and cheerleading during this process. I so appreciate his willingness to take on the cooking and taking care of the children when I was busy with schoolwork. I thank my children, Maya and Alex, for their understanding when I had to work on this project, for stepping up to do more chores, and for words of encouragement to stay on task and “get my homework done.” Lastly, thank you to my sweet baby Rayna for blessing me with a great pregnancy that left me with enough energy and brain power to complete this project.

Table of Contents

Introduction.....	6
Literature Review.....	8
What is Neurofeedback?.....	8
Common Childhood Mental Health Conditions.....	9
Attention Deficit Hyperactivity Disorder (ADHD).....	10
Anxiety.....	10
Autism Spectrum Disorder.....	11
Impact of Neurofeedback Treatment on Childhood Mental Health Conditions.....	11
Attention Deficit Hyperactivity Disorder (ADHD).....	12
Anxiety.....	13
Autism Spectrum Disorder.....	13
Additional Childhood Mental Health Conditions.....	15
Summary.....	16
Methods.....	17
Research Design.....	17
Sample.....	17
Protection of Human Subjects.....	18
Data Collection.....	19
Data Analysis.....	20
Strengths and Limitations.....	20
Findings.....	21
Sample.....	21
Results.....	22
Neurofeedback education.....	22
How neurofeedback works.....	22
Neurofeedback treatment structure.....	26

Conditions treated.....	27
Attention Deficit Hyperactivity Disorder (ADHD).....	27
Anxiety.....	28
Autism Spectrum Disorder (ASD).....	29
Additional Childhood Mental Health Conditions.....	29
Feedback.....	31
Discussion.....	33
Limitations.....	35
Implications.....	36
Conclusion.....	37
References.....	38
Appendix A: Informed Consent Form.....	44
Appendix B: Interview Guide.....	48
Appendix C: Content Analysis Start List.....	49
Appendix D: Content Analysis Final Coding List.....	50

Practitioner Use of Neurofeedback in the Treatment of Children's Mental Health

Mental health conditions in children are common (American Psychiatric Association, 2013; Centers for Disease Control and Prevention, 2013; National Alliance on Mental Illness Minnesota, 2016). According to the Centers for Disease Control and Prevention (2013), 13-20% of children struggle with one or more mental health conditions in any given year. The most common among these conditions for children ages 3-17 years include attention deficit hyperactivity disorder (ADHD) at 6.8%, anxiety at 3%, depression at 2.1%, and autism spectrum disorder (ASD) at 1.1%. Dealing with a mental health condition can affect children at home, at school, and in the community. It is also important to consider the impact a child's mental health can have on the child's family, friends, and teachers.

National Alliance on Mental Illness (NAMI) Minnesota (2016) points to increased risk of suicide, school failure, criminal activity, and increased health care costs as some of the effects of childhood mental health conditions. NAMI Minnesota specifies that suicide is the third leading cause of death among 15-24 year olds and that at least 90% of young people who complete suicide have one or more mental health conditions. They also state that about half of high schoolers with mental health concerns drop out of school. Shufelt and Coccozza (2006) found a high rate of mental illness in the juvenile justice system as well. Over 70% of youth in the system had at least one mental health diagnosis, with the majority of that group having more than one diagnosis. Although the topic of increased healthcare costs has not been extensively studied, some research shows that raising a child with a mental health condition can cost close to \$3000 more in annual medical bills than raising a child without such a condition (Lavelle et al., 2014; Pelham, Foster, & Robb, 2007).

Due to the great impact, mental health professionals are consistently in search of treatments that work to improve the lives of everyone involved. Many mental health conditions can be treated with medication, but do not work for all children or may have adverse side effects (Kaiser & Othmer, 2000; Shin et al., 2016). It can often take a long while to get the medication type and dosage correct. Additionally, some parents and clients object to pharmaceutical treatment (Duric, Aßmus, & Elgen, 2014; Hammond, 2005; Holtmann, Sonugo-Barke, Cortese, & Brandeis, 2014; Lofthouse, Arnold, Hersch, Hurt, & DeBeus, 2012). Psychotherapy, including talk therapy and behavior therapy, is another common treatment. However, even though these therapies have been shown to be very effective with some diagnoses, they do not work with all children or with all disorders either (Bernstein, Layne, Egain, & Tennison, 2005; Drysdale, Martinez, & Thompson, 2012). Because of these issues, therapists need other options to treat their clients in place of or in addition to medication or methods already in use.

Neurofeedback is one such alternative that has been found effective when used with children and adolescents who struggle with various mental health conditions (Kadosh et al., 2015). Neurofeedback is a treatment option in which brainwaves of the individual are read, compared to norms, and shown as feedback to the individual via a screen they can see (Hammond, 2005). More information is detailed in the next section. Research has not indicated any adverse side effects of neurofeedback, making it a choice that parents and clients may be in favor of as opposed to taking medications that usually have numerous side effects (Holtmann et al., 2014; Steiner, Frenette, Rene, Brennan, & Perrin, 2014b). The purpose of this study is to explore the experiences of mental health practitioners using neurofeedback—including their training, how they incorporate neurofeedback into their practice, and what changes they are seeing in the children they treat.

Literature Review

This literature review will provide an overview of neurofeedback and its processes. It will then briefly describe childhood mental health conditions and explore the impact these conditions have on children. Finally, it will review research examining the use of neurofeedback interventions to decrease mental illness symptomology.

What is Neurofeedback?

Neurofeedback, also known as electroencephalographic (EEG) biofeedback, is an example of operant conditioning (Duric et al., 2014). Brain waves of the individual are measured by placing electrodes on the head at a number of standardized sites (Hammond, 2005). Brainwaves are measured upon assessment and evaluated against brainwaves of typically developing children. Once deviant patterns are identified, a treatment plan can be developed (Gevensleben, Moll, Rothenberger, & Heinrich, 2014; Hammond, 2005; Holtmann et al., 2014; Sterman & Egner, 2006).

During neurofeedback training sessions, clients are able to see their brainwaves changing in real-time and are rewarded when desired brainwaves are produced. Neurofeedback training can be done in a way that seems to children like they are playing a video game with their brain. Examples of such games are moving a train (Swingle, 2015), painting a picture or shooting an arrow (Hong & Lee, 2012), making a character jump (Heinrich, Gevensleben, & Strehl, 2007), or increasing the speed of an airplane (Holtmann et al., 2014). The continuous feedback from the neurofeedback software provides the brain with practice and repetition, which builds connections in the brain that can reshape how the brain responds to stimuli in the future. Although there are no studies which have explicitly examined the effect of the intensity of neurofeedback training

on the results in clients (Holtmann et al., 2014), many studies incorporate multiple sessions per week with the understanding that redundancy training helps build these connections faster, thus reaching results quicker in clients (Duric et al., 2014; Hong & Lee, 2012; Sadjadi & Hashemian, 2014; Steiner et al., 2014b). During their sessions, the trainees are able to see what effect their actions have on those brainwaves on screen and will gradually learn what skills can be utilized to achieve the desired effects. Once the children can self-regulate their brain waves and these changes become long lasting, their symptoms decrease (Hammond, 2005; Holtman et al., 2014; Shin et al., 2016; Swingle, 2015). Positive reinforcement can be decreased and spread out during training to help clients maintain the skills they learned without being constantly rewarded (Heinrich et al., 2007).

To conduct neurofeedback training, there is a wide variety of software and hardware available for practitioners (Serman & Enger, 2006). Although most neurofeedback is conducted in a center or therapy office, Shin et al. (2016) found success with using smart-tablets during their training sessions with students at their school. They identified many benefits to this method including portability, affordability, and the fact that they can be used in non-clinical settings such as schools. This new research may help reach more children who can benefit from neurofeedback training.

Common Childhood Mental Health Conditions

As mentioned above, some of the most common childhood mental health conditions are attention deficit hyperactivity disorder, anxiety, and autism spectrum disorders (Centers for Disease Control and Prevention, 2013). This section will review these three conditions, the prevalence among children, and the impact the conditions may have on the children and their

families. The next section will review the impact neurofeedback can have on these conditions and briefly address impact on other conditions.

Attention Deficit Hyperactivity Disorder (ADHD). Attention deficit hyperactivity disorder (ADHD) is the most common childhood mental health condition, affecting up to 6.8% of children, as stated above (Centers for Disease Control and Prevention, 2013). Symptoms of ADHD include problems with inattention, impulse control, and hyperactivity at levels that are not developmentally appropriate (Centers for Disease Control and Prevention, 2013; Heinrich et al., 2007; Lofthouse et al., 2012). These symptoms lead to impairments in school settings, peer interactions, and family settings. The Diagnostic and Statistical Manual of Mental Disorders categorizes ADHD into one of three types—inattentive type, hyperactive/impulsive type, or a combination of the two (American Psychiatric Association, 2013). Typical treatment includes medication and behavior modification training (Heinrich et al., 2007; Lofthouse et al., 2012).

Anxiety. Anxiety is a problem for many children as well. According to the U.S. Surgeon General's report on mental health, anxiety disorders as a whole are one of the most common mental health disorders affecting children aged 5-17 years with a twelve-month prevalence of 13% (U.S. Department of Health and Human Services, 1999). Social phobia, the most common of anxiety disorders among children has a prevalence of 7% (American Psychiatric Association, 2013). Other common anxiety disorders in children include separation anxiety, panic disorder, and generalized anxiety disorders with prevalence rates of 4%, 2-3%, and .9%, respectively (American Psychiatric Association, 2013). All anxiety disorders are marked by a fear of a perceived threat that may or may not be real and the focus on this perceived threat may draw attention away from other tasks (Wood, 2006). These disorders are often associated with problems such as depression, low self-esteem, poor school performance,

lack of friends, and substance use (Brendel & Maynard, 2014; Masia-Warner et al., 2005; Vassilopoulos, Brouzos, Damer, Mellou & Mitropoulou, 2013; Wood, 2006). Given the prevalence of anxiety disorders among school-age children, it is imperative that this population have access to interventions that will reduce anxiety symptoms and increase academic and social success.

Autism Spectrum Disorder. Autism spectrum disorder is a neurodevelopmental disorder affecting 1 in 68 children and is 4.5 times more common in boys than in girls (Christensen et al., 2016). Symptoms include impairments in communication and interactions with peers and adults and repetitive behaviors, which might include hand flapping, lining up objects, or fixating on one object or set of objects (American Psychiatric Association, 2013; Centers for Disease Control and Prevention, 2013). Because this is a spectrum disorder, symptoms may manifest themselves in varying degrees. Communication can range from no verbal language to a lesser degree of lack of reciprocal conversations (American Psychiatric Association, 2013). Children with autism spectrum disorder may also prefer time alone to rejuvenate after too much sensory input such as noise from peers, smells, temperature variances, or other variables that may tax their senses.

Impact of Neurofeedback Treatment on Common Childhood Mental Health Conditions

The above conditions are also the most researched childhood mental health conditions that have been studied with neurofeedback. The use of neurofeedback to decrease mental illness symptomology in children has been researched for over 30 years (Conners, 1979), but the majority of the research on specific conditions has been more recent.

Attention Deficit Hyperactivity Disorder (ADHD). Many studies have shown improvements in ADHD symptoms after clients have received neurofeedback (Heinrich et al., 2007; Holtmann et al., 2014; Shin et al., 2016; Steiner, et al., 2014a; Steiner et al., 2014b). Most studies reviewed found increased attention skills, less hyperactivity, improved cognitive functioning, and greater impulse control (Heinrich et al., 2007; Shin et al., 2016; Steiner et al., 2014b). Steiner, et al. (2014b) conducted a study with 104 second and fourth graders with ADHD, in which participants were randomly assigned to either a neurofeedback group, a cognitive training group, or a control group. The control group was advised to continue the care they had been receiving in their community rather than be a “no treatment” group. The cognitive training and neurofeedback groups participated in three 45-minute sessions per week over five months for a total of 40 sessions. Parents, teachers, and blinded observers in the classroom utilized standardized scales pre- and post-intervention, finding significant improvement in ADHD symptoms in the neurofeedback group, but not in the other two groups. Steiner, et al. (2014a) found that their results were sustained at a six-month follow-up assessment and that the children in their study did not need the routine increased dosage of medication that was needed in both the control group and the cognitive training group. Not only does neurofeedback produce long-lasting results, but the results do not dissipate after treatment as they do when medications are discontinued (Holtmann et al., 2014).

Neurofeedback training also appears to have a positive effect on school performance in children with ADHD (Duric et al., 2014). These researchers conducted a randomized control study in which 130 children were assigned to one of three groups: a group treated with the common ADHD medication methylphenidate (MPH), a group treated with both MPH and neurofeedback, or a group treated with neurofeedback alone. The groups receiving

neurofeedback participated in 45-minute sessions three times per week for a total of 30 sessions. The participants completed a self-report questionnaire on hyperactivity, inattention, and school performance, all reporting positive changes in attention and hyperactivity. Interestingly, only the group being treated solely with neurofeedback reported a significant increase in school performance.

Anxiety. Numerous studies looking at children with generalized anxiety disorder and phobia disorders have shown a decrease in anxiety symptoms after receiving neurofeedback training (Hammond, 2005). These studies measured success by the increase of alpha brain waves and the decrease of anxiety scores. Sadjadi and Hashemian (2014) also found neurofeedback to help decrease separation anxiety in children. In their study, the researchers randomly assigned 24 children with separation anxiety to either a group receiving neurofeedback or to a group receiving “sham” neurofeedback (placebo). Each group received 20 30-minute sessions over a 10-12 week period. In the neurofeedback group, the participants received feedback on their own brain waves, whereas the sham group had all of the same conditions except their feedback was actually a recording of someone else’s feedback. Parents completed the Spencer Anxiety questionnaire before and after treatment. Results found that both groups had decreased separation anxiety scores, but that the real neurofeedback group had a greater impact.

Autism Spectrum Disorder. Autism spectrum disorder (ASD) is another well studied condition. Coben and Myers (2010) found that neurofeedback yielded good results in a shorter amount of time than other forms of treatment. Improvements achieved through neurofeedback training included increased social and daily living skills, as well as communication and relationship advances (Coben & Myers, 2010; Friedrich et al., 2015). Coben & Padolsky (2007)

conducted a study with 37 children in a neurofeedback group and 12 children in a wait-list control group, with both groups having no statistical difference in demographics from one another. The neurofeedback group received 20 sessions, after which parents rated the status of symptoms in their children. Eighty-nine percent of the parents stated that they perceived improvement in symptoms with the remaining 11% stating they saw no change. No parents reported a worsening of symptoms. The perceptions of success were confirmed by pre- and post-intervention standardized scales, which showed that in the 89% of children who improved, there was a 40% reduction of autism spectrum disorder symptoms including attention, executive functioning, visual perception, and language abilities.

Another study found that neurofeedback training helped children with autism spectrum disorder realize more positive emotions after reading humorous stories than when they read them previous to treatment (Drysdale et al., 2012). In this study, researchers did not conduct the neurofeedback sessions themselves, but rather recruited participants who had been diagnosed and treated with neurofeedback at a nearby clinic. The control group (Group A) was 23 normal functioning children from a local elementary school. Group B consisted of three children with ASD who had just recently begun their neurofeedback treatment with less than four 50-minute sessions completed. Group C consisted of 11 children with ASD who had received more than 40 50-minute sessions of neurofeedback. The children, all ages 10-14, completed the Multiple Affect Adjective Check List-Revised (MAACL-R) before and after choosing and reading a humorous story. The stories were ones that had been rated by teachers and parents prior to the project. The results on the post-test were similar for Groups A and C, suggesting that neurofeedback can help children with ASD attain more positive emotions from literature.

Additional Childhood Mental Health Conditions. In addition to the above conditions, various other conditions have also been tested using neurofeedback. Walker (2012) found that neurofeedback was effective in helping clients stop their nocturnal enuresis, for example, with effects lasting at least one year. He also found as long lasting results with improving anger control in clients (Walker, 2013). An individual case study showed promising effects for treating oppositional defiant disorder as well (Winkelmolen, Kruiver, & Arns, 2012).

In addition, Huang-Storms, Bodenhamer-Davis, Davis, and Dunn (2006) found neurofeedback training effective in decreasing aggression and other behavioral problems in children who had suffered abuse and neglect. In this study, researchers obtained the treatment records of 20 adopted children who had been removed from their families of origin due to abuse and neglect. The children were assessed before and after intervention using the Child Behavior Checklist (CBCL) and the Test of Variables of Attention (TOVA). Intervention involved children participating in 30 30-minute sessions of neurofeedback individualized to their specific needs. Results showed a significant improvement in social functioning and attention as well as a decrease in aggression, anxiety, depression and faulty thought processes.

As shown in a previous section, many studies have found neurofeedback to be effective in increasing attention abilities in children diagnosed with ADHD (Heinrich et al., 2007; Holtmann et al., 2014; Shin et al., 2016; Steiner, et al., 2014a; Steiner et al., 2014b). Additional studies support neurofeedback as treatment for attention deficits beyond the scope of ADHD. Hong & Lee (2012) found neurofeedback to be efficacious in increasing attention abilities in children with intellectual disabilities. Twenty-one third through sixth graders with mild intellectual disability were randomly assigned to one of three groups: a neurofeedback group, a visual perception training group, or a no treatment group. There were not statistical differences

among the three groups before intervention. The two training groups participated in 30-minute sessions three times per week for a total of 36 sessions. Results showed significant improvement in attention in the neurofeedback group, but not in the other two groups. These effects were still apparent at the 3-month follow-up and some attention scale scores had actually increased since the end of the trial.

Kaiser and Othmer (2000) found improved attention in a large study with children and adults, with only about seventeen percent of those having a diagnosis of ADHD. This study included 1089 participants from 32 clinics. Each participant received at least 20 30-minute neurofeedback sessions, with some participants electing to receive 20 additional sessions. After the initial 20 sessions, 85% of the participants showed significant improvement in attention and impulse control, with those starting at a greater deficit before treatment showing the greatest improvement. Those who elected the additional 20 sessions continued to show improvement.

Summary

There has been much research about neurofeedback training by professionals in various fields with positive results for numerous childhood mental health conditions. Several authors of these studies have suggested that neurofeedback needs to be conducted by professionals who have a good understanding of operant conditioning, neurofeedback processes, and good clinical skills to be effective (Heinrich, Gevensleben, & Strehl, 2007; Serman & Enger, 2006).

Although much research is available on the effectiveness of neurofeedback, very little research exists regarding the experiences of practitioners using this treatment with clients. In addition, many mental health professionals are unfamiliar with the processes and benefits of neurofeedback (Brown & Gerbarg, 2012). This study will focus on the experiences of practitioners including their training, how they incorporate neurofeedback into their practice, and

what changes they are seeing in the children they treat. This information will be used to increase the knowledge base on neurofeedback as a treatment for childhood mental health conditions.

Methods

This section will explore the method used to answer the research question of what are the experiences of mental health practitioners using neurofeedback—including their training, how they incorporate neurofeedback into their practice, and what changes they are seeing in the children they treat? It will describe the research design, sample for the study, data collection, and data analysis and will also address the strengths and limitations of this study and its design.

Research Design

Being that the research question is looking for the experiences of mental health practitioners using neurofeedback, this research design included qualitative interviews. Qualitative interviewing consists of one-on-one interviewing with the researcher and a respondent. Questions are asked in an open-ended fashion to allow respondents to express their story and experiences in their own way (Grinnell, Williams, & Unrau, 2016). More details about the specific technique used can be found in the data collection section.

Sample

The sample for this study included mental health practitioners who are currently using neurofeedback in their practice with children. Although it would be interesting to seek out only social work therapists for this study, doing so would have limited the sample size to too few. For this reason, mental health practitioners from varying disciplines were asked to participate in the study.

To find potential participants to interview, the writer conducted a Google search using the term “neurofeedback providers Minnesota.” There were a few provider databases that resulted from this search as well as some individual practices. Each site contained contact information for the providers. The writer also utilized the snowball sampling technique by asking the practitioners interviewed if they knew of any other practitioners that might be interested in participating in the study (Grinnell, Williams, & Unrau, 2016). The goal was to interview eight to ten practitioners. If that many qualified practitioners who were willing and able to participate could not be found, the plan was to expand the search to neurofeedback providers practicing in Wisconsin, Iowa, North Dakota, and South Dakota until at least eight practitioners agreed to be interviewed.

Protection of Human Subjects

Prior to conducting a study with human subjects, the proposal was approved by the institutional review board of St. Catherine University to ensure the protection of said individuals. Due to the interviews being conducted with professionals about their professional experience, the personal risk was minimized. Steps were taken, however, to ensure each participant knew what would be involved and how their confidentiality would be protected.

Preceding each interview, the researcher reviewed informed consent with the participant by thoroughly explaining the consent form (Appendix A). Each respondent was informed that the 30-45 minute interview would be audio recorded and transcribed, that a professor from the School of Social Work would have access to the transcription, and that quotes from the interview may be presented at the MSW Clinical Research Presentation Day at University of St. Thomas in May 2017. Participants were assured that their identifying information would not be available to

anyone other than the researcher and that the audio recording and transcription will be destroyed at the culmination of this project.

Data Collection

The proposed research design was qualitative research using semi-structured interviews with mental health practitioners from various disciplines. Because this study is looking at the experiences of practitioners, asking them directly is the best design to obtain this information. Semi-structured interviews serve as a strong guide for the interview while allowing for questions that might arise organically. Questions in the interview guide were developed based on the literature on neurofeedback, however, items were left open-ended and impartial as to gain as much information as possible while not influencing the respondent's answers.

The initial items of the guide included questions regarding the practitioner's experience and training in neurofeedback, followed by populations he or she is working with and conditions he or she is treating. Additional questions include those regarding how neurofeedback is incorporated into the treatment of clients, what changes are seen in clients, and feedback from clients and parents. This guide is included as Appendix B.

Due to geographical distance between the interviewer and the possible participants, Skype was chosen as the method to be used to conduct the interviews with phone calls as a back-up option. Literature on the use of Skype as a tool for qualitative research recommends the program as a viable alternative to face-to-face interviews (Janghorban, Roudsari, & Taghipour, 2014; Sullivan, 2012). This literature states that although Skype has some drawbacks such as the need for the proper equipment and knowledge of how to use it, the benefits often outweigh the negatives. The benefits addressed are access to participants that might not otherwise be available

due to geographical distance, convenience to participants which may increase willingness to participate, and the ability to see facial expressions and body language, though not the whole body.

Data Analysis

Data analysis began with transcribing all the interviews. Once transcription was complete, the researcher analyzed the data using content analysis, coding for common themes emerging from the interviews (Grinnell, Williams, & Unrau, 2016). To achieve this task, the researcher studied the transcripts, using the research question as a guide to what pieces of data might be valuable in informing the results. The next step was to categorize these pieces of data into codes. A start list with codes generated from the literature is included as Appendix C. The researcher then re-read and analyzed the transcripts further to refine the codes to best answer the research question of what are the experiences of mental health practitioners using neurofeedback—including their training, how they incorporate neurofeedback into their practice, and what changes they are seeing in the children they treat?

Strengths and Limitations

The biggest strength of this research design is the use of qualitative interviews. Asking therapists directly about their experiences is likely the most effective way to answer the research question. This topic is also important because very little research exists on the experience of the practitioner. Most of the literature focuses on the effectiveness of neurofeedback on a specific condition. While that is very important as well, the results of this study will serve to inform members of the social work profession of what they might expect if they decide to use neurofeedback with children in their own practices. An additional strength to this research

design is the use of Skype for the interviews because this will give access to more potential participants.

The use of Skype could also be a limitation in that participants need to be knowledgeable about its use and have the right equipment and internet speed to make it work properly. Another limitation will be the small sample size. As with many qualitative studies, the sample size is kept small to keep the project manageable. If similar themes emerge from all interviews, the effect of this limitation will be negated. A final limitation is that those interviewed for this project are more likely to have positively-skewed views of neurofeedback. If they did not, it is likely they would not be currently using neurofeedback as a treatment option.

Findings

The following findings reflect the experiences of eight neurofeedback providers in Minnesota. This section will review characteristics of who was interviewed as well as a summary of their answers relating to the research question of what are the experiences of mental health practitioners using neurofeedback—including their training, how they incorporate neurofeedback into their practice, and what changes they are seeing in the children they treat.

Sample

The individuals interviewed for this study were chosen because they are experienced in using neurofeedback in the treatment of children's mental health. Initially, the researcher planned to speak solely to mental health therapists about their experiences, however upon more research, found that therapists are not the only practitioners using neurofeedback to treat children's mental health conditions. Of the eight individuals interviewed, six were licensed as therapists in Minnesota. The other two are not licensed, but are certified to use neurofeedback.

All eight practitioners practice in suburban areas of Minnesota. No rural neurofeedback practitioners were located. Of those practitioners interviewed, five were male and three were female. The researcher interviewed three practitioners with experience ranging from 16-25 years and five practitioners with experience ranging from 2-7 years.

Results

The starting code list for content analysis included the following themes: Experience Being a Therapist, Training in Neurofeedback, How Neurofeedback Works, Neurofeedback Treatment Structure, and Conditions Treated. Upon in-depth review of the transcripts, the researcher redefined the themes as: Neurofeedback Education, How Neurofeedback Works, Neurofeedback Treatment Structure, Conditions Treated, and Feedback and identified three to four codes within each theme. This final coding list is included as Appendix D.

Neurofeedback education. All the respondents reported going to a four- or five-day training as their initial training in neurofeedback. They also reported that they had to travel to one of these training, as there are no local training locations. Many traveled to Chicago, Illinois. Others identified various cities in California as training locations. Other professional trainings included continuing education workshops, either in-person or online. Beyond the professional trainings, six of the eight respondents said they learned from colleagues also practicing in neurofeedback. Three were formally mentored by these colleagues, while the others consulted with colleagues to learn more in general or about specific cases. Lastly, five of the respondents specifically detailed self-study as a method to learn more about neurofeedback.

How neurofeedback works. As one respondent stated, there is no *best way* to do neurofeedback. He stated that practitioners are continually learning new ways of training to

benefit their clients. Although where sensors are placed can vary among practitioners, one thing that they all have in common is the explanation of how neurofeedback works: sensors are placed on the scalp, brainwaves are read, and then information is fed back to the client via audio and/or visual feedback about what is happening with the brain and central nervous system. The brain can then use this information to see how it is doing and work to reach the goals that the practitioner sets with the software.

One practitioner had a good analogy of neurofeedback. She said it is like having a piece of lettuce stuck in your teeth. You might walk around all day not knowing there is a problem. If someone tells you, then you can try to get it out, though with some difficulty. If you look in a mirror, however, you can see exactly where it is and more easily remove it. Neurofeedback is like a mirror for your brain. It gives real-time information about what is working and what is not.

Another commonality among the answers was the need for a ground, or reference, which serves to eliminate outside electrical noises that have nothing to do with brainwaves. One practitioner explained it this way:

One of the strongest electrical noises is your heartbeat. We want to be able to filter that out, so we can just pay attention to the brainwaves, so the reference's job is any signal that is the same for the active and the same for the reference gets filtered out. All the same signals get filtered out, so the only thing we are listening to is the difference between those two sensors. The common place that we put the reference is on the earlobe because there is not a lot of brain wave activity in your earlobe, but there is heartbeat activity and there's also the noise in the room and we are just listening to the

difference between what is on your head and what is on your earlobe and hopefully most of that is brainwave activity.

Many practitioners stated that they allow the client to have input on what kind of feedback they receive. All the practitioners who discussed their specific feedback said that they use audio and visual feedback. One practitioner said that her software relies mostly on audio feedback and she can unplug the visual component if that is what the client would like. Another practitioner stated that he trains most children with low stimuli visual feedback such as a nature scene built into the neurofeedback software. He said he does this because *kids are already good at video games*, and that they can benefit more from being trained in a more subdued environment. Most practitioners stated that their software allows for built-in videos and games as well as having the function of playing any movie of their choosing. The software can then provide an overlay of visual feedback to the screen and control the volume for audio feedback.

One topic that differs among some of the practitioners is how they train the brain. Over half of those interviewed stated that they train one or two channels at a time. This means they train with sensors at just one or two sites, targeting just those frequencies for specific symptomology. They will work to increase or decrease those frequencies depending on what symptoms they are treating. Some practitioners said one can train this way with up to three or four sites, but it starts getting more complicated if done that way. One practitioner reported that she usually only trains one site at a time, but that she sets up at the beginning with two sensors so that she can switch in the middle of the session without interrupting the child too much.

Another type of training that a few of the practitioners explained is Z score training. Whereas the above method trains only one to four frequencies at a time, Z score neurofeedback can train many areas of dysregulation at one time. The software scans the brain and compares

the brainwaves to a normative database. It calculates all the variables into a mean value and then works to train the brain until the mean value reaches zero standard deviations when compared to the database. This method takes the brain longer because it is training multiple areas, but can be beneficial for some clients and their symptoms.

Regardless of the method of training used, a couple of practitioners wanted to make clear the scope of neurofeedback. Based on the idea of operant conditioning, anything one can give the brain information about can be trained. Because neurofeedback is giving feedback to the brain and central nervous system about how it is doing, it can help train deficiencies within the central nervous system. It cannot repair structural damage such as a tumor or damage caused by a traumatic brain injury.

All the practitioners interviewed also stressed the importance of repetition for neurofeedback to work. One gave the analogy of learning how to swim—to become a good swimmer, one must keep practicing. Going to the pool just a few times will not be sufficient practice. It is also beneficial to practice a couple times a week versus spreading practices out too far. This is similar to neurofeedback training, many practitioners said. Some reported that the brain will pare away the training on its own if it is not reinforced. Practitioners gave a range of 24-72 hours for the brain to do this. This can be helpful in cases where the neurofeedback training caused an unexpected side effect such as sleep disruption. Because the brain will pare this effect away after a short time if you do not reinforce that training, this effect will go away on its own and not be long lasting. For new pathways to be built, the same training needs to be repeated many times. One practitioner offered the comparison to trampled grass. When one walks across grass, the blades will lie flat for a while, but then will go back to how they were in a short time. If one walks across the grass in the same place repeatedly, however, the grass will

wear down and will not return to the way it was. Instead, a new path through the grass will be formed.

Neurofeedback treatment structure. Another theme to emerge was neurofeedback treatment structure. Half of the respondents stated that they do an initial assessment scan of the child's brain, compare that to a normative database, and discuss the results with the client and parents/caregivers to verify if the areas showing deficits are the areas causing them concern. All of the respondents state they do ongoing assessment throughout neurofeedback training. They want to check-in with the clients and parents to ask what has happened since the last session to know if the neurotraining was on track. Getting feedback from the clients and caregivers is very important. If results are not positive, training will need to be adjusted as to not reinforce negative effects. Most practitioners reported getting positive results with clients. Two practitioners stated that if they have not seen positive results after five sessions, they know they are doing something wrong or that neurofeedback might not be the right intervention for these specific clients. Results should be positive and the improvements in symptoms should gradually generalize to longer and longer periods of time between sessions.

Respondents also stated that before they get started, they discuss with families the commitment needed to be successful with neurofeedback. Most respondents reported that they want to make sure clients are aware of the commitment and are willing and able to come to all required appointments before they begin the process of neurofeedback training. Six of the eight respondents ask clients to commit to two sessions per week, though two practitioners allow one time per week if the families are unwilling or unable to commit to twice a week sessions. These six respondents also reported that they tell clients to expect 20-40 sessions total, with the actual number of sessions depending on the complexity of symptoms. Toward the end of treatment,

three practitioners reported that they space out sessions to make sure results are lasting before they discontinue neurofeedback training.

As far as the length of sessions themselves, most report one hour sessions, though training usually lasts no longer than 30 minutes of the session. One practitioner keeps his sessions to 30 minutes with 23 minutes of the session being training. He said he does this to keep cost down for clients, while still being effective in training. Several practitioners reported that they may train 2-3 patterns during this time if necessary.

When asked about integrating neurofeedback with other modalities, the respondents had varying responses. Half of the practitioners explained that they do some sort of education with the clients and caretakers about how lifestyle changes can optimize brain health and learning. These lifestyle changes include getting good quality sleep, not using recreational drugs, eating well, drinking water, and exercising. Over half also practice relaxation breathing with their clients. Some include it in every session. They say it calms the body, so that the brain is ready to train. Other modalities that the practitioners listed include meditation training, progressive muscle relaxation, tapping, mindfulness training, art therapy, schema therapy, talk therapy, and cognitive behavior therapy.

Conditions treated. The practitioners interviewed described a wide variety of diagnoses and symptomology treated with neurofeedback. Some were common among many of the respondents and a few were only mentioned by a couple. Starting with the conditions identified in the literature review of this paper, findings will also cover the other conditions.

Attention Deficit Hyperactivity Disorder (ADHD). Most of the practitioners reported good results with their clients with ADHD diagnoses, though with varying results. They

reported that the attention aspect is often easier to train than the hyperactivity aspect. One said she has seen success in both aspects and hypothesized that the child needs to want to slow down. Some like their body and mind to be hyperactive and therefore are less motivated to change.

Another practitioner stated that many times when children come to him with a diagnosis of ADHD and their medications are not working, it is because they have been misdiagnosed. He said the brain scans suggest instead they may have a subclinical seizure disorder and he will then refer them to a neurologist.

Regardless of the diagnosis, if a child comes in with attention issues, practitioners report having success training for increased attention skills. One respondent also described that sometimes there are side benefits of treating ADHD symptoms. He detailed a case in which the child was being treated for ADHD deficits and benefitted by improved baseball skills. The child reported he could hit the ball better, catch it better, pay better attention in the outfield, and experienced overall better motor coordination. This was an added benefit that he was not expecting.

Anxiety. Every practitioner reported good results with children diagnosed with an anxiety disorder. Although symptoms might not completely go away, they are likely to decrease significantly. Two practitioners reported eliminating panic attacks with neurofeedback training.

One practitioner described the results as helping the brain to calm itself enough so that the child can then think about ways to calm the rest of his or her body. Another practitioner gave this explanation about anxiety and how neurofeedback can help:

You have a couple things going on in the brain. You have the brain processing information from the outside world and making sense of it and making decisions about it,

so that's kind of one task. The second thing that goes on is when the communication system isn't busy processing all this information, making decisions, and performing actions, it goes into a resting state and the resting state is associated with particular kinds of EEG frequencies and it also is associated with a decrease in incoming information. That's how we fall asleep at night. This mechanism cuts off the incoming sensory input, so we aren't bothered by the noises outside and the covers in our bed and all that. We shut that off and we don't go running around the house when we're having a dream. Kids with anxiety often times don't know how to do that cutoff process. They don't know how to separate themselves from that incoming data stream and it's very distressing. And so if we can just teach them to cut off that data stream like a [person without anxiety] would be when they have the chance to just relax and rest, it really makes a huge difference in their anxiety level.

Autism Spectrum Disorder (ASD). Six of the eight practitioners report good results with children with an autism spectrum disorder diagnosis. Among the positive results they reported are less rigidity in their behaviors, 60-80% decrease in temper tantrums, and increased social skills including good eye contact and conversation skills.

One practitioner described the success as being able to help relax their brain because their brains *are idling too fast*. She explains that when the part of the brain that is running too quickly is able to relax, other parts of the brain can then explore and grow and ASD symptoms can decrease.

Additional childhood mental health conditions. Among the additional mental health conditions covered during the interviews, some were simply described as having a decrease in symptoms, whereas others came with more detail. Those reported to have a decrease in

symptoms include depression, obsessive compulsive disorder, sleep issues (with results often in just a few sessions), and enuresis (can be eliminated in just a few sessions).

One practitioner reported that although he has had limited practice with dyslexia, he has seen good success with those individuals. He described one case in which he treated a child's dyslexia during the school year and summer and by the start of the next school year, the new teacher could not detect any dyslexia in the child.

Another practitioner described similar success with stuttering. He explained that when people stutter, it is often due to a breakdown of communication between the part of the brain that knows what the person wants to say and the part that puts it into motor context to make that speech happen. He said if one trains these two areas to communicate with each other, stuttering can be eliminated.

In the above section on ADHD, one practitioner said he identifies some children as actually having a subclinical seizure disorder rather than true ADHD. He said he refers these children to a neurologist because he does not feel qualified to treat seizure disorders. Another practitioner, however, who does have experience working with seizure disorders reported that neurofeedback can help them. She said the children she works with who have seizure disorders are usually on their maximum dosages of medication, but are still having seizures. She reported that the neurofeedback can help bring the number of seizures down so that the medication can work the rest of the time. Once the brain is having fewer seizures, she said, the brain can develop more consistently.

Another area where a couple of the practitioners have seen success is chemical use. The times when neurofeedback does not decrease chemical use is when it is part of the child's social

connections. If a client is using recreational chemicals to make themselves feel better, however, the practitioners have seen success in changing the need in the brain to use them. One respondent gave the example of using marijuana or alcohol to slow racing thoughts. Though this is an effective approach, it is also a maladaptive one. If neurofeedback can help slow the racing thoughts, the individual will no longer need the marijuana or alcohol to do that for them.

Attachment is yet another area where neurofeedback may be effective. One practitioner reported that he has seen children with attachment issues become much more prosocial after neurofeedback training. He said that their areas of conflict *tend to reduce significantly*, explaining that this is demonstrated by them being more comfortable around people and being able to engage in reciprocal relationships.

Six of the eight respondents also reported success when treating trauma with neurofeedback. Two of the respondents credit neurofeedback with *lowering walls protecting the trauma* so that the children are then able to process the trauma with their therapist. Others report benefits such as better mood regulation, better sleep regulation, and the ability to think before automatically reacting to triggers.

One practitioner gave the example of a young boy who had been adopted after experiencing early childhood trauma. After only 10 sessions of neurofeedback, his parents reported that he decreased his incidences of aggression from 25 per day to no more than three per day. He also became less impulsive and better able to communicate with his family members.

Feedback. A final theme that emerged from the interviews is the feedback from the children and parents as well as what the practitioners themselves observed after treating their clients. Besides the above results, practitioners cited various changes in their clients in general,

changes that were not specific to any particular diagnosis. Many practitioners described mood enhancement among the children they treated. Several practitioners also reported an increase in social awareness, demonstrated by better eye contact, being able to process what was going on around them, and being able to carry on conversations with others.

Most of the practitioners (six out of eight) also reported a decrease in medication for their clients. Several explained that while some medications might need to be discontinued after treatment, almost all medications will at least need to be decreased. One respondent said that he sees about half of his clients discontinue their medication and the other half have their dosages reduced by 50% or more. Another stated that some of her clients do not get the increased dosage that they would usually get as they grow. Practitioners reported that they advise parents and caregivers to watch for signs of being overmedicated and to discuss any changes with the prescribing doctor. One practitioner explained that she has a psychiatrist that she works with who refers clients to her for neurofeedback if the medication is not working well enough on its own. They find that neurofeedback can help the medication to be more effective than the medication alone.

When asked what kind of feedback they are getting from children they treat, the respondents said they are getting a lot of positive feedback. Some children simply say they feel better or they feel happy, whereas others give more specific answers such as *I can concentrate better, I listen better in school, I like not taking so many meds, I'm sleeping better, or I'm not wetting the bed*. Others have given more creative answers such as *my brain is usually so full, but it doesn't feel so full now* or *people are being nicer to me*. Many of the respondents also said that their clients do not always articulate their feedback and some needs interpretation. The most common of this kind of feedback is when the children come to their appointments, are fully

engaged and seem happy to be there. Over half of the respondents interpret this as positive feedback from their clients.

The respondents all also reported getting positive feedback from parents and caregivers of their clients. Almost all report that they are getting most of their new clients through the referrals of the parents of the children they have treated. Other feedback that they are getting include reports that the children now smile when they have not been doing so in a while, that they are getting along with siblings, listening better, having fewer arguments and meltdowns, doing better behaviorally in school, getting better grades, and have decreased symptoms compared to the beginning of treatment.

Discussion

The purpose of this study was to explore the experiences of practitioners using neurofeedback to treat mental health conditions in children. The interviews covered the topics of how the practitioners were trained, how they incorporate neurofeedback into their practice, and what changes they are seeing in their clients.

Although the practitioners interviewed come from a variety of disciplines, all were trained in a similar fashion, namely a multi-day training by neurofeedback professionals and then follow-up study on their own or with other experienced neurofeedback providers. Each practitioner also expressed the need to travel for this initial training, which could prove to be a barrier for some who would like to become trained to practice neurofeedback.

In addition to having comparable training experiences, the practitioners seemed to have similar perspectives about how neurofeedback works and the conditions that can most benefit from neurofeedback treatment; perspectives that align with the existing literature. Several

practitioners described similar set-ups (Hammond, 2005) and the need for frequent sessions to build new neuropathways faster (Duric et al., 2014; Hong & Lee, 2012; Sadjadi & Hashemian, 2014; Steiner et al., 2014b), with symptoms decreasing as these connections are built (Hammond, 2005; Holtman et al., 2014; Shin et al., 2016; Swingle, 2015). The ongoing assessment of these symptoms throughout treatment and the adjustment of training practices echoes the idea of individualized treatment in the literature (Gevensleben, et al., 2014) and ensures that clients are getting the proper neurofeedback training to address their specific issues.

Conditions treated was a prevalent theme that emerged from the interviews as well as in the literature. In the literature review, three common childhood diagnoses were addressed—attention deficit hyperactivity disorder (ADHD), anxiety, and autism spectrum disorder. The studies found neurofeedback to be effective in decreasing symptoms in all three of these conditions (Coben & Myers, 2010; Friedrich et al., 2015; Hammond, 2005; Steiner et al., 2014a). The respondents in this study also reported positive changes in clients with these disorders after neurofeedback treatment. Interestingly, they also identified many other conditions in the literature. These included resolving nocturnal enuresis (Walker, 2012), increasing anger control (Walker, 2013), decreasing symptoms of oppositional defiant disorder (Winkelmolen, Kruiver, & Arns, 2012), decreasing aggression and other behavioral problems in children who had suffered trauma (Huang-Storms, et al., 2006), and increased attention in non-ADHD clients (Kaiser & Othmer, 2000).

The literature and the respondents in this study also alluded to a possible advantage of neurofeedback over other treatments. Often when evaluating a treatment, one must consider the side effects of that treatment to determine risk. With neurofeedback, there are no known side effects (Holtmann et al., 2014; Steiner et al., 2014b). However, there may be side benefits

(Duric et al., 2014). The respondents detailed several instances in which unexpected, but welcome changes occurred following treatment. Some of these included mood enhancement, social awareness, and better sleep.

Another benefit that many of the practitioners reported is a decreased need for medication. This is an advantage to neurofeedback because, while medication can be helpful for some children, it does not work for all children, may have adverse side effects, can be difficult to find the right type and dosage, or simply may not be an option the clients or families want to explore (Duric, et al., 2014; Hammond, 2005; Holtmann, et al., 2014; Kaiser & Othmer, 2000; Lofthouse, et al., 2012; Shin, et al., 2016). The practitioners reported observing longer lasting results with neurofeedback than with medication, which also aligns with what the existing literature has found (Duric et al., 2014; Holtmann et al., 2014; Steiner, et al., 2014a).

Limitations

There are a few limitations identified in this study. Although Skype is a good alternative when face-to-face interviewing is not feasible, it was not always a viable option in this study. At times, the internet bandwidth was not reliable enough to keep a stable connection. Due to this, a few interviews were disconnected and had to be reconnected. Other interviews were conducted over the phone due to respondents not being familiar with Skype technology. Despite these limitations, the writer does not believe interview content was hindered.

Another limit to this study, as with most qualitative studies, is the small sample size. With only eight respondents, generalizability is limited. It is encouraging, however, that even though there were only eight respondents, this number is over half of the fourteen identified neurofeedback providers that work with children in Minnesota. It is also encouraging that most

of the respondents had similar experiences in their practice of neurofeedback. The fact that these practitioners individually described comparable experiences lends credibility to the findings.

A final limitation identified is that the respondents and the writer may have a positively skewed view of neurofeedback and the outcomes it may provide. It is unlikely that these individuals would continue to practice and express interest in the practice of neurofeedback if they did not have a positive opinion about this modality. The respondents in this study all expressed eagerness to share their knowledge of neurofeedback, pointing to the great success they have seen as the source of this enthusiasm.

Implications

Due to the number of children affected by mental illness and the impact of these illnesses, it is beneficial to have yet another tool with which to treat them. This study suggests that for many, neurofeedback is a viable option for treatment. It also adds to the knowledge base of how practitioners utilize it as a treatment modality for treating these children. Social workers and other mental health professionals should be encouraged to explore neurofeedback as an option in their own practice.

While this and previous research has spoken to the benefits of neurofeedback, very little research exists on the accessibility. Future social work research needs to examine what barriers might be in place for parents who are seeking out neurofeedback as an alternative treatment for their children. Cost, insurance coverage, access to therapists who offer neurofeedback, and education about the process of treatment are all areas to be explored. Similarly, research should investigate the accessibility for therapists interested in providing neurofeedback as a treatment option.

Conclusion

Just as no other single therapy can work for every individual (Kaiser & Othmer, 2000; Shin et al., 2016), neurofeedback does have limitations. The respondents in this study, however, identify where neurofeedback can be beneficial and where it can help when other therapeutic modalities have proved unsuccessful. Neurofeedback has been shown to be a safe (Holtmann et al., 2014; Steiner, Frenette, Rene, Brennan, & Perrin, 2014b) and valuable treatment for several common childhood mental health conditions (Kadosh et al., 2015). Practitioners and clients alike seem excited about the outcomes that neurofeedback provides. The field of childhood mental health will surely benefit from further knowledge on how to access neurofeedback as an additional treatment modality to use to improve the lives of clients and their families.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.
- Bernstein, G. A., Layne, A. E., Egan, E. A., & Tennison, D. M. (2005). School-based interventions for anxious children. *Journal of the American Academy of Child & Adolescent Psychiatry*, 44(11), 1118-1127. doi:10.1097/01.chi.0000177323.40005.a1
- Brendel, K. E., & Maynard, B. R. (2014). Child–parent interventions for childhood anxiety disorders: A systematic review and meta-analysis. *Research on Social Work Practice*, 24(3), 287-295. doi:10.1177/1049731513503713
- Centers for Disease Control and Prevention (2013). *Mental Health Surveillance Among Children — United States, 2005–2011*. <http://www.cdc.gov/mmwr/pdf/other/su6202.pdf>. Accessed on 6/22/16
- Christensen D.L., Baio J., Braun K.V., Bilder D., Charles, J., Constantino, J.N., ... Yeargin-Allsopp, M. (2016). Prevalence and characteristics of autism spectrum disorder among children aged 8 years — Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2012. *Surveillance Summaries*, 65(3). 1-23. doi: <http://dx.doi.org/10.15585/mmwr.ss6503a1>
- Coben, R., & Myers, T. E. (2010). The relative efficacy of connectivity guided and symptom based EEG biofeedback for autistic disorders. *Applied Psychophysiology and Biofeedback*, 35(1), 13-23. doi:10.1007/s10484-009-9102-5

- Conners, C.K. (1979). Application of biofeedback to treatment of children. *Journal of the American Academy of Child Psychiatry*, *18*(1), 143-153.
- Drysdale, M. T. B., Martinez, Y. J., & Thompson, L. (2012). The effects of humorous literature on emotion: A pilot project comparing children with Asperger's syndrome before and after neurofeedback training and controls. *Journal of Neurotherapy*, *16*(3), 196-209.
doi:10.1080/10874208.2012.705758
- Duric, N. S., Aßmus, J., & Elgen, I. B. (2014). Self-reported efficacy of neurofeedback treatment in a clinical randomized controlled study of ADHD children and adolescents. *Neuropsychiatric Disease and Treatment*, *10*, 1645—1654.
doi:https://dx.doi.org/10.2147/NDT.S66466
- Friedrich, E. V. C., Sivanathan, A., Lim, T., Suttie, N., Louchart, S., Pillen, S., & Pineda, J. A. (2015). An effective neurofeedback intervention to improve social interactions in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *45*(12), 4084-4100. doi:10.1007/s10803-015-2523-5
- Gevensleben, H., Moll, G. H., Rothenberger, A., & Heinrich, H. (2014). Neurofeedback in attention-deficit/hyperactivity disorder—Different models, different ways of application. *Frontiers in Human Neuroscience*, *8*, 846. doi:10.3389/fnhum.2014.00846
- Grinnell, Jr., R.M., Williams, M., & Unrau, Y.A. (2016). *Research methods for social workers: An introduction*. Kalamazoo, Michigan: PairBond Publications.
- Hammond, D. C. (2005). Neurofeedback with anxiety and affective disorders. *Child and Adolescent Psychiatric Clinics of North America*, *14*(1), 105-123.
doi:10.1016/j.chc.2004.07.008

- Heinrich, H., Gevensleben, H., & Strehl, U. (2007). Annotation: Neurofeedback-train your brain to train behaviour. *Journal of Child Psychology and Psychiatry*, *48*(1), 3-16.
doi:10.1111/j.1469-7610.2006.01665.x
- Holtmann, M., Sonuga-Barke, E., Cortese, S., & Brandeis, D. (2014). Neurofeedback for ADHD: A review of current evidence. *Child and Adolescent Psychiatric Clinics of North America*, *23*(4), 789-806. doi:10.1016/j.chc.2014.05.006
- Hong, C., & Lee, I. (2012). Effects of neurofeedback training on attention in children with intellectual disability. *Journal of Neurotherapy*, *16*(2), 110-122.
doi:10.1080/10874208.2012.677666
- Huang-Storms, L., Bodenhamer-Davis, E., Davis, R., & Dunn, J. (2007). QEEG-guided neurofeedback for children with histories of abuse and neglect: Neurodevelopmental rationale and pilot study. *Journal of Neurotherapy*, *10*(4), 3-16.
doi:10.1300/J184v10n04_02
- Janghorban, R., Roudsari, R.L., & Taghipour, A. (2014). Skype interviewing: The new generation of online synchronous interview in qualitative research. *International Journal of Qualitative Studies on Health and Well-being*, *9*. doi: 10.3402/qhw.v9.24152
- Kadosh, K. C., Luo, Q., de Burca, C., Sokunbi, M. O., Feng, J., Linden, D. E. J., & Lau, J. Y. F. (2016). Using real-time fMRI to influence effective connectivity in the developing emotion regulation network. *NeuroImage*, *125*, 616-626.
doi:10.1016/j.neuroimage.2015.09.070
- Kaiser, D. A., & Othmer, S. (2000). Effect of neurofeedback on variables of attention in a large multi-center trial. *Journal of Neurotherapy*, *4*(1), 5-15. doi:10.1300/J184v04n01_02

- Lavelle, T.A., Weinstein, M.C., Newhouse, J.P., Munir, K., Kuhlthau, K.A., Prosser, L.A. (2014). Economic burden of childhood autism spectrum disorders. *Pediatrics* 133(3). 520-529. doi:10.1542/peds.2013-0763
- Lofthouse, N., Arnold, L. E., Hersch, S., Hurt, E., & DeBeus, R. (2012). A review of neurofeedback treatment for pediatric ADHD. *Journal of Attention Disorders*, 16(5), 351-372. doi:10.1177/1087054711427530
- Masia-Warner, C., Klein, R. G., Dent, H. C., Fisher, P. H., Alvir, J., Albano, A. M., & Guardino, M. (2005). School-based intervention for adolescents with social anxiety disorder: Results of a controlled study. *Journal of Abnormal Child Psychology*, 33(6), 707-722. doi:10.1007/s10802-005-7649-z
- National Alliance on Mental Illness (NAMI) Minnesota. *Facts on Children's Mental Health in America*. <http://www.namihelps.org/assets/PDFs/fact-sheets/Children-and-Adolescents/Facts-on-Childrens-Mental-Health--in-America.pdf>. Accessed on 6/23/16.
- Pelham, W.E., Foster, E.M., & Robb, J.A. (2007). The economic impact of attention-deficit/hyperactivity disorder in children and adolescents. *Journal of Pediatric Psychology*, 32(6). 711-727. doi:10.1093/jpepsy/jsm022
- Sadjadi, S. A., & Hashemian, P. (2014). Effectiveness of neurofeedback therapy in children with separation anxiety disorder. *African Journal of Psychiatry*, 17(6), 1-3.
- Shin, M., Jeon, H., Kim, M., Hwang, T., Oh, S. J., Hwangbo, M., & Kim, K. J. (2016). Effects of smart-tablet-based neurofeedback training on cognitive function in children with attention problems. *Journal of Child Neurology*, 31(6), 750-760. doi:10.1177/0883073815620677

- Shufelt, J. L. & Coccozza, J. J. (2006). *Youth with mental health disorders in the juvenile justice system: Results from a multi-state, multi-system prevalence study*. Delmar, New York: National Center for Mental Health and Juvenile Justice. Retrieved from [www.unicef.org/tdad/usmentalhealthprevalence06\(3\).pdf](http://www.unicef.org/tdad/usmentalhealthprevalence06(3).pdf)
- Steiner, N. J., Frenette, E. C., Rene, K. M., Brennan, R. T., & Perrin, E. C. (2014a). In-school neurofeedback training for ADHD: Sustained improvements from a randomized control trial. *Pediatrics*, *133*(3), 483-492. doi:10.1542/peds.2013-2059
- Steiner, N. J., Frenette, E. C., Rene, K. M., Brennan, R. T., & Perrin, E. C. (2014b). Neurofeedback and cognitive attention training for children with attention-deficit hyperactivity disorder in schools. *Journal of Developmental and Behavioral Pediatrics*, *35*(1), 18-27.
- Serman, M. B., & Egner, T. (2006). Foundation and practice of neurofeedback for the treatment of epilepsy. *Applied Psychophysiology & Biofeedback*, *31*(1), 21-35.
- Sullivan, J. R. (2012). Skype: An appropriate method of data collection for qualitative interviews? *The Hilltop Review*, *6*(1), 54-60.
<http://scholarworks.wmich.edu/hilltopreview/vol6/iss1/10> Accessed on 9/10/2016
- Swingle, P. G. (2015). *Adding Neurotherapy to Your Practice*. Springer International Publishing: Switzerland. doi:10.1007/978-3-319-15527-2
- U.S. Department of Health and Human Services. (1999). *Mental health: A report of the Surgeon General*. Rockford, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health and National Institute of Mental Health.

- Vassilopoulos, S. P., Brouzos, A., Damer, D. E., Mellou, A., & Mitropoulou, A. (2013). A psychoeducational school-based group intervention for socially anxious children. *Journal for Specialists in Group Work, 38*(4), 307-329. doi:10.1080/01933922.2013.819953
- Walker, J. (2013). QEEG-guided neurofeedback for anger/anger control disorder. *Journal of Neurotherapy, 17*(1), 88-92. doi:10.1080/10874208.2012.705767
- Walker, J. E. (2012). Remediation of enuresis using QEEG-guided neurofeedback training. *Biofeedback, 40*(3), 109-112. doi:10.5298/1081-5937-40.3.04
- Winkelmolen, D., Kruiver, V., & Arns, M. (2012). Neurofeedback treatment in a client with ADHD and ODD. *Biofeedback, 40*(3), 102-108. doi:10.5298/1081-5937-40.3.05
- Wood, J. J. (2006). Effect of anxiety reduction on children's school performance and social adjustment. *Developmental Psychology, 42*(2), 345-349. doi:10.1037/0012-1649.42.2.345

Appendix A

Informed consent form



ST. CATHERINE UNIVERSITY
Informed Consent for a Research Study

Study Title: Therapist Use of Neurofeedback Treatment with Children

Researcher(s): Andrea Markworth, BA

You are invited to participate in a research study. This study is called Therapist Use of Neurofeedback Treatment with Children. The study is being done by Andrea Markworth, a Masters' degree student at the joint School of Social Work at St. Catherine University and University of St. Thomas in St. Paul, MN. The faculty advisor for this study is Dr. Sarah Ferguson, PhD, MSW, MA, LISW, associate professor, School of Social Work at St. Catherine University/University of St. Thomas.

The purpose of this study is to explore the experiences of mental health therapists who are using neurofeedback in the treatment of childhood mental health conditions. This includes their training, how they incorporate neurofeedback into their practice, and what changes they are seeing in the children they treat. This study is important because the information will be used to increase the knowledge base on neurofeedback as a treatment for childhood mental health conditions. Approximately 10-15 people are expected to participate in this research. Below, you will find answers to the most commonly asked questions about participating in a research study. Please read this entire document and ask questions you have before you agree to be in the study.

Why have I been asked to be in this study?

You have been asked to participate in this study because you use neurofeedback in the treatment of mental health conditions in children. Your name was obtained in one of two ways: (1) an online search for neurofeedback providers or (2) your name was provided by another therapist who had been contacted to participate in the study.

If I decide to participate, what will I be asked to do?

If you meet the criteria and agree to be in this study, you will be asked to complete an interview via Skype. The interview will include questions regarding your experience and training in neurofeedback, populations you are working with, and conditions you are treating with neurofeedback. Additional questions include those regarding how neurofeedback is incorporated in the treatment of clients, what changes you are seeing, and feedback you are getting from clients and parents.

Because this is not a face-to-face interview, you will also be asked to sign and email this consent form back to the researcher before the interview starts.

In total, this study will take approximately 45-75 minutes.

What if I decide I don't want to be in this study?

Participation in this study is completely voluntary. If you decide you do not want to participate in this study, please feel free to say so, and do not sign this form. If you decide to participate in this study, but later change your mind and want to withdraw, simply notify me and you will be removed immediately. Your decision of whether or not to participate will have no negative or positive impact on your relationship with St. Catherine University, University of St. Thomas, nor with any of the students or faculty involved in the research.

What are the risks (dangers or harms) to me if I am in this study?

This study has no foreseeable risks to participants.

What are the benefits (good things) that may happen if I am in this study?

There are no direct benefits to you for participating in this research.

Will I receive any compensation for participating in this study?

You will not be compensated for participating in this study.

What will you do with the information you get from me and how will you protect my privacy?

The interview will be audio recorded and later transcribed by the researcher. Identifying information in the transcripts will be replaced with generic terms so that you cannot be identified by the transcript. I will keep the audio recording on a password protected device and the transcripts in a locked filing cabinet. Only my research advisor and I will have access to the recordings and transcripts while I work on this project. I will finish analyzing the data by June 1, 2017 and will then destroy all original recordings and transcripts.

Any information that you provide will be kept confidential, which means that you will not be identified or identifiable in the any written reports or publications. Quotes from the interview may be included in the final report unless you object to their use. If it becomes useful to disclose any of your information, I will seek your permission and tell you the persons or agencies to whom the information will be furnished, the nature of the information to be furnished, and the purpose of the disclosure; you will have the right to grant or deny permission for this to happen. If you do not grant permission, the information will remain confidential and will not be released.

Are there possible changes to the study once it gets started?

If during the course of this research study I learn about new findings that might influence your willingness to continue participating in the study, I will inform you of these findings.

How can I get more information?

If you have any questions, you can ask them before you sign this form. You can feel free to contact me, Andrea Markworth, at (320) 296-6903 or abmarkworth@stthomas.edu. If you have any additional questions later and would like to talk to the faculty advisor, please contact Dr. Sarah Ferguson, Associate Professor, at (651) 690-6296 or smferguson@stkate.edu. If you have other questions or concerns regarding the study and would like to talk to someone other than the researcher, you may also contact Dr. John Schmitt, Chair of the St. Catherine University Institutional Review Board, at (651) 690-7739 or jsschmitt@stkate.edu.

You may keep a copy of this form for your records.

Statement of Consent:

I consent to participate in the study and agree to be audio recorded.

My signature indicates that I have read this information and my questions have been answered. I also know that even after signing this form, I may withdraw from the study by informing the researcher(s).

Signature of Participant

Date

Signature of Researcher

Date

Appendix B

Interview Guide

1. How long have you been a therapist?
2. Under which professional license do you practice neurofeedback in the treatment of children with mental health issues?
3. How were you trained for neurofeedback?
4. How long have you been incorporating neurofeedback into your mental health practice with children?
5. How are you integrating neurofeedback into your practice?
6. What type of neurofeedback are you using?
7. What populations are you finding to be a good fit with neurofeedback?
8. What conditions are you treating with neurofeedback?
9. How do you determine who might be a good candidate for neurofeedback?
10. What do sessions look like?
11. What challenges do you face in using this methodology?
12. Do you consistently use other treatment modalities alongside neurofeedback? If so, which other treatment modalities do you use?
13. What is a typical number of sessions per client to see results?
14. What results are you seeing in clients?
15. What feedback are you getting from clients?
16. What feedback are you getting from parents of clients?

Appendix C

Content Analysis Start List

Themes expected to emerge during content analysis include:

Experience Being a Therapist

Training in Neurofeedback

How Neurofeedback Works

Neurofeedback Treatment Structure

Conditions Treated

Appendix D

Content Analysis Final Coding List

Themes	Codes within themes
Neurofeedback education	Professional training Self-study Colleague support
How neurofeedback works	Neurofeedback set-up Need for repetition Scope of neurofeedback
Neurofeedback treatment structure	Assessment & client input Commitment Integration with other modalities Neurotraining
Conditions Treated	ADHD Anxiety Autism Spectrum Disorder Additional childhood mental health conditions
Feedback	Practitioner observations Child feedback Parent feedback Medication implications